Indian Head Hatchery Expansion Project

Environmental Registration 1975

Environmental Preview Report

July 31, 2023

Mowi Canada East Inc.

This document has been prepared for Mowi Canada East Inc. to be submitted on behalf of Northern Harvest Sea Farms Ltd. to the Province of Newfoundland and Labrador, Department of Environment and Climate Change according to the requirements of Government of Newfoundland and Labrador *Environmental Protection Act* and pursuant to the Minister of Environment and Climate Change Decision Letter of July 15, 2021.

Prepared by
Linda D. Hiemstra and Morgan R. Townsend
Mel-Mor Science, 379 Poets Trail Drive, Nanaimo, BC V9R 7B1

EXECUTIVE SUMMARY

Introduction

Project Name: Indian Head Hatchery Expansion Project

Environmental Assessment Registration: Environmental Registration (ER) 1975

Date of Registration: July 2018

Proponent

The proponent, Northern Harvest Sea Farms Ltd. (NHSF), is a Canadian company growing Atlantic salmon in the Province of Newfoundland and Labrador since the 1990's. In 2017, NHSF was purchased by Mowi Canada East Inc. (MCE).

MCE is a registered Canadian company farming salmon on the east coast of Canada including the Province of Newfoundland and Labrador.

This Environmental Preview Report (EPR) has been prepared by MCE on behalf of NHSF for the Province of Newfoundland and Labrador, Department of Environment and Climate Change, according to the requirements of Government of Newfoundland and Labrador *Environmental Protection Act* and pursuant to the Minister's decision of July 15, 2021.

Mowi is a global seafood company registered in Norway with fish farming operations in Norway, Scotland, Canada, the Faroe Islands, Ireland, and Chile. As a 100% owned subsidiary, MCE benefits from Mowi's vast knowledge and corporate integrity, as well as economic support. MCE shares and adheres to the production standards and environmental sustainability values set by Mowi.

Mowi is the largest salmon farming company in the world supplying 20% of the farm-raised Atlantic salmon with a harvest volume of 464,000 MT in 2022 and employing 11,500 people in 26 countries. As a fully integrated company raising salmon from egg to plate, Mowi ensures all aspects of production meet the highest standards in all operations globally.

Mowi's holistic approach to fish culture places the emphasis on environmental sustainability. The company leads the industry in continuous improvement in all aspects of salmon farming. Significant corporate resources are invested in innovations and improvements to improve the health and welfare of salmon, to minimize interactions with the environment, and to provide the best food for our customers.

In recognition of these efforts, for the fourth year in a row, Mowi has been ranked the most sustainable protein producer by the independent Coller FAIRR Protein Producer Index.

Purpose

The Indian Head Hatchery Expansion Project (Hatchery Expansion) proposes to improve the production of Atlantic salmon at the existing and fully licensed Indian Head Hatchery by increasing the number of Atlantic salmon juveniles ready to go to sea (referred to throughout this document as smolt) by 2.2 million annually and producing larger and more robust smolt, to fully utilize MCE's saltwater farm capacity within the Province of Newfoundland and Labrador, to improve environmental performance, and to enhance production security.

Project Rationale

The Hatchery Expansion is required to support business development within the province and meet the targets in the 2018 Newfoundland Salmon Farming Development Business Plan submitted to the provincial government, to enhance environmental sustainability, and to improve production and business security.

Business Development

The Hatchery Expansion's additional 2.2 million smolt will be used to fully utilize existing licensed saltwater farms in the province. Additional smolt are an important component in developing an independent self-sustaining salmon culture business in the Province of Newfoundland and Labrador that includes both freshwater and saltwater production.

Environmental Improvement

The Hatchery Expansion represents MCE's principles of continuous advancement towards more environmentally sustainable salmon farming. The project will improve the hatchery's environmental performance in the following ways.

1. Reduced potential for environmental interactions and escapes through installation of a fully enclosed Fish Transfer System to move smolt to the transport vessel.
2. Greater efficiency in use of freshwater by installing new Recirculating Aquaculture System (RAS) technology requiring less water per smolt grown.
3. Lowering the effluent environmental risk profile with improved wastewater treatment including additional particle removal, triple screening, and disinfection.

4. Improved production efficiencies through upgrades in existing systems for healthier fish and improved fish welfare.

Business Security

The Hatchery Expansion will increase long-term industry and business stability by producing larger (250+ g), more robust smolt. Larger smolt are the industry standard worldwide as they shorten the time that salmon spend in the ocean, minimizing exposure to sea lice and natural pathogens, and thus reducing the opportunity for potentially negative environmental impacts.

Environmental Assessment History

The Indian Head Hatchery Expansion was submitted for environmental assessment and registered as ER 1975 in July 2018. After government assessment, the project was released from further environmental review the same year and the project construction commenced. Following a legal challenge by special interest groups represented by the environmental charity Ecojustice, a court decision in 2021 overturned the 2018 release. The Minister of Environment and Climate Change (the Minister) subsequently ordered an Environmental Preview Report (EPR) to fill in the data gaps identified by the Judge.[1]

MCE elected to provide an EPR, and the Minister appointed an Environmental Assessment Committee (EAC) in August 2021 to provide guidance to MCE in the preparation of the EPR. Details of the history of ER 1975 are provided in the Introduction section.

The EPR Guidelines, developed to provide direction on the information to be included in the EPR, were issued in December 2021. This EPR is an unrestricted and candid reporting of MCE fish farming practices as requested in the Guidelines.

Environmental Preview Report (EPR)

Salmon farming is complicated, highly technical, and continuously evolving. For these reasons, the industry is often not well understood by the public. The EAC has provided Guidelines for the EPR with topics that the public indicated more information was required.

Along with the public engagement sessions conducted during the preparation of the EPR, this document will promote greater understanding of how aquaculture is regulated within the

[1] *Salmonid Association of Eastern Newfoundland v. Her Majesty the Queen in Right of Newfoundland and Labrador,* 2020 NLSC 34, aff'd 2021 NLCA 26

province and MCE's farming practices.

Purpose

The purpose of the EPR is to address the information gaps identified during the legal challenge in sufficient detail for the Minister of the Department of Environment and Climate Change (the Minister) to determine if the mitigation measures manage the potential environmental interactions and no significant negative environmental effect nor significant public concern remains in connection with the proposed undertaking.

Scope

As per the direction of the Minister and the EAC, the scope of the undertaking for the purpose of the EPR includes the following.

1. The systems, technologies, and processes required to increase production at the Indian Head Hatchery from 4.5 million Atlantic salmon smolt to 6.7 million annually (as listed in the original registration).
2. The requirements for rearing Atlantic salmon through full life cycle from egg to harvest.
3. The potential effects on the surrounding environment from Atlantic salmon production through the full life cycle, from egg to harvest, and the regulatory controls and company policies in place that mitigate harmful effects.

The Undertaking

The Hatchery Expansion proposes to increase production at the existing licensed Indian Head Hatchery by 2.2 million salmon smolt (juveniles ready to go to sea) annually while improving efficiency and security of salmon production and reducing the hatchery environmental footprint. The additional smolt will all be grown to harvest on saltwater farms in the province and will be used to fully utilize existing licenced saltwater farms. A full description of all components of MCE facilities, operational procedures, and culture parameters used to grow salmon from egg to harvest is provided in Section 4.0 Description of the Undertaking.

Hatchery Expansion Construction

As a result of the timing of the Court decision that overturned the 2018 release of the undertaking, the components of the Hatchery Expansion are either partially or fully constructed. It is indicated in the list below which elements are not completed.

- **Additional fish production units** - Modular RAS Building with four independent fish culture modules each having four culture tanks and a dedicated RAS technology which cleans and reuses up to 97% of the fish culture water. These units are capable of freshwater and saltwater culture of smolt 250+ g in size.
    - Modules 1 and 2 are complete, modules 3 and 4 have not yet been constructed.
- **Improved vaccination and grading** – The improved vaccination and grading system has enclosed fish transport lines leading to and from culture systems providing better fish welfare and more efficient vaccination and grading processes.
- **Enhanced effluent management** - New Effluent Treatment Building 2 to process all fish culture wastewater with 37-micron particle removal, triple screening, and ultraviolet disinfection prior to discharge at a new deep-water outfall.
- **Secure fish culture freshwater source** – Three new freshwater wells provide additional water for the increased production. The water flows from the wells to the new Water Treatment Building where it is disinfected and stored in a reservoir prior to use in the culture systems.
- **New fish culture saltwater source** – New wells provide saline fish culture water to acclimatize the salmon for ocean rearing.
    - This system is not complete. An additional barrier well is required to increase the salinity in the production wells. The water line between the hatchery and the Water Treatment Building has not yet been installed.
- **Secure fish transfer system** - New fully enclosed Fish Transfer System runs from the Modular RAS Building to the transport vessel at the Port of Stephenville. It is a fully enclosed system for conveying fish that reduces the potential for escapes and loss of fish culture water to the environment while providing more efficient transfer to the vessel and improved fish health and welfare.
    - The section of the Fish Transfer System from the boundary of the hatchery property to the Port of Stephenville is not yet constructed.

The Hatchery Expansion components will support increased production and higher quality larger smolt that are better acclimatized to the ocean. The new technology will allow for enhanced management of the fish culture environment and greater efficiency in the use of freshwater. The

fish culture effluent will have additional treatment including disinfection prior to discharge.

Indian Head Hatchery

Since 2011, the Indian Head Hatchery has been licensed to produce 4.5 million salmon from egg to smolt annually. The facility is fully compliant with all licence conditions and provincial and federal regulations and policies that govern freshwater salmon culture in the Province of Newfoundland and Labrador. The Indian Head Hatchery operational licences include Aquaculture Licence #1087 and Water Use Licence #WUL 18-9929.

The hatchery is ideally located in the Port of Stephenville Industrial Park with services, including power, water, fire protection, and paved roads, and a deep-water port for the vessels transporting smolt to the saltwater farms. The hatchery and the Hatchery Expansion components are all located on land owned or leased by MCE or in process to be owned or leased.

Fish Culture

Including the components of the Hatchery Expansion, the hatchery has five fish culture buildings with dedicated water influent lines and effluent lines: egg incubation and fry rearing building, three smolt rearing buildings, a new modular RAS building. There is also a grading/vaccination building used during culture.

- The grading/vaccination building is a component of the Hatchery Expansion that was fully constructed prior to the court's reversal of the release decision.
- The Modular RAS Building, which is also part of the Hatchery Expansion, is not fully constructed.

All culture systems have fish rearing tanks and recirculating aquaculture system (RAS) technology that allows for enhanced control over the fish culture environment to manage fish health and welfare. RAS technology also provides the ability to make highly efficient use of freshwater resources. With the current fish culture systems, up to 97% of the fish culture water is cleaned and re-used. The Hatchery Expansion Modular RAS Building is designed for 97% of the fish culture water to be treated and re-used. In employing the RAS technology, less than 5% of the culture water is required to be renewed each day. Traditional flow-through hatchery culture systems would require 100% new water.

Fish Culture Water Source

Freshwater for fish culture for the current production and for the proposed Hatchery Expansion is 100% sourced from a nearby aquifer. Extensive testing and modeling of the groundwater since 2018 showed the quality meets fish culture parameters with no requirement for chemical modification and has no contamination. The aquifer recharge rate is more than adequate for the current hatchery production, the proposed Hatchery Expansion, and all other users who withdraw from the same source.

The use of the groundwater is actively managed by the Department of Environment and Climate Change (ECC) Water Resources Management Division on several levels.

- Extensive testing and modeling of the freshwater aquifer completed prior to submission of ER 1975 demonstrated the aquifer has the capacity to supply the additional hatchery requirements.
- Conditions of the Water Use Licence WUL 18-9929, including annual water use reports.
- A hydrogeologic assessment was completed and reports submitted to the Water Resource Management Division every two months and accepted by the ECC Minister.
- A groundwater monitoring system, a condition of ER 1975 release in 2018, has been installed and will continue to be operated as per the Water Use Licence. This system provides data reported to the ECC for management of the aquifer use. All costs for installation, operation, and maintenance are paid for by MCE.
- A real-time water quality and quantity monitoring network continues to provide water levels and selected water quality parameters with the type, number, and location of the stations to the ECC.

Water flows from the deep wells to the Water Treatment Building, a component of the Hatchery Expansion that was fully constructed prior to the court's reversal of the 2018 release. At the Water Treatment Building, the influent water is UV disinfected as a precaution and held in a reservoir prior to distribution to the fish culture units.

Fish Culture Effluent Management

The fish culture effluent management system has been designed to service the current production and the proposed additional Hatchery Expansion production. As all current and proposed hatchery fish culture systems have RAS technology, less than 5% of the volume is discarded as effluent.

- Effluent Treatment Building 1 is pre-existing. Effluent Treatment Building 2 is a component of the Hatchery Expansion that was fully constructed prior to the court's reversal of the 2018 release decision.
- Effluent Treatment Building 2 includes enhanced technology and capacity to remove solids to 37 microns, triple screen the liquid effluent, and UV disinfect to eliminate pathogens prior to discharge at a deep-water outfall.

100% of current fish culture effluent is processed through both buildings. When the Modular RAS Building is completed and functional, the effluent from this system will be processed through Building 2 only.

Effluent is sampled monthly and tested for over 40 parameters to ensure compliance with the *Environmental Control Water and Sewage Regulations*, *2003* NLR 65/03 and Best Aquaculture Practices Certification Standards, Guidelines: Finfish, Crustacean and Mollusk Hatcheries and Nurseries, Appendix A.

Fish Transport to Saltwater Farms

The proposed Hatchery Expansion includes an efficient and secure Fish Transfer System consisting of an enclosed pipe that runs from the hatchery to the transport vessel. The fish culture water used during transfer is returned to the hatchery or held with the fish in the vessel. This permanent and enclosed structure will reduce environmental impacts by reducing the potential for escapes and discharge of untreated fish culture water to the environment.

All salmon are shipped to saltwater farms via transport vessel. The standard protocol is no water exchange with the environment during transport. Water quality monitoring and aeration and oxygen systems are continuously active for the duration of the trip. The salmon arrive at the saltwater farms in the best condition and are transferred securely to net pens via enclosed lines with catch nets.

Saltwater Farms

The salmon smolt produced at the Indian Head Hatchery, including the proposed Hatchery Expansion smolt, will grow to harvest size on saltwater farms located on the south coast of the province in the Bays East and Bays West areas. Bays East has operations to the east of Harbour Breton including Harbour Breton Bay. Bays West area is to the west of Harbour Breton excluding farms in Harbour Breton Bay. Most farms are remote with access by water only, limited local activity, few close communities, and no nearby sources of pollution.

Thirty-nine saltwater farms owned by MCE are the full complement of farms available for production. All farms have a valid aquaculture licence, water use licence, crown lands permit, and *Navigable Waters Protection Act* (NPA) approval. These authorizations indicate each site has been thoroughly reviewed for potential environmental impacts and the use of the site as described in the application meets all environmental thresholds and regulatory standards.

Six new farm applications have been submitted but have not been approved, therefore these sites are not available for salmon culture production planning.

The licences have been attained through purchase or acquisition of other companies or through new aquaculture licence applications.

- At the submission of the Indian Head Hatchery Expansion in 2018, thirty-three farms had been acquired from the purchase of Northern Harvest Sea Farms Ltd.
- By the end of 2018, seven additional licences had been acquired and three trout licences were removed from the production plan as this species is not currently farmed by MCE.
- In 2019 and 2020, ten new licences were approved, and eight licences were dropped from production due to being in areas shared with other companies which no longer aligns with the company's Bay Management Area (BMA) principles, leaving a total of thirty-nine farms available for production.

Farm infrastructure is certified third-party engineered design with installation according to the engineered site layout to ensure strength and to maintain integrity throughout the rearing cycle and all potential weather conditions reducing opportunities for predator access and for fish escapes.

Fish are cultured at a maximum stocking density of 15 kg/m^3 to provide the best environment for fish health and growth, sea lice management, and water quality management. Fish are fed on a specific schedule using calculated quantities of feed and during feeding are continuously monitored for behaviour that indicates satiation – the point at which the salmon are no longer consuming the food pellets. Once satiation has been reached, the feeding is stopped to reduce uneaten feed which has the potential for environmental impact.

Potential Environmental Interactions and Mitigations

Situations with the potential for environmental interaction were identified in the Guidelines and include use of the freshwater resource, pathogen transfer between farmed and wild salmon, management of mortalities, benthic habitat impacts, chemotherapeutant use, activities that affect species at risk, invasive species distribution, and farms salmon escapes.

A summary of the interactions identified in the Guidelines with the MCE operational measures and the regulations and policies in place to safeguard the environment can be found in Table 71 Summary of Potential Environmental Interactions and Operational Mitigations Summary in Section 6.0 Potential Environmental Interactions and Operational Mitigations.

Unless otherwise indicated, the information provided on potential environmental interactions, comprehensive regulatory controls, detailed MCE management plans, and farming operating procedures apply to the rearing of all MCE salmon in the province including the proposed Hatchery Expansion salmon.

Regulatory Environmental Safeguards

The Province of Newfoundland and Labrador has comprehensive and rigorous regulations, policies, and active administrative processes that govern salmon aquaculture with environmental sustainability as an overriding principle.

Licensing

All licensed saltwater farms in the province have had rigorous review by provincial authorities, namely Department of Fisheries, Forestry and Agriculture (FFA) and Department of Environment and Climate Change (ECC) and federal agencies, namely Department of Fisheries and Oceans (DFO) and Transport Canada (TC) as part of the aquaculture licence application process. Questions or concerns, including those raised in public consultation, are addressed during the review. Design changes are made until all agencies are satisfied.

The aquaculture licensing review process includes full assessment for the following.

- Review of benthic environment and potential impacts (DFO)
- Mitigation measures to protect the environment and the farm site (DFO, FFA)
- Wild and farmed interaction, both traditional fishery species and wild salmon (DFO)
- Operational Plans (FFA)
- Water use and environmental review (ECC)

All MCE facilities in production are fully licensed and are fully compliant with all licensing and

operational regulatory and policy requirements. In addition, the facilities have operational and management plans and policies that meet or exceed the regulatory requirements.

Bay Management Area Strategy

In 2015, the Government of Newfoundland and Labrador established the Bay Management Area (BMA) principles to enhance the health and biosecurity of saltwater farms and to preserve the environmental integrity of the ecosystem. MCE follows all regulations and government policies including the Bay Management Strategy. Examples from the strategy include the following.

- A company operating within a BMA will stock with the same year class of fish.
- Minimum of four months fallow between stockings for a BMA. Fallowing refers to the time when no fish are grown on the site after harvest and before the next stocking.
- A biosecurity management plan, that dictates the flow of materials between sites and BMAs, must be provided to FFA.
- Each company must provide Production Plans for FFA approval.
- New site separation within the BMA is 5 km apart for different companies and 1 km apart for the same company.

Aquaculture Act, Regulations and Policies

The provincial *Aquaculture Act* provides the Department of Fisheries Forestry and Agriculture (FFA) with the authority to manage and control the development of the aquaculture industry in the province. The purpose of the *Act* and associated regulations is to promote the prudent and orderly development of the aquaculture industry, secure property rights, minimize resource user conflicts, and engage in co-operative decision making with external government agencies.

The operational Aquaculture Policy and Procedures Manual provides the processes for the development, licensing, and operation of an aquaculture facility. It includes aquatic animal health responsibilities with the objective of promoting the orderly development of an environmentally sustainable aquaculture industry, establishing the province as a world leader in aquaculture health and production, and increasing public trust.

The Aquaculture Policies provide a comprehensive framework for salmonid culture in the province. MCE abides by the regulations as stated under the *Aquaculture Act* and the detailed guidance provided in the Aquaculture Policies.

Code of Containment of Salmonids

MCE respects and meets or exceeds all requirements in The Code of Containment for Culture of Salmonids in Newfoundland and Labrador (The Code). The Code is a provincial government policy that addresses salmon containment and escapes through equipment standards, handling practices, infrastructure testing and reporting requirements, inspections, and reviewing company management plans and mitigating measures.

The Code is a management strategy for the culture of salmonids and focuses on containment of farmed fish as a fundamental aspect of sustainable aquaculture.

- All salmonid culture license holders are required to abide by The Code under the authority of the *Aquaculture Act* and regulations.
- The Code represents the province's commitment to maintaining sustainable development that is transparent, responsible, and collaborative.

The Code is managed for the province by FFA and for the federal government by DFO. Both regulators are responsible for ensuring robust requirements are in place to minimize farmed fish escapes and to effectively deal with escapes if they do occur.

Certificate of Health for Fish Transfer

All salmon to be transported to saltwater farms have an extensive health assessment and a risk assessment by the provincial veterinarian prior to transport. The FFA Aquatic Animal Health Division (AAHD) determines the requirements for the health assessment and conducts the risk review. The requirements include the components required for the Certificate of Health for Fish Transfer (CoHFT) developed to ensure the health of farmed fish moved between provinces on the east coast of Canada. The required FFA Transport Permit and DFO Introductions and Transfer Licence are only issued once the AAHD provincial veterinarian is satisfied the fish meet the health standards.

Reporting

All freshwater and saltwater salmon culture operations are managed by either federal or provincial regulations or a combination of both. Reporting is a requirement of all regulatory agencies. MCE submits detailed reports regularly to these agencies. Public reporting is also a requirement of the aquaculture licence for specific situations such as an escape event.

Corporate Commitment to the Environment

Mowi's continuous improvement principles have provided support for salmon farming innovations aimed at reducing potential environmental interactions across all areas where the company farms.

Following the Mowi requirements, MCE has developed comprehensive management plans that provide or set the standards for strategies, responsibilities, and standard operating procedures for all operations. The management plans and all fish culture activities focus on rearing healthy salmon and protecting the environment.

The management plans include but are not limited to the following topics.

- Operational Environmental Mitigation
- Mitigating Potential Farm Impacts on the Environment
- Environmental Management and Waste Management
- Salmonid Fish Health Management
- Integrated Pest Management
- Sensitive Habitat and Species at Risk Management

The management plans are reviewed annually and revised to reflect MCE's continuous improvement through all practices, aligning with new standards developed by Mowi globally. The management plans are incompliance with or exceed all regulatory requirements. The management plans are also submitted to and approved by the Government of Newfoundland to ensure they meet all regulations and policies.

Environmentally Friendly Protein Production

By all indicators, salmon farming is the most environmentally efficient form of animal production with the lowest freshwater use, lowest carbon emissions, and smallest environmental footprint compared to beef or pork. The carbon footprint of farm-raised salmon is 7.9 kilogram of carbon equivalents per kilogram of edible salmon product, compared with 12.2 and 39 kilograms of carbon equivalents per edible kilogram of pork and beef respectively.[2]

Sustainability Strategy

The Mowi Sustainability Strategy is a company-wide policy that recognizes the value of the

[2]220707-Mowi-Policy-on-climate-change-and-energy-use.pdf.

environment and the corporate responsibility in safeguarding it for the future. This strategy aligns with the UN Sustainability Development Goals. The Sustainable Development Goals (SDGs) - Mowi Company Website.

The Sustainability Strategy provides a framework for developing salmon rearing practices with the environment in mind. For example, Mowi's plastic waste reduction target for 2025 is for 100% of plastic packaging to be reusable, recyclable, or compostable. The Sustainability Strategy is more fully explained in the introduction to Section 6.0 Potential Environmental Interactions and Mitigations.

Global Sustainable Seafood Initiative

Mowi endorses the principles of the Global Sustainable Seafood Initiative (GSSI), a public-private partnership that works to preserve oceans for future generations and provide a sustainable source of seafood for everyone. The GSSI is aligned to implement the UN Sustainable Development Goals through collaboration of businesses, NGOs, governments, and international organizations representing the full seafood value chain.

Coller FAIRR Index

The independent Coller FAIRR Protein Producer Index evaluates sixty of the largest global meat, dairy, and aquaculture companies annually. It has recognized farmed salmon producers as the most sustainable animal protein producers in the world.

In 2022, **Mowi ASA was ranked the most sustainable protein producer globally for the fourth year in a row** and was rated **"Industry Best"** using criteria aligned to the SDGs including greenhouse gas emissions, deforestation and biodiversity, use of antibiotics, animal welfare, working conditions, food safety, and governance.

Best Aquaculture Practices (BAP) Certification

All MCE salmon harvested from the province are Best Aquaculture Practices (BAP) certified. BAP is a Global Seafood Sustainability Initiative (GSSI) recognized standard designed to reduce the impact of aquaculture activities on the environment and increase production efficacy through science and research. BAP standards provide the framework for ecological sustainability. Independent audits of each production site ensure MCE is doing everything they can to be ecologically sustainable. MCE has participated in the program since 2012. The Indian Head Hatchery was the first hatchery to be BAP certified in North America.

Wild-Cultured Interactions, Cultured Salmon Containment

It is standard Mowi policy that interaction between cultured salmon and wild salmon is to be avoided at all costs. Detailed protocols and procedures for reducing opportunities for fish escapes are included in the MCE Environmental and Waste Management Plan, Management of Wild and Farmed Salmon Interactions that are revised as needed and approved by FFA. This ensures all regulations and best practices are followed.

- Farm infrastructure is designed, and engineer certified to ensure strength and integrity throughout the rearing cycle and all potential weather conditions and to reduce the potential for equipment failure.
- All equipment meets or exceeds the conditions as determined in the provincial Code of Containment.
- Equipment is routinely inspected and promptly replaced as needed and determined by provincial and federal aquaculture regulations.
- Specific training has been designed to ensure crew and operational staff are aware of the best management and husbandry practices to safeguard salmon and reduce the potential for escape.

In managing potential environmental interactions, the robustness of salmon farming equipment is of key importance. MCE farm design is third-party engineering certified for environments similar to the south coast of the province ensuring no infrastructure will fail which could result in the potential for fish escapes.

In addition to reducing the potential for escapes, MCE exclusively uses local Saint John River stock which is the only stock approved by DFO for aquaculture in the province. DFO manages the species/stock of salmon cultured through the National Code of Introductions and Transfers of Organisms Program which requires permits for all fish movement within the province and between the Canadian Atlantic provinces in order to reduce potential effects such as introducing a non-native species.

Hatchery Expansion Potential Environmental Impacts

The Indian Head Hatchery is licensed to produce 4.5 million smolt annually. In constructing the hatchery, the production processes and environmental impacts underwent a full environmental assessment, and the project was released in 2011 (ER 1544).

The Hatchery Expansion (ER 1975) is to further improve technology and processes to increase production by 2.2 million smolt annually. The project has been designed to provide greater

management of culture practices, reduced requirement for freshwater resources per fish, and improved quality of effluent discharge – all significantly improving the current environmental footprint of the facility. The following information addresses the potential environmental impacts of the proposed additional production of 2.2 million smolt annually from the Hatchery Expansion.

Infrastructure Construction

The Hatchery Expansion construction and infrastructure design considered the potential environmental impacts.

- The hatchery site was previously used for industrial purposes and required minimal clearing and leveling prior to construction.
    - Hatchery Expansion systems – Modular RAS Building, Vaccination and Grading Building, and Effluent Treatment Building 2 – are all located on hatchery site in close proximity to the existing buildings.
    - Sub-surface water lines were installed in the same trench to reduce the need for disturbance.
- The Hatchery Expansion components were designed specifically for the site to improve environmental performance.
    - To take advantage of the natural slope of the site towards the shoreline, the Water Treatment Building is upland from the hatchery allowing fish culture water to be gravity fed to the fish culture systems reducing the need for pumping.
    - The Modular RAS systems are designed for up to 97% fish culture water re-use. The technology reduces the amount of water required per fish.

A full description of the status of the undertaking and the remaining construction is provided in Section 4.2 Hatchery Expansion Construction.

Freshwater Culture

The proposed Hatchery Expansion smolt production will increase the volume of fish culture water required, effluent discharged, and general waste.

- Additional freshwater for fish culture.
    - All tests and continuous monitoring show the groundwater source is capable of providing the required additional volume of fish culture water.
    - The proposed new Modular RAS Building technology provides enhanced control over the rearing environment and treatment of fish culture water allowing for up to 97% of the water to be re-used, reducing the amount of water required per fish.

- Additional waste and fish culture effluent.
    - The Hatchery Expansion includes Effluent Treatment Building 2 with additional waste management including removal of particles down to 37 microns, triple screening, and UV disinfection to remove pathogens. Though the volume of effluent will be increased, the potential for negative environmental impact is reduced.
    - The effluent is tested monthly to ensure it conforms to Government of Newfoundland wastewater regulations and the BAP standard.
- Additional waste materials.
    - All waste is managed through an approved Waste Management Plan included in the Environmental and Waste Management Plan that is on file with FFA.

Transport

The Hatchery Expansion Fish Transfer System eliminates the need for truck transport of smolt, reducing the concern for fish escapes during transport, loss of fish culture water to the environment, and eliminating fossil fuel consumption.

It is estimated the additional 2.2 million Hatchery Expansion fish will increase the number of vessel trips to saltwater farms by 2-3 annually. The additional trips will follow the existing transport vessel use and fish transport protocols that have the following safeguards.

- All fish transported from the hatchery to saltwater farms undergo a health assessment and review by the provincial veterinarian, prior to the issuance of the mandatory federal Introductions and Transfers Licence and provincial Transport Permit.
- The transport vessel is equipped with fish life support systems. Standard practice is to run closed without water exchange for the full trip from the hatchery to the saltwater farms. All waste materials generated on board are disposed of on-land at registered disposal sites. The vessel is thoroughly cleaned and disinfected prior to making a subsequent transport.
- The fish transport vessels are under contract and fully licensed. The transport vessel crew is responsible for all registrations and authorizations required for ships working in Canadian waters. Arrangements to use the Port of Stephenville wharf are made in advance by MCE and provided to the vessel captain.

Saltwater Culture

The Hatchery Expansion smolt will be grown on saltwater farms on the south coast of the

province that are individually licensed for a specific limit of production. The smolt for stocking these farms will be sourced from either the Indian Head Hatchery or from outside of the province. The source of smolt does not change the number of fish that can be reared per farm, nor does it change the rearing practices at each farm. Therefore, growing the Hatchery Expansion smolt on existing fully licensed saltwater farms will not create the potential for environmental impact in excess of what has already been evaluated in the process of granting the aquaculture licence.

- The potential for environmental interactions was evaluated during the licence application process for each saltwater farm. This included a review of the rearing practices, technology, proposed stocking plan and the maximum rearing capacity. The proposed Hatchery Expansion is to produce additional smolt to fully use capacity at existing licensed saltwater farms. Therefore, the rearing of current hatchery production and proposed Hatchery Expansion production on saltwater farms has been taken into consideration previously during the licence application process. The proposed Hatchery Expansion salmon will not significantly increase the potential for environmental interactions beyond what has been already assessed during the licence approval process.
- The MCE Environmental Management and Waste Management Plan (EMWMP) applies to all aspects of saltwater production and focuses on management of potential environmental interactions. This plan and the associated standard operating procedures (SOPs) ensure all production practices align with government regulations and policies. The EMWMP is reviewed annually, revised as needed, and submitted for review and approval by FFA.
- The MCE Salmonid Health Management Plan provides operational guidance and reporting requirements for the management of fish health issues to maintain fish health and welfare at all times.
- For the farms designated to receive the Hatchery Expansion smolt, stocking and rearing must adhere to the same regulations, reporting, policies, and permitting required for every salmon farm in the province. This is the case if the smolt originate from the Indian Head Hatchery or elsewhere.

The stocking of each farm with hatchery smolt is approved by, and production continuously monitored by federal and provincial agencies, including FFA, ECC, and DFO. Impact on the farm site from salmon production is monitored and evaluated for each production cycle. Renewal of the licence is dependent on receiving approval from the Government of Newfoundland and Labrador departments and federal agencies.

Veterinary Services and Chemotherapeutant Use

For both the freshwater and saltwater culture, fish health is managed by a veterinarian certified in Canada. On the rare occasions that chemotherapeutants are required, Health Canada determines the products that are available, how they are used, and when they can be used in relation to harvest. Oversight is provided by the Government of Newfoundland and Labrador. After approved treatment, reports are submitted to several federal and provincial agencies to track the use of prescription chemotherapeutants.

Prior to being transported to saltwater farms, all salmon are vaccinated against disease, which is similar to how vaccines are used in other agricultural operations and in human medicine. As a result, antibiotic use on saltwater farms is rare, employed only when other methods of sustaining fish health are not successful. Antibiotics are never used to promote growth but only used for specific situations to ensure the health and welfare of the fish.

A comprehensive MCE Integrated Pest Management Plan for sea lice management is submitted to FFA for approval annually. Each treatment is managed by a licensed veterinarian and approved by government agencies. Only drugs approved by Health Canada can be used. The application of approved drugs is strictly regulated thereby tightly managing the potential for unwanted drugs in the marine environment.

The goal of all fish rearing practices is healthy robust salmon. Fish culture technicians apply biosecurity practices as outlined in Section 4.3b Biosecurity Protocols and for the most part aquaculture fish are healthy. The veterinarian manages biosecurity and fish health assessments. For specific health events, the veterinarian determines the response, manages the treatment, and ensures regulatory reporting as required. On the rare occasion a chemotherapeutant is deemed the best choice for fish health, the veterinarian is required to prescribe the drug, to manage the treatment, and assess the efficacy.

Detailed information on chemotherapeutants legally available for aquaculture, MCE's use of anti-microbials in the past two years, and management measures to mitigate environmental interactions please refer to Section 4.3c Veterinary Services for All Life Stages, Section 4.3d Purpose and Use of Anti-microbials, Section 4.3l Integrated Pest Management Plan, and Section 6f Chemotherapeutant Management. Section 6 Potential Environmental Interactions and Mitigations includes Table 71 Summary of Potential Environmental Interactions and Operational Mitigations Summary.

Biosecurity

Biosecurity is the ongoing process of identifying, evaluating, and addressing actions or events to reduce the risk of disease transmission, to or from the culture site.

MCE has developed rigorous biosecurity protocols that are detailed in the Salmonid Health Management Plan (HMP) that is reviewed annually, revised as needed, and approved by the provincial government to ensure all regulations and policies are addressed.

All salmon harvested in the province are BAP certified. BAP standards for biosecurity are also comprehensive and include the following that apply to both freshwater and saltwater rearing of salmonids.

- MCE biosecurity and health management plans include procedures for site fallowing, cleaning of farm equipment, visitor and vessel hygiene precautions, sanitary disposal of dead fish, increased vigilance if disease is suspected, sea lice management, and management of abnormal events including elevated mortality and reportable disease events.
- Training programs ensure competency for implementing the Health Management Plan (HMP) and biosecurity Standard Operating Practices (SOPs).
- Potential pathogens of concern are listed in the HMP and federally reportable diseases can be found at : https://inspection.gc.ca/animal-health/aquatic-animals/diseases/reportable-diseases/eng/1322940971192/1322941111904.
- Health status documents for all live animals are brought into the facility.
- HMP includes procedures and indicators to monitor and document the health of stocks including observations of physical appearance, feeding response and mortality, or of larval development and/or growth rate at biologically relevant intervals.
- HMP includes procedures for identifying diseases in hatchery stocks, diagnosis of pathogens and, where necessary, determination of susceptibility to therapeutants and treatments.
- Records are kept for the health status of all animals or gametes shipped from the facility.
- All holding, transport, and culture systems are designed, operated, and maintained to minimize the unintended release of eggs, larval forms, juveniles, and adult animals.
- Staff members who drive boats shall be trained to avoid contact between boats and net pens.

Biosecurity is the key to having healthy fish and effectively managing potential environmental interactions. As such biosecurity precautions are prevalent in all fish culture practices. In this document, specific protocols are provided in Section 4.3b Biosecurity Protocols, Section 4.3l

Integrated Pest Management Plan, Section 6b Mitigation Strategies to Limit Pathogen Transmission and Section 6c Elevated Mortality and Reportable Disease Event Management.

Other Marine Users

MCE saltwater farms are entirely on the water and there are no terrestrial facilities for farm rearing of salmon. MCE saltwater farms are on the south coast in remote areas with small communities accessed by water or by a limited network of roads. Farms are accessible by water only and most are more than 5 km from a community.

Public engagement events and an open-door policy provide situations where MCE staff and other users can exchange information and discuss activities. In this way, other users are known to MCE staff. To date, any issues with other marine users have been resolved satisfactorily for both parties through communication.

Activities such as fishing, boating, and accessing cabins etc. are not restricted by the farm infrastructure nor the salmon farming activities. Access to the area is not impeded as the aquaculture license conditions require the following.

- A minimum 40 m navigation channel between farm infrastructure and the shoreline on all newly developed aquaculture farms.
- Minimum depth of 10 m above all farm sub-surface moorings.
- Aids to navigation such as buoys, day beacons, lights etc. are installed as required by Transport Canada for the safety of marine resource users.
- Provisions for lobster traps to be deployed and harvested near and beneath the farm infrastructure.
- All infrastructure, surface and sub-surface, are within the boundaries of the aquaculture lease.
- Though established farms can maintain current site separation, new sites operated by different companies in one BMA must be greater than 5 km apart and new sites operated by the same company must be greater than 1 km apart.

Detailed information on other users and maps with their activities can be found in Section 6j Avoiding Interference with Other Legitimate Marine Users and Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Marine Activities in the Bay Management Area.

Decommissioning and Site Restoration

MCE is committed to the establishment of an independent and self-sustaining salmon farming business unit in the Province of Newfoundland and Labrador. This information provides contingency planning for the unlikely occurrence of having to decommission a site. Detailed information is provided in Section 4.2e Construction for Site Decommissioning and Restoration and Section 7.0 Decommissioning and Site Restoration.

Indian Head Hatchery

The Indian Head Hatchery is MCE's only freshwater production facility in the province. MCE has invested significantly in the Indian Head Hatchery and this facility is a key component in the development of an independent sustainable Atlantic salmon aquaculture business in the province. Therefore, there is no plan to close this facility.

However, should decommissioning be required, a detailed plan would be developed and approved to ensure all environmental requirements are addressed.

- The modular nature of the fish culture systems allows for staged shutdown of individual culture units and/or individual buildings without affecting the functions of other units or buildings.
- Water flow and effluent also have individual lines and are managed separately for each building.
- Equipment will be moved to other MCE sites, sold, or recycled.
- A building to be decommissioned would have the same controls and procedures in place during construction that ensured limited impact on the environment.
- Any materials not reused will be recycled or disposed of as indicated in the MCE Waste Management Plan approved by FFA.

Saltwater Farms

The equipment used on the saltwater farms is designed and constructed to be accessible and taken apart for regular cleaning and repair and if necessary, replacement. These normal activities are undertaken on a defined maintenance and repair schedule as determined by FFA and DFO. Inspection reports are provided by MCE to regulatory agencies.

In the case of farm decommissioning, a Site Restoration Plan was provided to the Government of Newfoundland and Labrador for approval with all new site applications submitted since 2019.

By the fall of 2023, all operational farms in the province will have an approved Site Restoration and Financial Assurance Plan that details the process of decommissioning and site restoration and has company financial commitments.

At the heart of the plan is collaboration with regulatory agencies to determine the infrastructure removal and schedule to meet all government requirements.

The federal *Aquaculture Activities Regulations* (AAR) protect the environment from potential negative effects. A survey is completed for every new farm site prior to licensing that includes site bathymetry, bottom type, wild species present on the site, current flow, and temperature throughout the water column. This baseline survey documents the natural state of the site prior to salmon farming and can be used to confirm no lasting detrimental effects after decommissioning.

Site components will be re-used or recycled as much as possible and disposed of according to the MCE Environmental Management and Waste Management Plan (EMWMP). This plan is reviewed annually, revised as needed and submitted to FFA for review and approval. The EMWMP is developed according to the FFA Environmental and Waste Management Guide, 2022. As of 2023, though plastics can be sent to a landfill in the province, MCE has chosen to recycle or stockpile large plastics until a recycling option is available.

Public Engagement

As part of the EPR preparation, three options were organized for the public to learn more about the project, engage with MCE representatives, ask questions, and submit comments. An in-person information meeting, a virtual live question and answer session were organized, and a project website provided project information and the opportunity for the public to provide comments. Comments received were overwhelmingly supportive.

Towns of Stephenville Support

The Town of Stephenville has provided a Letter of Support for the Hatchery Expansion in recognition of the contribution of this undertaking to the community in employment, service contracts, and taxes and municipal fees, See Appendix F: Town of Stephenville Letter of Support for the Indian Head Hatchery Expansion.

Public Support

At all events, 91-100% of the comments submitted were in support of the Hatchery Expansion.

- In-person Open House, held at Town of Stephenville, in close proximity to the Indian Head Hatchery, on April 20, 2023.
- Project website provided detailed project information and included a Comment Forum for questions and comments to be posted and for MCE representatives response from April 20-June 1, 2023.
- Virtual Live Question and Answer Session was held May 11, 2023, so the public could interact with MCE representatives in real-time, have their questions answered and post additional comments.
- In addition to public events, several Focused Events were organized at the request of various groups who wanted to discuss the Hatchery Expansion in terms of their specific requirements. These events include presentations, meetings, and hatchery tours and are ongoing.

A full description of the engagement events, participants and participant comments are provided in Section 9.0 Public Engagement.

Approval of the Undertaking

For the components of the Hatchery Expansion that are not yet fully constructed, permits and approvals were received prior to initiating construction in 2018. It is not expected that new permits will be required. When the project is released from further environmental review, the appropriate authorities including the Town of Stephenville will be advised of the schedule of the remaining work and any additional obligations will be addressed before work commences.

Approval for fish to be transported from the hatchery to the saltwater farms is arranged prior to transportation. A fish health assessment and a risk analysis by the provincial veterinarian is conducted and if required a Certificate of Health for Transfer issued. Once the health assessment is completed, a provincial Transfer Permit and a federal Introductions and Transfer Licence are required prior to fish moving from the hatchery to the saltwater farms.

All saltwater farms to receive the hatchery salmon production, including the proposed 2.2 million Hatchery Expansion smolt, are fully licensed. No further approvals or authorisations are required to plan the stocking of these farms. However, the annual production plan, which includes the farms to receive smolt and the number of smolt per farm for each year, is approved

by FFA prior to fish being transferred to the farm.

Section 10.0 Approvals for the Undertaking provides a full description of the authorizations required to complete the Hatchery Expansion construction and culture the proposed additional salmon.

Alternatives to the Project

Prior to deciding to make the significant investment in the Indian Head Hatchery Expansion, the following alternatives to provide the additional smolt were considered.

1. Moving smolt production to another location in the province.
2. increasing smolt capacity at a hatchery outside of the province and importing the smolt to the Province of Newfoundland and Labrador saltwater farms.

The following is a recap of the information provided in Section 5.0 Project Alternatives and Section 5.2 Preferred Means for Project Delivery.

It was concluded that the Indian Head Hatchery had benefits not available elsewhere and is the best option to develop a sustainable independent salmon farming unit in the province for the following reasons.

- The facility is licensed and currently producing smolt for saltwater farms in the province.
- The facility is owned by MCE on land owned or leased by MCE or currently under negotiation.
- The staff are trained, the rearing practices established, the office and management infrastructure are in place, and the fish culture system supports, such as water lines and reservoirs, are in place.
- The hatchery is located next to a unique aquifer that has an abundant source of high-quality fish culture water that requires no additional treatment.
- The hatchery is located in an industrial park with services and amenities supplied by the Town of Stephenville and is less than 1 km from a deep-water port for transporting smolt.
- Transport to the saltwater farms is less than half the distance compared to transport from an out of province hatchery. The shorter transport time reduces cost and opportunity for negative environmental interactions.

Atlantic salmon require rearing in the ocean to complete their life cycle. All fish from the Hatchery Expansion will be stocked at approved saltwater farms on the south coast of the province. The south coast has deep protected bays with cold water which is ideal for salmon farming.

Extensive data is collected on water flow, temperature, ice presence, depths etc. from prospective locations and only sites with good characteristics for salmon culture are selected for the licence application process. Several government agencies verify the site is appropriate for salmon culture as part of the license application review: Fisheries and Oceans Canada, Department of Fisheries, Forestry and Agriculture, Department of Environment and Climate Change and Transport Canada.

The alternative to saltwater farming is land-based culture. Consistent and profitable production of Atlantic salmon to market size (5 kg) has so far eluded the land-based start-ups. Through the attempts, what has been documented is the much larger environmental footprint of land-based systems compared to marine farms. A greater need for power, water, and highly technical infrastructure makes this option not feasible at present.

Further, land-based production would be established near markets to reduce transportation time and costs. Key markets are currently large cities in the US. Relocating operations outside of the province is not in alignment with MCE's commitment to invest in the Province of Newfoundland and Labrador.

For the reasons presented above, the Indian Head Hatchery Expansion is the preferred option to fully utilize the MCE saltwater farms on the south coast of the province.

Conclusion

The EPR is a comprehensive compilation of information that updates the information provided in the original Hatchery Expansion submission ER 1975 and provides new information to fill the data gaps identified during the government and public review**.**

The EPR provides an open and comprehensive report on MCE salmon farming in the province. It is also focused on potential environmental interactions from salmon culture practices and describes how these effects are being managed through robust federal and provincial regulations and policies and salmon rearing practices developed to meet MCE's commitment to environmental sustainability.

The Hatchery Expansion proposes an essential increase in the production of Atlantic salmon smolt at the fully licensed and operating Indian Head Hatchery. The additional smolt will be used to develop approved saltwater farms on the south coast, a key step in the development of an independent business unit in the province. Other benefits of the Hatchery Expansion include the following.

- All fish stay in the province, smolt raised at Stephenville are to be grown to harvest at

farms on the south coast.

- Improved hatchery effluent treatment - new effluent treatment with additional levels of solids removal and disinfection reduces harmful components before discharge to a new deep-water outfall.
- Real-time monitoring of the freshwater source ensures continuous high-quality water for all users and continuously provides data to government managers.
- Up to 97% of fish culture water is re-used with the new recirculating aquaculture technology reducing the volume of water required to grow each fish.
- The proposed Fish Transfer System keeps fish contained, reduces potential spillage into natural waterways and eliminates the need for truck and road transport.
- The proposed larger more robust Hatchery Expansion fish require a shorter duration to harvest and a reduced time at saltwater farms while fish health and survivability during entry to seawater are improved.

The Hatchery Expansion will not have a significant effect on the environment beyond the effects identified in the licensing review process. These concerns have established mitigations.

- Prior environmental investigation has demonstrated that the proposed use of the aquifer arising from the additional hatchery production will have no impact on the groundwater resource (yield or quality).
- Additional Hatchery Expansion smolt will be grown to harvest on existing licensed saltwater farms within the approved maximum biomass capacity and according to an FFA approved production plan - the same as smolt from other sources.
- All federal and provincial regulatory and policy requirements that focus on ensuring environmental sustainability apply to all salmon reared in the province.

The Hatchery Expansion supports and enhances the economic base of the areas where salmon are cultured.

- Local service and supply contracts are a critical part of the success of MCE’s saltwater farms in the province. Examples of services that will benefit from the proposed expansion are research facilities, divers, net washers, fish movers, trucking, environmental consultants, wharves, offices, maintenance, and transportation.
- Communities on the south coast benefit from salmon farming which brings in more people for short-term work while also providing long-term permanent employment for residents and newcomers.
- There are seven communities that maintain long-standing arrangements to provide

wharf use and other services. The Indian Head Hatchery employs 25 people fulltime and the saltwater farms in the province employ up to 100 full-time staff.

- The full culture cycle for Atlantic salmon, egg to harvest, requires a ratio of about 15 farming staff to 1 million smolt produced, therefore the project 2.2 million fish would require 30 additional staff throughout freshwater and saltwater farming with 10 of the positions at the hatchery.
- In the Stephenville area, the increase in production of smolt at the hatchery will create additional business for operational services for waste management, mortality management, and office and administrative services in addition to construction for the remining components of the Hatchery Expansion.
- To date, approximately $86 million has been invested in the Hatchery Expansion, with construction and many other services sourced locally.
- Hatchery operational costs for 2022 were approximately $7 million with the majority being spent locally. This will increase once the project has been completed and will be a regular influx to the economy of the area.
- In 2022, the Indian Head Hatchery property, water and sewer, and business taxes were approximately $206,000.

TABLE OF CONCORDANCE

Section #	Section Title	Section Description	Appendix	Information in Other Sections
	Introduction	Background information on the undertaking, EA history and undertaking Letter of Support	Appendix F: Town of Stephenville Letter of Support	
1	Name of the Undertaking	The name "*Indian Head Hatchery Expansion"* is given to the project.		
2	Proponent	Identification of Mowi Canada East Inc. as a corporate body and contact information.		
3	Nature of the Undertaking	Description of proposed undertaking Sections: • Environmental Assessment History • Project Purpose and Rationale • Project Scope • Environmental Preview Report (EPR)		
4	Description of the Undertaking (Overview)	An overview of the Hatchery Expansion. Sections: • Preferred Choice of Location • Design • Construction Standards • Operations • Maintenance Standards		
4.1	Geographic Location and Physical Components	All existing and proposed facility components, site information, access road, facilities, infrastructure, and equipment, including GPS location coordinates		4.2a Indian Head Hatchery Expansion Construction 4.3a Salmon Rearing Operations 4.3g Influent Water Quality Parameters for All Life Stages 4.3h Hatchery Fish Culture Effluent Management 4.3k Fish Culture Water Quality 5.0 Project Alternatives
4.1a	Indian Head Hatchery	All existing and proposed culture and support systems Sections: • Location and Area Description • Fish Culture Systems • Modular RAS Building • Vaccination/Grading Building • Influent Water Supply • Effluent Treatment System • Sewage Disposal		4.2a Status of Construction 4.3a Salmonid Culture Life stages and associated processes

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.1b	Transport from Hatchery to Saltwater Farms	Infrastructure associated with the transfer of smolt to the Port of Stephenville and transport to saltwater farms. Sections: • Fish Transfer System • Transport to Saltwater Farms		4.3i Waste Management Normal Operations
4.1c	Saltwater Farms	Site locations and layout of all licensed saltwater farms that will receive smolts produced by the Hatchery Expansion. Sections: • History of Production Farms • Farm Locations • Farm Layout and Infrastructure Design	Appendix A: Saltwater Farms by BMA	4.1f Ownership and Zoning 4.2c Saltwater Farm Construction 4.2e Construction for Site Decommissioning and Restoration 4.3a Salmon Rearing Operations 4.3j Fish Culture Stocking Densities 4.3m Fish Containment Saltwater Farms 6j Avoiding Interference with Other Legitimate Marine Users
4.1d	New Saltwater Farms	Site locations and layout of proposed new saltwater farms.		4.1f Ownership and Zoning
4.1e	Proximity to Pollution Sources	Proximity of the hatchery and farm sites to potential pollution sites. Sections: • Indian Head Hatchery • Saltwater Farms	Appendix B: Saltwater Farms and Potential Pollution Sources by BMA	4.1f Ownership and Zoning 6j Avoiding Interference with Other Legitimate Marine Users
4.1f	Ownership and Zoning	Ownership and zoning and restrictions on freshwater and saltwater sites. Sections: • Indian Head Hatchery • Saltwater Farms		4.1c Saltwater Farms 4.3p Regulatory, Incident Management, and Public Reporting
4.2	Hatchery Expansion Construction	Details, materials, methods, schedule, and location of all planned construction for the Indian Head Hatchery Expansion and remaining work required to complete the hatchery components.		4.1a Geographical Location and Physical Components, Indian Head Hatchery 4.1b Geographic Location, Physical Components, Transporting Smolt to Saltwater Farms 4.1c Geographic Location, Physical Components, Saltwater Farms 4.1f Ownership and Zoning 4.3a Hatchery Expansion Construction

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.2a	Hatchery Expansion Construction	Expansion work completed to date as a result of the initial release decision of EA 1975, and the remaining work required to complete the hatchery components. Sections: • Design Changes • Construction Status and Schedule to Complete • Methods and Materials		4.1a Geographical Location and Physical Components, Indian Head Hatchery 4.1f Ownership and Zoning
4.2b	Fish Transport Construction	Any work required to permit the transfer of hatchery fish to sea farms, including pipelines, right of way, access roads, wharves, slipways, or other physical structures. Sections: • Fish Transfer System		4.1b Transport from Hatchery to Saltwater Farms
4.2c	Saltwater Farm Construction	Work required for construction, installation, or modification of new or existing sea farms. Sections: • Construction Standards • Construction for First Stocking • Saltwater Farm Development Schedule		4.1c Geographic Location and Physical Components, Saltwater Farms 4.3a Salmon Rearing Operations 4.3m Fish Containment Saltwater Farms
4.2d	Waste Management During Construction	Management of solid and liquid waste during construction. Sections: • Material Storage, Handling, and Waste Disposal Plan • Hatchery Expansion • Construction of Saltwater Farms • Waste Management Agencies		4.3i Waste Management Normal Operations
4.2e	Construction for Site Decommissioning and Restoration	How the project would be constructed if there was a future requirement to decommission and rehabilitate the area. Sections: • Indian Head Hatchery • Saltwater Farms		7.0 Decommissioning and Site Restoration

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.3	Operations and Maintenance for All Life Stages	All aspects of the operation and maintenance of freshwater and saltwater culture including potential environmental interactions when transporting and adding additional smolt to sea farms.		4.1a Geographical Location, Physical Components Indian Head Hatchery 4.1b Geographical Location, Physical Components Transporting Smolt to Saltwater Farms 4.1c Geographical Location and Physical Components, Saltwater Farms 4.1d Geographical Location and Physical Components, New Saltwater Farms 4.2a Indian Head Hatchery Expansion Construction 4.2b Fish Transport Construction 4.2c Saltwater Farm Construction 6d Farmed and Wild Salmon Interactions Management
4.3a	Salmon Rearing Operations	Equipment and procedures for fish-rearing operations including acquisition of eggs, all hatchery growth stages, transport and transfer of fish to sea farms, grow-out within sea pens, and final harvest and transfer to a processing facility. Sections: • Salmon Culture Life Stages • Hatchery Culture • Transport Operations • Saltwater Rearing		4.1a-c Farm Location, Layout and Equipment 4.3g Influent Water Quality Management 4.3j Fish Culture Stocking Densities 4.3k Water Quality Management 4.3m Fish Containment, Saltwater Farms 4.3n Recapture of Escaped Farmed Salmon 4.3p Government & Public Reporting 6a-j Management of Potential Environmental Interactions
4.3b	Biosecurity Protocols	Description of biosecurity protocols associated with hatchery operations and sea cage operations. Sections: • Hatchery • Transporting Fish • Saltwater Farms		4.3a Salmon Rearing Operations 4.3c Veterinary Services for All Life Stages 4.3d Purpose & Use of Anti-microbials 4.3i Waste Management Normal Operations

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.3c	Veterinary Services for All Life Stages	Aquatic animal health veterinary services through all stages of salmonid culture. Sections: • Aquatic Animal Health Management • Veterinary Services • Service Providers		4.3a Salmon Rearing Operations
4.3d	Purpose and Use of Anti-microbials	Proposed use and purpose of antibiotics, anaesthetics, vaccines, pesticides, and disinfectants in all life stages. Sections: • Fish Health Management Plan • Mowi Policy on Use of Anti-microbial Agents • Best Aquaculture Practices • Chemotherapeutant Use in Aquaculture • Canadian Regulations & Management of Therapeutants • Therapeutants Approved for Use • Anti-microbials Application and Conditions of Use		4.3a Salmon Rearing Operations 4.3c Veterinary Services for All Life Stages 6f Chemotherapeutant Management
4.3e	Freshwater and Saltwater Use at Hatchery	Freshwater and saltwater use in the hatchery and hatchery expansion from source to discharge. Sections: • Water Source • Water Flow Through the Hatchery • Water Use		4.1a Geographic Location and Physical Components, Indian Head Hatchery 4.2a Hatchery Expansion Construction 4.3a Salmon Rearing Operations 4.3f Groundwater Source and Operational Volumes for Hatchery
4.3f	Hatchery Groundwater Source and Operational Volumes	Identification of the ground water source and operational water withdrawal volumes for the hatchery expansion. Sections: • Groundwater Sources • Operational Water Use		4.1a Geographic Location and Physical Components, Indian Head Hatchery
4.3g	Hatchery Influent Water Quality Management	Minimum fish culture water quality parameters and the industry or regulatory standards. Include all treatment, testing and monitoring of intake water, processes and technology involved. Sections: • Salmonid Culture Water Quality Parameters • Regulatory Standards • Fresh Water Testing and Monitoring • Saltwater Supply • Influent Water Treatment	Appendix C: ER 1975 Conditions of Release	4.1a Geographic Location and Physical Components, Indian Head Hatchery 4.3e Freshwater and Saltwater Use at Hatchery 4.3f Hatchery Groundwater Source and Operational Volumes 4.3k Fish Culture Water Quality Management 6a Capacity and Suitability of Indian Head Aquifer

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.3h	Hatchery Fish Culture Effluent Management	Treatment, testing, and monitoring of hatchery effluent including industry/regulatory standards. Sections: • Waste Volume • Effluent Processing • Ecological Improvements • Effluent Disinfecting and Testing, Solids Disposal • Regulations and Standards		4.1a Geographic Location and Physical Components, Indian Head Hatchery 4.3f Hatchery Groundwater Source and Operational Volumes 4.3k Fish Culture Water Quality Management
4.3i	Waste Management Normal Operations	Anticipated volumes of waste generated and waste management methods or normal operations. Sections: • Indian Head Hatchery • Vessel Transport • Saltwater Farms • Waste Management Agencies and Companies		4.2d Waste Management During Construction 4.3h Hatchery Fish Culture Effluent Management 4.3l Integrated Pest Management Plan 6c Elevated Mortality and Reportable Disease Event Management 6f Chemotherapeutant Management
4.3j	Fish Culture Stocking Densities	Planned stocking densities for the hatchery and saltwater farms, including maximum densities at peak production. Sections: • Planned and Maximum Stocking Density by Culture Life Stage		
4.3k	Fish Culture Water Quality Management	Measures undertaken to monitor water conditions and quality at the hatchery and sea farms, including water temperature and dissolved oxygen. Sections: • Hatchery • Saltwater Farms • Vessel Transports or Treatments		4.3g Hatchery Influent Water Quality Management
4.3l	Integrated Pest Management Plan	Use of Integrated Pest Management for sea lice control and monitoring, including provisions of designated veterinary services. Sections: • Mowi Policy on Integrated Pest Management • MCE Integrated Pest Management Plan • Reporting • Additional Management Procedures • Research and New Treatments		4.3a Salmon Rearing Operations 4.3b Biosecurity Protocols 4.3c Veterinary Services All Life Stages 4.3d Purpose and Use of Anti-microbials 6f Chemotherapeutant Management

Section #	Section Title	Section Description	Appendix	Information in Other Sections
4.3m	Fish Containment Saltwater Farms	Methods for fish containment within sea farms as well as any transfer periods. Sections: • Management of Wild & Farmed Salmon Interactions • NL Code of Containment • Infrastructure Design, Construction • Operational Procedures		4.2c Saltwater Farm Construction 4.3a Salmon Rearing Operations 4.3p Regulatory, Incident Management, and Public Reporting 6d Farmed and Wild Salmo Interactions Management
4.3n	Recapture of Escaped Farmed Salmon	Methods to recapture fish should an escape occur. Sections: • Saltwater Fish Escape Management Plan • Hatchery Rearing and Transfer to Vessel		4.3m Fish Containment Saltwater Farms
4.3o	Predators and Controls	Description of potential predators and controls. Sections: • Predators • Management Measures		
4.3p	Regulatory, Incident Management, and Public Reporting	All reporting, including regulatory, incident management and public reporting requirements related to the hatchery and sea farm operations. Sections: • Aquaculture Activities Regulations • Quarterly Reports • Sea Lice Monthly Reports • Incident Management Reporting • Escapes		
5	Project Alternatives	Identification, description, and evaluation of alternative means and locations for the project, that are technically and economically feasible, reduce environmental interactions and preferred means and location. Sections: • Indian Head Hatchery Expansion • Transport of Salmon Smolt • Saltwater Culture of Salmon • Preferred Means of Project Delivery		4.3e Freshwater and Saltwater Use - Source to Discharge 4.3f Hatchery Groundwater Source and Operational Volumes 6a Capacity and Suitability of Indian Head Aquifer
5.1a	Indian Head Hatchery Expansion	Review of alternatives to the Hatchery Expansion.		
5.1b	Fish Transfer System	Review of alternatives to the fish transfer from the hatchery to the transport vessel and alternatives to the vessel transport to the saltwater farms.		

Section #	Section Title	Section Description	Appendix	Information in Other Sections
5.1c	Saltwater Culture	Alternatives to saltwater culture of salmon. Sections: • Out of Province Farms • Land-based Saltwater Culture • Research		
5.2	Preferred Means of Project Delivery	Justification of the location and components of the Hatchery Expansion.		
6	Potential Environmental Interactions and Mitigations	Potential effects of the project on the environment and the proposed mitigations used to avoid adverse environmental impacts.		
6a	Capacity and Suitability of the Indian Head Aquifer	Impacts to freshwater sources including up to date testing, monitoring, and modelling that has been conducted to determine the capacity and suitability of the aquifer to supply fresh water. Sections: • Water Use Licence • Aquifer Assessments • Well Field Development • Groundwater Assessments, Monitoring, and Testing • Assessment and Monitoring Results • Reporting	Appendix C: ER 1975 Conditions of Release	4.1a Geographic Location and Physical Components, Indian Head Hatchery 4.3f Groundwater Source and Operational Volumes for Hatchery Expansion 4.3g Hatchery Influent Water Quality Management
6b	Mitigation Strategies to Limit Potential Pathogen Transmission	Mitigation strategies that limit potential pathogen spread between farmed and wild salmon. Sections: • Siting of Saltwater Farms • Commitment to Fish Health • Escape Prevention • Escape Management • Fish Health Reporting • Training		4.3b Biosecurity Protocols 4.3c Veterinary Services All Life Stages 4.3l Integrated Pest Management Plan 6d Farmed and Wild Salmon Interaction Management

Section #	Section Title	Section Description	Appendix	Information in Other Sections
6c	Elevated Mortality and Reportable Disease Event Management	Biosecurity measures and contingency plans for mortality from elevated mortality and reportable disease events including disposal sites and capacity. Sections: • Management Plans, Emergency Management Team • Event Management, Records and Reporting • Disposal Sites		4.3b Biosecurity Protocols 4.1f Ownership and Zoning 4.3i Waste Management Normal Operations 4.3l Integrated Pest Management Plan 4.3p Regulatory, Incident Management and Public Reporting
6d	Farmed and Wild Salmon Interactions Management	Risk to wild Atlantic salmon and operational mitigations including identification of Atlantic salmon bearing streams, prevention of pathogen spread between farmed and wild salmon, escaped/wild interactions, DFO monitoring support. Sections: • Atlantic Salmon Rivers • Decline in Wild Salmon Populations • Measures to Reduce Risk • Publications Used in This Section		4.3m Fish Containment Saltwater Farms 4.3n Recapture of Escaped Farm Salmon 6b Mitigation Strategies to Limit Potential Pathogen Transmission 6e Protection of Wild Species and Benthic Habitat at Saltwater Farms
6e	Protection of Wild Species and Benthic Habitat at Saltwater Farms	Methods to protect fish and fish habitat beneath saltwater farms from the effects of deposits due to feed and fecal matter including regulatory thresholds of benthic biochemical oxygen demand and the proposed mitigations if thresholds are exceeded. Sections: • Benthic Deposition Modelling and Monitoring • Regulatory Benthic BOD Thresholds • Assessment of Immediate Marine Environment • Farm Baseline Report • Mitigation Measures for Reducing Benthic Deposition • Reducing Micro and Nano Plastics in the Ocean • Sensitive Habitat		
6f	Chemotherapeutant Management	Environmental concerns and controls used to manage chemotherapeutants including potential impacts on, and mitigations for non-target species. Sections: • Mowi ASA Policy on Use of Anti-Microbial Agents • Environmental Interactions • Management Measures		4.3d Purpose and Use of Anti-Microbials 4.3l Integrated Pest Management Plan

Section #	Section Title	Section Description	Appendix	Information in Other Sections
6g	Species at Risk Management	Identification of any Species at Risk in the area that may be impacted by hatchery and sea farm operations and provide mitigations for protection. Sections: • Regulations • Management Measures		
6h	Aquatic Invasive Species Management	Describes the potential for proliferation of aquatic invasive species due to sea farm operations and due to hatchery effluent discharge. Sections: • Regulations • Species in the Area • Management Measures		
6i	Management of Extreme Environmental Conditions	Risks associated with extreme environmental conditions periodically observed at the hatchery and sea pen locations including temperature events and low dissolved oxygen levels and the operational measures that will be undertaken to mitigate the risk of abnormal mortality events. Sections: • Hatchery • Saltwater Farms		
6j	Avoiding Interference with Other Legitimate Marine Users	Avoidance of interfering with the rights of other legitimate users in the area including but not limited to other fisheries including commercial, Indigenous, or recreational fisheries, and tourism or recreational activities. Sections: • Good Neighbour Policy • Public Engagement • Indian Head Hatchery • Saltwater Farms • Public Engagement • Regulatory Management • Other Marine Users and Specific Practices	Appendix D: Saltwater Farms and Other Marine Activities in the BMA	

Section #	Section Title	Section Description	Appendix	Information in Other Sections

7	Decommissioning and Site Restoration	All aspects of the decommissioning and restoration plans for the project assume the eventual need to eliminate the entire project footprint from the landscape.
		Sections:
		• Hatchery
		  ○ Recycling of Large Plastics
		  ○ Returning Site to Pre-Hatchery Expansion Conditions
		• Saltwater Farms
		  ○ Site Restoration Plan (2023)
		  ○ Decommissioning
		  ○ Site Restoration
				4.2e Construction for Ste Decommissioning and Restoration

8	Project Related Documents	All project-related documents already generated by or for the project and used in the preparation of the EPR.		
9	Public Engagement	Record of public engagement undertaken to 1) provide project information to the people whose environment may be affected by the undertaking; 2) record and respond to concerns of the local community regarding the environmental interactions and 3) present the information to fulfill Section 5 of the Guidelines. Sections: • Public Engagement Plan • Advertising • In-person Open House • Project Website & Comment Forum • Virtual Live Q &A Session • Interviews and Print Media • Focused Events	Appendix E: Notifications of Public Engagement	

10	Approvals for The Undertaking	A list of main permits, licences, approvals, and other authorizations required for the undertaking with the responsible authorities.
		Sections:
		• Hatchery Expansion
		  ○ Groundwater Use
		  ○ Effluent Outfall
		• Transport of Smolt to Saltwater Farms
		• Saltwater Culture
				4.1c Geographic Location and Physical Components, Saltwater Farms
				4.1f Geographic Location and Physical Components, Freshwater and Saltwater Facility Zoning and Ownership
				4.2a Hatchery Expansion Construction

TABLE OF ACRONYMS

Acronym/Abbreviation	Full Name
AAHD	Aquatic Animal Health Division
AAR	*Aquaculture Activities Regulations*
ADCP	Acoustic Doppler Current Profiler
ADD	Aquaculture Development Division
AIS	Aquatic Invasive Species
AP	Aquaculture Policy
APB	Algal Plankton Bloom
ALS	Accidental Limit State
AMMP	Aquaculture Monitoring and Modelling Program
AQ	Aquaculture Licence
ASC	Aquaculture Stewardship Council
ATP	Adenosine Triphosphate
AVC	Atlantic Veterinary College
BAP	Best Aquaculture Practices
BMA	Bay Management Area
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CACC	Centre for Aquaculture Technologies
CATC	Center for Aquatic Technologies
CAV	Chief Aquaculture Veterinarian
CD	Communications Director
CFIA	Canadian Food Inspection Agency
CMT	Crisis Management Team
COC	Code of Containment
COHFT	Certificate of Health for Transfer of Live Cultured Finfish
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Services
DAV	Designated Aquaculture Veterinarian
DCPT	Dynamic Cone Penetration Test
DECC	Department of Environment and Climate Change
DEPOMOD	Depositional Modelling Program

Acronym/Abbreviation	Full Name
DFO	Department of Fisheries and Oceans Canada
DIN	Drug Identification Number
DO	Dissolved Oxygen
DSS	Decision Support System
EA	Environmental Assessment
EAC	Environmental Assessment Committee
ECC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMD	Ecosystem Management Division
EMT	Emergency Management Team
EOLL	As listed for end of lamp life
EPR	Environmental Preview Report
ER	Environmental Registration
EPR	Environmental Preview Report
FCR	Feed Conversion Ratio
FFA	Department of Fisheries, Forestry and Aquaculture (previously Department of Fisheries and Land Resources)
FFAW	Fish, Food, and Allied Workers Union
FHU	Fish Health Unit
FLS	Fatigue Limit State
FW	Freshwater
GAA	Global Alliance Aquaculture
GSSI	Global Sustainable Seafood Initiative
GLOBAL G.A.P.	Global Good Aquaculture Practices
GSA	Global Seafood Alliance
HAB	Harmful Algal Bloom
HAP	Hazardous Air Pollutants
HC	Health Canada
HDPE	High Density Polyethylene
ICMS	Incident and Crisis Management System
IR	Inventory Reconciliation Report
I&T	Introductions and Transfers Permit
IG	Industrial General

Acronym/Abbreviation	Full Name
IPMP	Integrated Pest Management Plan
kg	Kilograms
LHO	Low Head Oxygenator
LPM	Litres Per Minute
MAE	Ministry of Environment
MARPOL	International Convention for the Prevention of Pollution from Ships
MMCP	Mass Mortality Contingency Plan
MBBR	Moving Bed Bioreactor
MCA	Monitoring, Control and Alarm (system)
MCAS	Central Management Control System
MCE	Mowi Canada East Inc.
MOM	Main Operation Manual
MSHWDP	Materials Storage, Handling, and Waste Disposal Plan
MT	Metric Tons
NAAHP	National Aquatic Animal Health Program
NAFC	North Atlantic Fisheries Centre
NAIA	Newfoundland Aquaculture Industry Association
NASCO	North Atlantic Salmon Conservation Organization
NASEMTOC	Newfoundland Aquaculture Salmon Escape Monitoring and Traceability Oversight Committee
NEEC	National Environmental Emergency Centre
NL	Province of Newfoundland and Labrador
NLR	Newfoundland and Labrador Regulation
NPA	*Navigational Protection Act*
NWD	New World Dairy
OH&S	Occupational Health and Safety
PAV	Provincial Aquaculture Veterinarian
PMRA	Pest Management Regulatory Agency
PPC	Pressurized Pack Column
PPE	Personal Protective Equipment
RAS	Recirculating Aquaculture System

Acronym/Abbreviation	Full Name
RFD	Rotating Drum Filtration
RFS	Radial Flow Separator
ROV	Remotely Operated Vehicle
SAR	Species At Risk
SDG	Sustainable development Goals
SDS	Safety Data Sheets
SLS	Serviceability Limit State
SOP	Standard Operating Procedure
SSAC	Species Status Advisory Council
SW	Saltwater
SM	Sustainability Manager
TAN	Total Ammonia Nitrogen
TC	Transport Canada
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
ULS	Ultimate Limit State
UV	Ultraviolet
VDD	Veterinary Drugs Directorate
VFD	Variable Frequency Drives
VOC	Volatile Organic Compounds
WHO	World Health Organization
WHMIS	Workplace Hazardous Materials Information System
WUL	Water Use Licence

TABLE OF CONTENTS

List of Tables

List of Figures

INTRODUCTION

The Indian Head Hatchery Expansion (Hatchery Expansion) proposes to improve Atlantic salmon production at an existing licensed facility owned by Mowi Canada East Inc. (MCE). The Hatchery Expansion includes upgrading existing culture systems and installing new technologies to 1) increase salmon production, 2) reduce the potential for environmental impacts, 3) create greater production security, and 4) support the development of an independent self-sustaining business unit in the Province of Newfoundland and Labrador. Smolt are juvenile salmon ready for the marine environment.

Currently licensed annual production at the Indian Head Hatchery is 4.5 million juvenile salmon ready for the marine environment (referred to as smolt in this document). The proposed Hatchery Expansion will bring production to 6.7 million smolt annually and produce larger more robust smolt. This production is required to fully utilize approved licensed saltwater farms in the province.

Environmental Assessment History

The Hatchery Expansion was submitted for environmental review and registered as ER 1975 in July 2018. ER 1975 was released from further environmental assessment in 2018 and the project construction commenced.

Following a legal challenge by special interest groups, represented by the environmental charity Ecojustice, a 2021 court decision overturned the 2018 release, and the Minister of Environment and Climate Change (the Minister) ordered an Environmental Preview Report (EPR) or an Environmental Impact Statement to fill in the information gaps identified by the Judge. MCE elected to provide an Environmental Preview Report.[3]

The public engagement and legal review were extensive. In response to that level scrutiny, an Environmental Assessment Committee (EAC) was appointed by the Minister in August 2021 to develop the EPR Guidelines and ensure all requirements were addressed. The environmental assessment timeline is provided in Table 1 History of ER 1975 Environmental Assessment

- The EAC is a government committee chaired by the Department of Environment and Climate Change (ECC) with representation from Fisheries and Oceans Canada (DFO) and Department of Fisheries, Forestry and Agriculture (FFA).
- The Guidelines provide the topics to be addressed in the EPR to cover the gaps in

[3]Salmonid Association of Eastern Newfoundland v. Her Majesty the Queen in Right of Newfoundland and Labrador, 2020 NLSC 34, aff'd 2021 NLCA 26.

information in the original ER 1975 submission. This document is an open and honest reporting of salmon farming activities on all topics listed in the Guidelines.

- The EAC reviewed the draft EPR and provided their edits and recommendations in June 2023. The recommendations were included in the final submission.

Table 1 History of ER 1975 Environmental Assessment

Dates	Activity
2017	Department Environment and Climate Change determined environmental assessment required
Jul 17, 2018	Indian Head Expansion Project registered Environmental Registration #1975
Aug 31, 2018	Minister's decision: Project released with conditions and construction initiated
Sep 20, 2018	Appeal #1 of Minister's decision
Oct 25, 2018	Minister's decision: Appeal dismissed
Nov 9, 2018	Appeal #2 of Minister's decision
Dec 5, 2018	Minister's decision: Appeal dismissed
2019-2021	Court Challenge
Jul 15, 2021	Minister's decision and decision to submit an Environmental Preview Report (EPR)
Dec 16, 2021	EPR Guidelines issued
Nov 9, 2022	Environmental Assessment Committee (EAC) assigned and EPR preparation initiated
May-June 2023	Environmental Assessment Committee (EAC) review of the draft EPR and recommendations
Jul 31, 2023	EPR estimated submission date

Project Status

Due to the nature of the environmental assessment process that included a project release in 2018, subsequent legal challenge and rescinding of the release in 2021, the components of Hatchery Expansion are fully or partially constructed. The status of the project components is provided in section 4.2 Hatchery Expansion Construction.

Environmental Preview Report

This EPR is an open and honest representation of Mowi Canada East Inc. (MCE) currently available information on policies, management plans, and practices for rearing Atlantic salmon in the Province of Newfoundland and Labrador. The information in this document supplements information provided in the 2018 ER 1975 submission. Except for the Executive Summary, this document is meant to be read in its entirety.

Scope

The scope of the Hatchery Expansion, as submitted in 2018, was the work and technologies to be installed at the Indian Head Hatchery to culture the additional 2.2 million smolt.

As per the direction of the Minister in July 2018, and in addressing the data gaps identified in the public and legal challenge, the scope of the undertaking, for the purpose of the EPR, includes all aspects of Atlantic salmon culture from egg to harvest.

1. The systems, technologies, and processes required to increase production at the Indian Head Hatchery from 4.5 million Atlantic salmon smolt to 6.7 million annually (as listed in the original registration).

2. The requirements for rearing Atlantic salmon through full life cycle from egg to harvest.

3. The potential effects on the surrounding environment from Atlantic salmon production through the full life cycle, from egg to harvest, and including the regulatory controls and company policies in place that mitigate harmful effects.

The following terms are used to designate the various aspects of this undertaking.

- Hatchery Expansion – Indian Head Hatchery Expansion
- ER 1975 – Indian Head Hatchery Expansion, original registration in 2018
- EPR – Indian Head Hatchery Expansion, Environmental Preview Report

Throughout this document, it is indicated where the information provided pertains specifically to work and activities of the Hatchery Expansion as described in the original submission and where the information applies to all MCE operations of a similar type within the province.

Organization

The EPR organization follows the Guidelines and covers all topics in sufficient detail to determine for the Minister to determine the likelihood of significant negative environmental effects or significant public concern because of the proposed Hatchery Expansion.

The EPR Is organized and numbered as per the Guidelines and the instructions from the Guidelines for each topic are included at the beginning of each section in red italics.

Number	Section
	EXECUTIVE SUMMARY
	TABLE OF CONCORDANCE
	TABLE OF ACRONYMS
	TABLE OF CONTENTS
	INTRODUCTION
1	UNDERTAKING NAME
2	PROPONENT
3	NATURE OF THE UNDERTAKING
4	DESCRIPTION OF UNDERTAKING
	4.1 Geographical Location and Physical Components, and Existing Environment
	4.2 Hatchery Expansion Status and Construction Schedule
	4.3 Operations and Maintenance for All Life Stages
5	PROJECT ALTERNATIVES
6	POTENTIAL ENVIRONMENTAL INTERACTIONS & MITIGATIONS
7	DECOMMISSIONING AND SITE RESTORATION
8	PROJECT RELATED DOCUMENTS
9	PUBLIC ENGAGEMENT
10	APPROVALS FOR THE UNDERTAKING
	APPENDICES

Wherever possible, repeating of information has been avoided and cross referencing is used. For ease of locating specific information a Table of Concordance is also provided.

As a result of the timing of the Court decision overturning the Minister's earlier release decision, some of the components of the Hatchery Expansion are partially or fully constructed. Throughout the document, it is indicated where the component described has not yet been completed.

Also, throughout this document, it is indicated where the information provided pertains specifically to the work or technology of the Hatchery Expansion and where the information applies to all MCE operations of a similar type within the province.

Where applicable, sections have a table with the relevant Aquaculture Policies (APs), from the Department of Fisheries, Forestry and Agriculture Aquaculture Policies and Procedures Manual 2019. The APs, as well as other policies and regulations that govern salmon farming in the Province of Newfoundland and Labrador, are also referenced within the text each section.

1.0 NAME OF UNDERTAKING

The undertaking has been assigned the Name "***Indian Head Hatchery Expansion"***.

2.0 THE PROPONENT

Guidelines: Name the proponent and the corporate body, if any, and state the mailing and e-mail address. Name the chief executive officer if a corporate body, and telephone number, fax number and e-mail address. Name the principal contact person for purposes of environmental assessment and state the official title, telephone number, fax number and e-mail address.

Name of Corporate Body: Northern Harvest Smolt Inc. (Mowi Canada East Inc.)

Address: 2 Salar Court, Saint George, NB E5C 3N1

The proponent, Northern Harvest Sea Farms Ltd. (NHSF), has been growing Atlantic salmon in the Province of Newfoundland and Labrador since the 1990's. NHSF is wholly owned by Mowi Canada East Inc. (MCE), a registered Canadian company farming salmon on the east coast of Canada including the Province of Newfoundland and Labrador. The undertaking is registered under the name of NHSF.

The EPR has been prepared by MCE on behalf of NHSF for the Province of Newfoundland and Labrador, Department of Environment and Climate Change according to the requirements of Government of Newfoundland and Labrador *Environmental Protection Act* and pursuant to the Minister's Decision Letter of July 15, 2021.

Chief Executive Officer:

Name: Mr. Gideon Pringle
Official Title: Managing Director
Address: 2 Salar Court, Saint George, NB E5C 3N1
Telephone Number: PROVIDED IN PRIVATE COVER LETTER
E-Mail Address: PROVIDED IN PRIVATE COVER LETTER

Principal contact person for purposes of environmental assessment:

Name: Mr. Aaron Bennett
Official Title: Development and Environmental Compliance Director
Address: 2 Salar Court, Saint George, NB, E5C 3N1
Telephone Number: 506-469-4750
E-Mail Address: Aaron.Bennett@mowi.com

Mowi Canada East Inc. and Mowi ASA

Mowi Canada East Inc. (MCE) is a Canadian registered company growing Atlantic salmon in the provinces of Newfoundland and Labrador, New Brunswick, and Prince Edward Island. MCE is owned by Mowi ASA (Mowi), a publicly traded company and an industry leader.

- **The largest salmon farming company globally.** Mowi supplies 20% of the farm-raised Atlantic salmon with a harvest volume of 464,000 MT in 2022 and employing 11,500 people in 26 countries.
- **The most sustainable protein producer globally**. Mowi was ranked the most sustainable protein producer by the independent Coller FAIRR Protein Producer Index for the fourth year in a row in an assessment of 60 of the largest listed global meat, dairy and aquaculture companies.
- **Leads the industry in environmental sustainability.** Mowi's continuous improvement philosophy adopts ever higher standards in all operations and provides the resources to invest in innovation and improvements that deliver healthier lives for salmon, reduce negative impact on the environment, and provide the perfect food for the world.

MCE benefits from the vast global salmon farming knowledge and economic support from Mowi and adheres to the high production standards and environmental sustainability values established by Mowi.

3.0 THE NATURE OF THE UNDERTAKING

Guidelines: State the nature of the project. State the purpose/rationale/need for the project. If the proposal is in response to an established need, this should be clearly stated. Identify needs that are immediate as well as potential future needs.

3.1 Project Purpose

The purpose of the Indian Head Hatchery Expansion (Hatchery Expansion) is to improve production of Atlantic salmon smolt (juveniles that are ready to move from the freshwater to the ocean) at a licensed and actively producing Atlantic salmon facility, the Indian Head Hatchery. This will be accomplished by increasing production by 2.2 million annually, enhancing environmental performance, creating greater production security, and supporting planned business development.

3.2 Project Rationale

The Hatchery Expansion smolt are required to fully utilize Mowi Canada East Inc. (MCE) saltwater farm capacity within the Province of Newfoundland and Labrador.

The Hatchery Expansion will also align production with targets committed to the Department of Fisheries, Forestry and Agriculture (FFA) in the 2020 Mowi Canada East Inc. Business Development Plan for the Province of Newfoundland and Labrador.

MCE Business Development Plan outlines the requirements for an independent self-sustaining business unit in the province. Realization of this plan requires increased production of smolt, reduced potential for negative environmental impact, and enhanced production security.

Business Development

The south coast of the Province of Newfoundland and Labrador has deep bays with cold water that are remote with limited road access and other user activity. These areas are good locations for growing salmon.

The strong regulatory framework for salmon aquaculture within the province fits with Mowi's Sustainability Strategy. Salmon farming is managed and controlled by several levels of federal and provincial *Acts*, legislations, policies, and permit/approval processes.

Comprehensive strategies and policies govern all aspects of salmon aquaculture and provide guidance with a focus on ecologically sound practices. This level of engagement and commitment by regulatory authorities provides a secure framework for sustainable salmon farming and supports responsible business development. Please refer to Table 14 in section 4.1f Ownership and Zoning for a list of regulators, legislations, and permits or programs associated with salmon farming in the province.

For these reasons, Mowi is attracted to farming in the province and has the goal of developing an independent salmon farming business here. Table 2 provides a recap of the development in the province.

Table 2 Mowi Canada East Inc. Business Development in the Province of Newfoundland and Labrador

Year	Activity
2017	Marine Harvest Atlantic Canada Ltd. presents Salmon Farming Business Concept for the Province to the Government of Newfoundland and Labrador
2018	Gray Aqua Group Ltd purchased, subsidiaries acquired Northern Harvest Sea Farms Ltd purchased, Indian Head Hatchery acquired. Indian Head Hatchery Expansion - Environmental Registration and Release Indian Head Hatchery Expansion - Construction initiated. 17 licence applications submitted for new saltwater farms
2019	Marine Harvest Atlantic Canada Ltd. becomes Mowi Canada East Inc. 14 licences approved for new saltwater farms
2020	3 licences approved for new saltwater farms
2021	Indian Head Hatchery Expansion - Release rescinded & Environmental Preview Report required Indian Head Hatchery Expansion - Construction halted. Environmental Preview Report Guidelines - provided & development initiated
2023	Environmental Preview Report submitted

Increased Production of Smolt

The current licensed salmon production at the Indian Head Hatchery is 4.5 million smolt annually. The Hatchery Expansion proposes to increase production to 6.7 million smolt annually.

- Additional smolt are required to bring currently licensed saltwater farms in the province into production.
- The proposed increase in production will be used to stock six farms or more annually

while complying with the stocking requirements according to the FFA Bay Management Areas (BMA) principles.

- With the proposed Hatchery Expansion smolt increase, production targets in the Business Plan as presented to the provincial government in 2020 can be achieved.
- Fully utilizing saltwater farms available for production is an important component of developing an independent self-sustaining business in the Province of Newfoundland and Labrador.

While salmon smolt can be sourced from outside the province, increasing production at the Indian Head Hatchery is the best choice for the following reasons.

- The hatchery has been growing Atlantic salmon smolt since 2012 and is an established and licensed facility owned by the proponent.
- The hatchery is located within the province keeping all production from egg to harvest within the province.
- A nearby natural aquifer has abundant water, and the water quality is ideal for salmon culture.
- The hatchery is located within 1 km from the Port of Stephenville deep-water facility that can accommodate transportation of the additional smolt from the hatchery to the saltwater farms eliminating long-distance truck transport over land to a port.
- The distance the well-boat travels from the Indian Head Hatchery to the saltwater farms within the province is approximately half the distance from the closest hatchery outside the province providing less opportunity for environmental impacts.
- Reduced transport time means improved fish health and welfare. The fish are in better shape arriving at the saltwater farm and better able to withstand the natural challenges of the marine environment.
- Because of the shorter transport duration, smolt can be held completely contained within the transport vessel with no water exchange with the environment as the standard protocol. Water quality is monitored, and oxygen added continuously during transport.
- Shorter transport distance means less fuel used and lower carbon footprint and having less time at sea provides fewer opportunities for environmental interactions.
- The saltwater farms are all located in the Bays East and Bays West areas of the south coast of the Province of Newfoundland and Labrador and the Indian Head Hatchery is MCE’s only smolt production facility in the province.

Enhanced Environmental Management

The Hatchery Expansion represents MCE's continuous advancement towards more environmentally sustainable salmon rearing. The project includes the following new technology that improves the hatchery's sustainability and reduces the potential for environmental impacts.

- A new real-time water use monitoring system allows government regulators and hatchery staff to monitor the aquifer that is a source of fish culture freshwater ensuring continuous high-quality water for all users.
- The new Fish Transfer System is a fully enclosed secure method of transferring fish from the hatchery to the transport vessel at the Port of Stephenville. This system eliminates the need for trucks and reduces the potential for fish escapes and loss of untreated fish culture water to the environment.
- The new RAS modular rearing facility provides greater control of the rearing environment allowing for enhanced efficiency in the use of freshwater. At up to 97% efficiency in fish culture water re-use and less than 5% of the fish culture water is discharged as effluent.
- The new RAS facility also enables the culture of larger more robust salmon smolt that shortens the duration of saltwater culture and reduces the opportunity for environmental impacts.
- A new fish culture effluent management system has improved wastewater treatment with UV disinfection plus a deep-water ocean outfall which reduces the potential for environmental impact.
- Upgraded vaccination and grading system that is connected to the culture buildings with underground lines reduces fish handling for healthier fish and improved fish welfare.

Production Security

The Hatchery Expansion will increase long-term industry and business stability by increasing production by 2.2 million smolt annually and producing larger (250+ g), more robust smolt.

- Larger smolt are the industry standard worldwide as they are more robust when transported to the saltwater farms, better able to survive the transport, and more competent to withstand the natural stresses of the marine environment.
- The larger smolt are older when they enter the ocean and have a shorter duration in the ocean to harvest, minimizing exposure to sea lice and other natural pathogens. This is healthier for the fish and less time at sea reduces the opportunity for negative environmental impact.

The Expansion Project aligns with MCE commitment to the development of a sustainable

independent business unit in the province.

- MCE is committed to the province, local communities, companies, and residents. To date, approximately $86 million has been invested in the development of the Indian Head Hatchery with a significant amount going to local contractors and service suppliers.
- A key factor in the development of an independent sustainable business unit in the province is the production of more smolt. The additional Hatchery Expansion 2.2 million smolt will be used to stock licensed saltwater farms in the province.
- The Hatchery Expansion reduces the number of out-of-province smolt required. Smolt production is more bio-secure and fish welfare is improved when the hatchery production is closer to the sea sites.
- Both the shorter transport route and using smolt grown in the province reduces environmental impacts with lower greenhouse gas emissions from reduced requirement for fuel and reduced waste generation.

3.3 Project Benefits

The Hatchery Expansion benefits include salmon production increase, improvement in rearing efficiencies, additional environmental safeguards, and increased economic and social opportunities locally. The project also has advantages for the salmon farming industry in the province and the Government of Newfoundland and Labrador.

Fish Culture and Environmental Benefits

The Hatchery Expansion will result in greater control over production processes, increased production, fewer environmental interactions, and healthier fish - all of which support a sustainable independent business development within the province. Benefits of the specific Hatchery Expansion components are provided below.

Modular Recirculating Aquaculture System (RAS) Facility

- Enables the currently licensed smolt production of 4.5 million annually to increase to 6.7 million annually to allow full development of licensed saltwater farms in the province.
- Supports production of larger saltwater acclimatized smolt leading to improved smolt quality at saltwater farm stocking, reduced time at sea to harvest, improved fish welfare.
- Provides greater management of the rearing environment for enhanced fish health and welfare.
- Supports fish culture water reuse of up to 97% resulting in improved conservation of

water resources with less culture water per fish is required and reduced wastewater (effluent) volume.

Hatchery Upgrades

- Allow egg incubation batching to rear more eggs to support the increased smolt production.
- Create greater efficiency, improved fish health and welfare, and higher fish survival with modern, centralized grading and vaccination system.

Fish Culture Water Systems

- Ensures adequate water quality and quantity for existing culture and proposed Hatchery Expansion through addition of freshwater wells.
- Includes technology to monitor the use groundwater source through comprehensive real-time monitoring program, data collection, and reporting as directed by Department of Environment and Climate Change.
- Ensures highest quality fresh and saltwater for fish culture through UV disinfection.
- Reduces the cost of pumping water by using gravity to assist the movement of water to the fish culture units.
- Supporting culture of larger, saltwater acclimatized smolt for improved survival in the marine environment and shorter duration to harvest.

Effluent Treatment System

- Reduces potential for negative environmental impacts with enhanced effluent treatment and discharge to a deep-water outlet in Bay St. George.

Fish Transfer System

- Reduces potential for negative environmental impact with fully enclosed permanent fish transfer system from the hatchery to the Port of Stephenville replacing current truck transport, eliminating requirement for fossil fuels and concerns for escaped fish and loss of fish culture water to the environment.

Economic Benefits

The following economic benefits will result from the increased production at the Indian Head Hatchery and the stocking of additional saltwater farms on the south coast of the province. The Town of Stephenville Letter of Support states their “unqualified support” for the proposed Hatchery Expansion and outlines the economic value in the letter. Please see Appendix F: Town of Stephenville Letter of Support for the Indian Head Hatchery Expansion.

Employment

The proposed increase in smolt production could create an additional 30 jobs throughout the

company with 10 positions created at the hatchery benefitting the immediate area and the Town of Stephenville.

The full culture cycle for Atlantic salmon, egg to harvest, requires a ratio of about 15 farming staff to 1 million smolt produced resulting in 30 additional staff throughout freshwater and saltwater farming plus additional administrative and/or office staff. These jobs are full-time, well-paid employment within the province and for the most part in small coastal communities that have few alternatives for employment providing the ability for young people to have a career locally where they were raised.

Service Contracts

The Indian Head Hatchery operational costs for 2022 were approximately $7 million and this will increase once the project has been completed. The Hatchery Expansion will require building contractors, fish culture systems contractors, site preparation including excavation and pipe laying and site finishing, waste management etc. Once in full production, the hatchery will require additional operational services and suppliers such as Stephenville Airport for egg transport, Gale's Septic for fish waste removal, Port of Stephenville for smolt transport etc.

For saltwater farms, local service and supply contracts are a critical part of rearing salmon. Service contracts are in place for research facilities, divers, net washers, fish movers, trucking, environmental consultants, wharves, offices, maintenance, and transportation services. In addition to these arrangements, seven communities maintain long-standing arrangements to provide wharf use and other services. This will increase once the new farms are developed.

Taxes

In 2022, the Indian Head Hatchery property, water and sewer, and business taxes were approximately $206,000.

Industry Benefits

The proposed Hatchery Expansion also provides benefits for the salmon aquaculture industry in general.

- Hatchery Expansion increases salmon aquaculture production in the Province of Newfoundland and Labrador, a Way Forward commitment by the provincial government.
- Implementing the state-of-art technology will raise the standard of production within the provincial industry to the worldwide standard and improve overall industry performance.

- An existing licensed hatchery will be upgraded and expanded to create greater efficiency of production and increased production capacity including larger more robust smolt thereby improving industry productivity and security.
- Existing hatchery systems will be upgraded with new technology designed to meet the certification standards of the Best Aquaculture Practices (BAP) thereby securing the environmental and social standing of the company and the industry.

3.4 Project Scope

Environmental Registration (ER) 1975

The proposed Hatchery Expansion is designed to improve production at the Indian Head Hatchery by upgrading existing facilities and installing new state-of-the-art culture systems to support production of an additional 2.2 million smolt annually.

As described in the original registration ER 1975, the project includes the following components.

- Construction of a new modular RAS culture facility and supporting infrastructure.
- Upgrades to existing hatchery vaccination, grading, and incubation systems.
- Upgrades to freshwater supply with new wells, lines, and a treatment facility.
- Installation of saltwater supply system including wells and lines.
- Enhanced effluent treatment system and new discharge location.
- Fish transfer line from hatchery to transport vessel.

Environment Preview Report (EPR)

As per the direction of the Minister of the Department of Environment and Climate Change (ECC) and the Environmental Assessment Committee (EAC) assigned to ER 1975, the scope of the undertaking for the purpose of the EPR is defined as follows.

1. The systems, technologies, and processes required to increase production at the Indian Head Hatchery from 4.5 million Atlantic salmon smolt to 6.7 million annually (as listed in the original registration)
2. The requirements for rearing Atlantic salmon through full life cycle from egg to harvest.
3. The potential environmental impacts of Atlantic salmon production through the full life cycle, from egg to harvest, including the regulatory controls and company policies in place that mitigate harmful effects.

The purpose of the EPR is to provide information as described above in sufficient detail for the Minister of the Department of Environment and Climate Change to make a determination on the potential for significant negative environmental effects or significant public concern from the proposed undertaking.

The EPR provides information to augment details provided in the original registration and information to address the data gaps identified during the government and public reviews. These topics are provided in the EPR Guidelines and are listed below.

- Geographical location, zoning, and land ownership of all facilities.
- Physical components and infrastructure of all facilities.
- Proximity of facilities to pollution sources.
- Hatchery Expansion construction status, waste management, and decommissioning considerations.
- Operations, equipment, culture procedures for all fish culture life stages.
- Biosecurity protocols and veterinary services.
- Anti-microbial use and purpose.
- Chemotherapeutant use and purpose.
- Freshwater and saltwater culture parameters, management of the resource, and use in fish culture.
- Hatchery fish culture effluent management.
- Stocking densities and culture water quality management for all culture life stages.
- Integrated Pest Management Plan
- Fish containment methods and escape recapture methods.
- Predator controls.
- Limiting the spread of pathogens.
- Elevated morality and reportable disease event mortality management.
- Wild-farmed salmon interaction management.
- Fish and benthic habitat management.
- Invasive species management.
- Management of extreme natural events.
- Avoiding interference with other legitimate users.
- Decommissioning the facilities and returning the site to its natural state.
- Alternative methods and locations for the project.
- Government and public reporting.
- Authorizations and approvals required to complete the project.
- Project related documentation.
- Public engagement and public response to the project.

4.0 DESCRIPTION OF THE UNDERTAKING

Guidelines: Provide a complete overview of the project in the following subsections, including information about the preferred choice of location, design, construction standards, operation, and maintenance standards, etc.

4.1 Geographical Location, Physical Components and Existing Environment

This section provides an overview of the main components for freshwater and saltwater production of salmon at the Mowi Canada East Inc. (MCE) hatchery and saltwater farms in the Province of Newfoundland and Labrador. For details on the requirements for each life stage of culture as well as the equipment and fish culture processes used, please refer to the following sections.

- 4.2a Indian Head Hatchery Expansion Construction for status of project construction and estimated completion dates for unfinished components
- 4.3a Equipment and Procedures for Culture of All Life Stages
- 4.3g Influent Water Quality Parameters for All Life Stages
- 4.3h Hatchery Fish Culture Effluent Management
- 4.3k Fish Culture Water Quality
- 5.0 Project Alternatives to the proposed Indian Head Hatchery Expansion

Unless otherwise indicated, the information provided pertains to the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador and the salmon proposed in the Hatchery Expansion.

4.1a Indian Head Hatchery

Guidelines: Provide an accurate description of the proposed site, access road, facilities, infrastructure, and equipment, including GPS location coordinates. Attach an original base map (1:25,000 scale) and/or recent air photos. This description shall include, but not be limited to:

- *provide all existing and proposed hatchery components, including infrastructure for water supply, sewage disposal, effluent discharge and waste management.*
- *Important that all components of the hatchery are described and indicate which parts are the expansion project and which are constructed/implemented currently. Include existing infrastructure and what is needed to produce an additional 2.2 million smolt.*

Location and Area Description

The Indian Head Hatchery is located on the northeastern shore of Bay St. George ion the western coast of the Province of Newfoundland and Labrador within the boundaries of the Town of Stephenville, provincial electoral district of Stephenville - Port au Port.

The information in this section pertains to both the location and equipment of the existing licensed hatchery and the proposed Hatchery Expansion.

Figure 1 shows the Island of Newfoundland with the Town of Stephenville indicated on the western shore. Figure 2 shows Bay St. George, the Town of Stephenville and the location of the Indian Head Hatchery.

Figure 1 Location of Town of Stephenville in Western Newfoundland and Labrador

Figure 2 Location of the Indian Head Hatchery on the Northeastern Shore of Bay St. George

Topography and Geology

The Bay St. George area has rolling hills with forested areas over generally nutrient poor soils and extensive areas of bogs. A number of small water bodies including Noels Pond, Mine Pond, and Gull Pond drain from the higher areas inland into the waters of Port of Stephenville (previously called Port Harmon) that is connected to Bay St. George.

The hatchery is situated below the elevated bog plateau, west of the Indian Head Mountain Range. The hatchery site is gently sloping from the north to the south allowing for natural storm water drainage.

The hatchery location was selected because of the quality of the local aquifer that provides fish culture water which meets the requirements for salmonid culture without the need for treatment. The hatchery site is also down-gradient from the wells allowing for the use of gravity to transport water to the culture buildings.

Town of Stephenville

The hatchery is located within the boundaries of the Town of Stephenville (Stephenville). Stephenville has a population of 6,604 (2022) and is the service centre for the south-west coast with a catchment area that includes approximately 35,000 people.

The Stephenville Council actively promotes economic advancement and has a well-developed Economic Development Plan. Infrastructure exists to service commercial interests including a 42-bed hospital, an education system that includes the Provincial Headquarters of the College of the North Atlantic, and natural areas for recreational activities. Local options exist for services, such as building construction and waste removal and recycling.

Figure 3 Indian Head Hatchery Location in Relation to the Port of Stephenville and Town of Stephenville

Port of Stephenville Industrial Park

The Indian Head Hatchery is in the Port of Stephenville Industrial Park (Industrial Park), see Figure 3. The Industrial Park has commercial services such as paved roads, three phase power, potable water, and fire protection. Access from the neighbouring communities of Corner Brook and Deer Lake is via Highway 490.

The privately owned Port of Stephenville is located within in the Town of Stephenville on the north shore of Bay St. George, approximately 50 km east of Cape St. George. GPS coordinates: 48° 31' 46" N, 58° 31' 30" W.

The name Port Harmon name was officially changed to Port of Stephenville in 2016 to avoid confusion with Little Port Harmon, however Port Harmon remains in common use.

The Port of Stephenville is an ice-free deep-water port and a certified commercial harbour providing facilities for national and international ships, fishing boats, and freighters and includes 7,500 m^2 of asphalt paved dock area and a 100,000 ft^2 industrial warehouse.

The hatchery site was previously cleared and developed as part of a US Air Force Base which closed in 1966. In 2000, the land was transferred to the Town of Stephenville and since that time has been targeted for commercial development. For ownership information, please refer to section 4.1f Freshwater and Saltwater Facility Zoning and Ownership.

Hatchery Components

This section describes the existing hatchery components including fish culture facilities, water supply system, sewage disposal, effluent treatment and discharge, and waste management and includes the proposed Hatchery Expansion components.

Please refer to the following sections for additional information that pertains to culture facilities.

- Section 4.2a ER 1975 Hatchery Expansion Construction
- Section 4.3a Salmon Rearing Operations

Table 3 provides the main components and location and if they are part of the Hatchery Expansion. Hatchery Expansion components that are not fully constructed and commissioned are also indicated.

In total, the hatchery has five fish culture buildings: incubation/fry building; three smolt production buildings; and the Modular RAS post-smolt building (partially constructed); plus, a vaccination/grading building and two effluent treatment buildings. All buildings are located at 14-15 Connecticut Drive. Also located on the hatchery site are the back-up power units, domestic septic system, fish culture water system, and fish culture effluent management.

Figure 4 shows the location of the major infrastructure.

- The existing Indian Head Hatchery is on the left of the schematic with the Hatchery Expansion Modular RAS Production Building shown on the right.
- Fish culture buildings Incubation/Fry and Smolt 1-2-3 on the upper left.
- The Modular RAS Building is on the right with Modules 1 and 2 indicated and the proposed location for Modules 3 and 4 drawn in.
- Effluent Treatment Building 1 is between the Port of Stephenville and the Smolt 1-2 buildings.
- Effluent Treatment Building 2 is on the lower right of the map between the Port of Stephenville and the Modular RAS Building.
- Vaccination/grading Building is to the right of Smolt Building 1.
- The Influent Water Treatment Building is across Connecticut Drive from the hatchery.

Each hatchery building is dedicated to a specific activity and/or salmonid culture life stage. The fish are transferred from one culture system/building to the next as they mature and grow. The layout of the buildings has been designed to efficiently move the fish through the culture systems and maintain the highest-level biosecurity and optimal fish health.

Table 3 Indian Head Hatchery Infrastructure and Location

Existing or Expansion	Main Infrastructure	Address/Location	Location
Existing Hatchery	Incubation/Fry Building	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 8° 31' 51.7308"W
	Smolt Building 1	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 8° 31' 51.7308"W
	Smolt Building 2	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 8° 31' 51.7308"W
	Smolt Building 3	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 58° 31' 51.7308"W
	Effluent Treatment Building 1	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 58° 31' 51.7308"W
	Freshwater wells	NE hatchery across Connecticut Drive	48° 3' 0" N 58° 3' 0" W
ER 1975 Hatchery Expansion[A]	Modular RAS (Post-smolt) Building[B]	14 Connecticut Drive, Stephenville	48° 32' 21.8472"N 58° 32' 29.9544"W
	Vaccination/Grading Building	15 Connecticut Drive, Stephenville	48° 32' 21.4232"N 58° 31' 51.7308"W
	Effluent Treatment Building 2	14 Connecticut Drive, Stephenville	48° 32' 21.8472"N 58° 32' 29.9544"W
	(Influent) Water Treatment Building	Across Connecticut Drive from the hatchery	48° 31' 53.1948"N 58° 31' 48.6906" W
	Water line Water Treatment Building to hatchery	14 Connecticut Drive, Stephenville	48° 32' 21.8472"N 58° 32' 29.9544"W
	Freshwater wells	NE of the hatchery across Connecticut Drive	48° 3' 44 55.0" N 58° 3" 5.5" W
	Saltwater wells[B]	W hatchery on Seaside Links Golf Course	48° 03' 13.3" N 58° 03' 53.1" W
	Effluent discharge line from hatchery to ocean outfall	Stephenville Airport Corp, Stephenville	N5377165.763 E300854.697 (grid coordinates N corner)
	Effluent discharge line from hatchery to ocean outfall	Seaside Links Golf Course, Massachusetts Drive, Stephenville	48° 31' 55.43"N 58° 33' 22.84"W
	Fish transfer line to Port of Stephenville[B]	Port of Stephenville	48° 31' 48.52" N 58° 31' 30.66" W
	Potable/fire water supply, Sanitary Sewage System	15 Connecticut Drive, Stephenville	48° 32' 21.42" N 58° 31' 51.73" W
	Electrical Services and Back-up Diesel Power	15 Connecticut Drive, Stephenville	48° 32' 21.42" N 58° 31' 51.73" W

[A]Components of the Indian Head Hatchery Expansion.
[B]Hatchery Expansion components not complete.

Figure 4 Indian Head Hatchery, 14-15 Connecticut Drive with Hatchery Expansion Components and Location

Fish Culture Systems

The hatchery fish culture systems reflect the salmonid life stages: egg incubation, fry rearing to smolt, and post-smolt production.

For a detailed description of salmonid culture life stages and fish culture operations and procedures associated with each stage, please refer to section 4.3a Salmon Rearing Operations.

The three life stages indicated above have dedicated areas at the hatchery as indicated in the five fish production buildings: Incubation/Fry Building, Smolt Buildings 1-3, and Modular RAS (post-smolt) Building. The fish culture systems are specifically designed to provide the best fish rearing environment, enhanced biosecurity, and facilitate responsible management of fish health.

As they mature, salmon are moved through the culture systems and buildings according to a predetermined schedule devised to provide optimal growing conditions at each life stage.

Incubation/Fry Building

Incubation/Fry Building is located at the front of the hatchery site next to the hatchery parking lot. This building is the main hatchery entry and has direct access to Connecticut Drive.

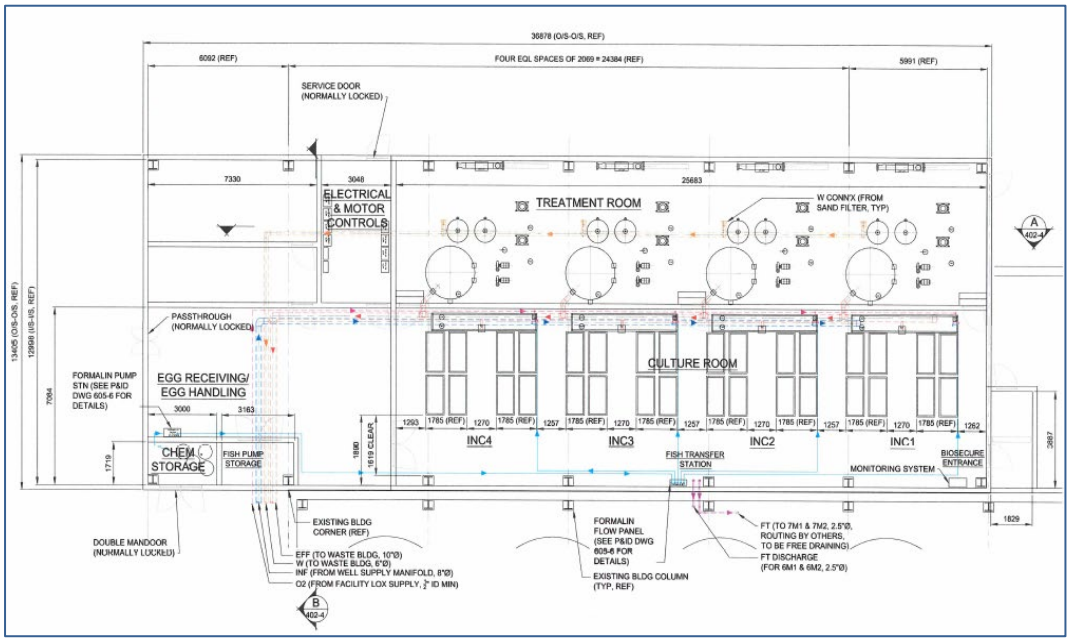
- The building is approximately 2500m^2.
- Incubation and fry production rooms are separate and located at the back of the building with offices, staff room and boot room at the front.
- Egg incubation is an isolated bio-secure area with separate secured entry, biosecurity foot bath, and dedicated personal protection equipment for technicians working in this area.

Egg Incubation System

- Four independent CompHatch units have a total of 128 trays per system.
- Systems receive partial flow-through, or chilled water treated in Recirculating Aquaculture System (RAS) technology.
- RAS technology includes: 2 sand filters, ultraviolet sterilization, and a header tank.
- A reservoir holds the influent water and treated culture water for distribution to the incubation units.
- Liquid wastewater (effluent) is pumped to Effluent Treatment Building 1 for processing.

Figure 5 shows the layout of the incubation area. Areas labelled INC1-4 are incubation units, the large circles indicate the water reservoir for each incubation unit and the smaller circles are the sand filters.

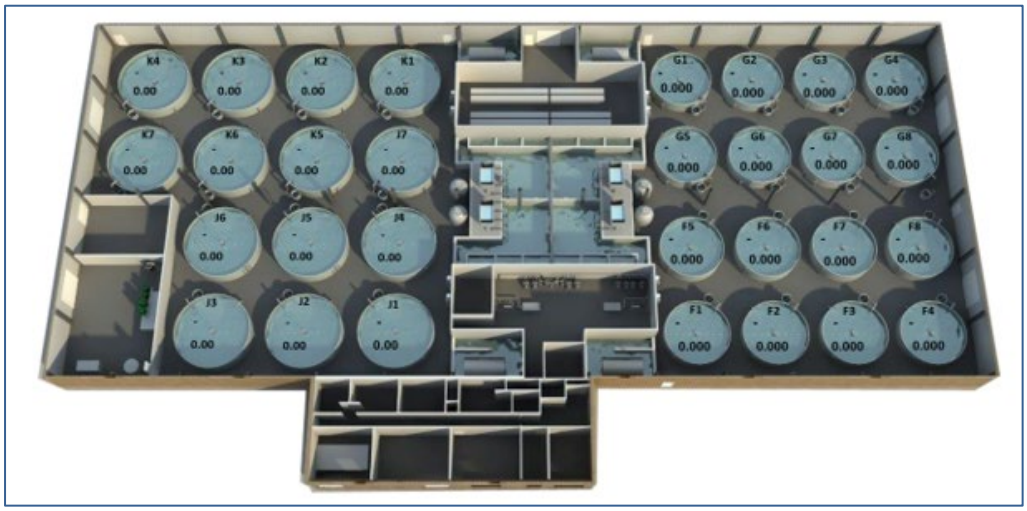
Figure 5 Incubation System Layout



Fry Rearing

- Located in the same building as incubation at the front of the hatchery site next to Connecticut Drive.
- The fry rearing area is an independent, isolated area with separate secured entry, bio-security foot baths and dedicated personal protection equipment for technicians working in the area.
- The area is divided into two self-contained sections with a physical barrier between for additional biosecurity, see Figure 6.
- Each section has dedicated RAS water treatment technology that includes: a reservoir that holds influent freshwater and treated water for distribution, one 36-micron drum filter to remove solids, one bead filter for dissolved waste treatment, and UV sterilization.
- 6 m culture unit includes: two systems with eight 6 m diameter x 1.2 m deep culture tanks for total of sixteen tanks.
- 7 m culture unit includes: two systems with seven 7 m diameter x 1.6 m deep culture tanks for a total of fourteen tanks.
- One oxygen packed column supplies additional oxygen to each of the 6 m and 7 m culture units.

Figure 6 Fry Rearing Layout Showing Culture Systems with 6m and 7m Tanks



Smolt Buildings 1, 2, and 3

As salmon mature, they are moved from the fry rearing systems to the larger culture tanks of the smolt buildings to allow for increase in size. Smolt are salmon able to survive and thrive in the marine environment. This is a natural process and a salmon “smolt” is a physiological point in development not a specific fish size or weight.

- Buildings 1 and 2 are located between the Incubation/Fry Building and waters of the Port of Stephenville.
- Building 3 is located to the north of the Incubation/Fry Building, as shown in Figure 4.
- Each building is approximately 2,322 m^2.

Smolt Culture System

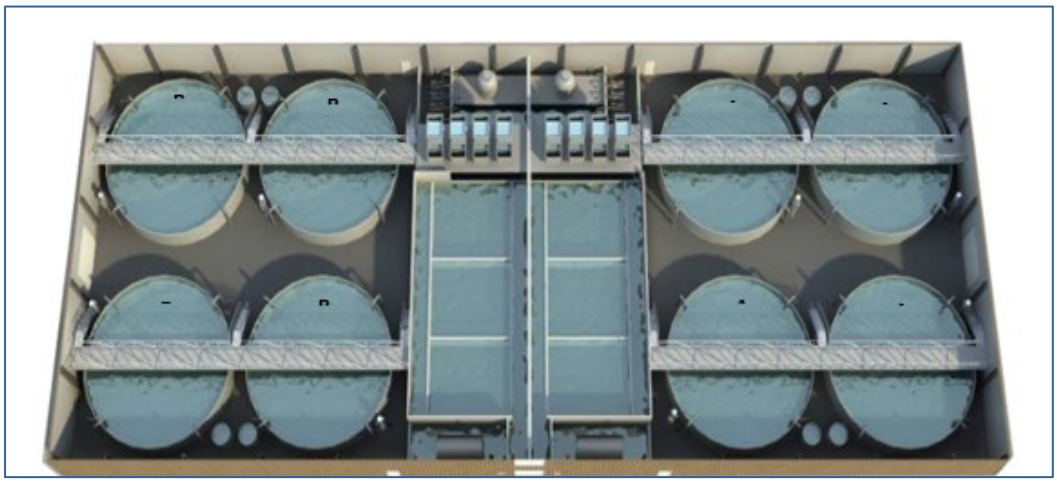
Each building has eight culture tanks divided into two independent culture units with four tanks each, see Figure 7.

- Culture tanks are 12.2 m diameter x 2.3 m in depth, 280m3 each.
- Low Head Oxygen (LHO) supply and CO2 degasser technology is located on each culture tank.
- Each culture module has dedicated RAS water treatment technology.

RAS water treatment technology

- 82.9 m^3 sump holds influent water and treated water to be distributed to each of the four tanks.
- A 45-micron drum filter removes suspended particles.
- One moving bed biofilter removes dissolved metabolites.
- A UV sterilization unit disinfects the water.

Figure 7 Layout of a Smolt Building Showing Two Independent Culture Modules



Modular RAS (Post-smolt) Building

The purpose of post-smolt culture is to saltwater acclimatize the fish before they go to the ocean. This is accomplished by a staged increase of the salinity in the culture tanks. As this requires additional rearing time at the hatchery, post-smolt are generally larger in size when transferred to saltwater farms. This reduces the time they are reared in the ocean.

The Modular RAS Building is part of the Hatchery Expansion and is not currently fully constructed. As per the direction of the Minister on July 15, 2021, Modules 1 and 2 have been constructed and Modules 3 and 4 will not be constructed until the project is released from further environmental review. The following information is for both the constructed and proposed modules.

Modular RAS Building

- The building is located on the land purchased for this purpose adjacent to the original

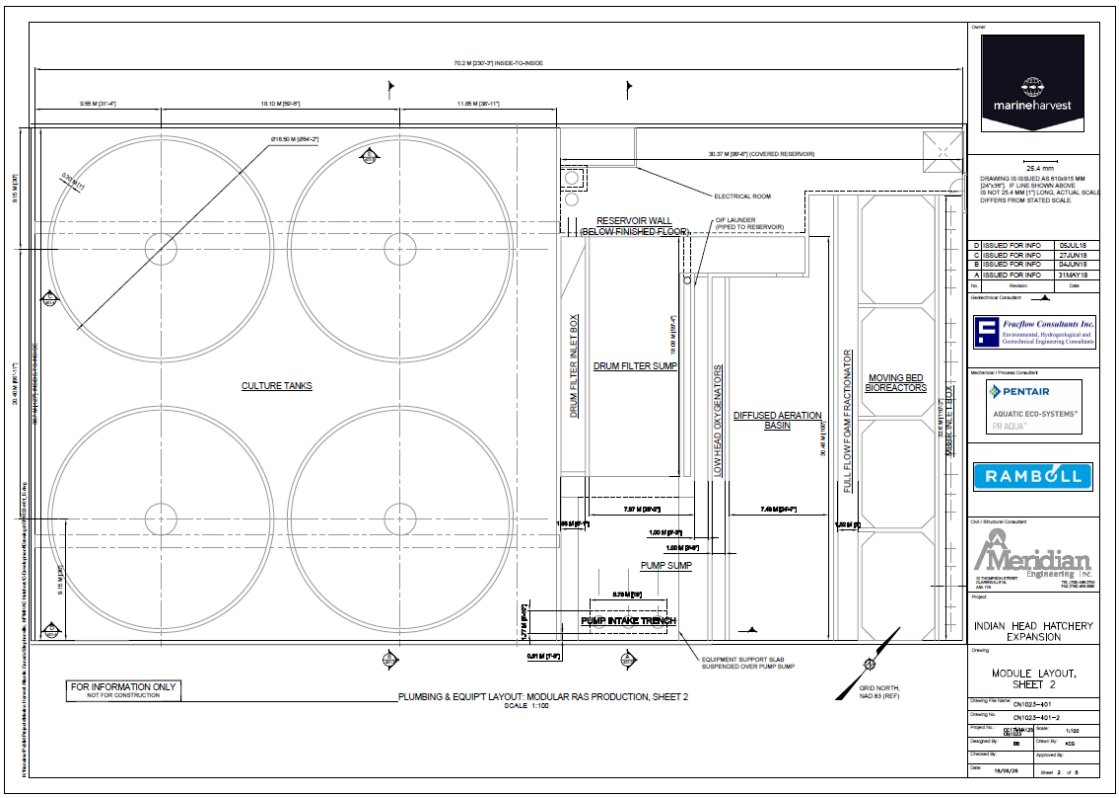
hatchery site.

- When complete, the building will be approximately 160mx 65m (10,400m^2).
- The building design uses the natural slope of the property with the main floor entrance at approximate elevation of 7.0 m and a second entrance at level of the bottom of the fish culture tanks at 4.0 m.

Four identical modules each have four 800m^3 fiberglass culture tanks and a dedicated RAS water treatment technology, see Figure 8.

- The RAS Treatment System includes the following technology.
  - One header tank that receives influent freshwater and treated water for distribution to the culture tanks.
  - Two 37-micron drum filters for removal of suspended particles.
  - A Moving Bed Bioreactor (MBBR) for removal of dissolved metabolites.
  - A foam fractionation system for removal of dissolved proteins.
  - An aeration basin for addition of air and removal of CO_2.
  - A UV sterilization unit that disinfects the water prior to return to the fish culture tanks.
- Each culture tank has a Low Head Oxygenators (LHO) to oxygenate the water returning to the fish culture tanks.

Figure 8 Layout of One Module in the Modular RAS (Post-smolt) Building



Vaccination/Grading Building

As part of the Hatchery Expansion, the vaccination and grading systems were upgraded in a centralized Vaccination/Grading Building. This component of the Hatchery Expansion is completed and functional.

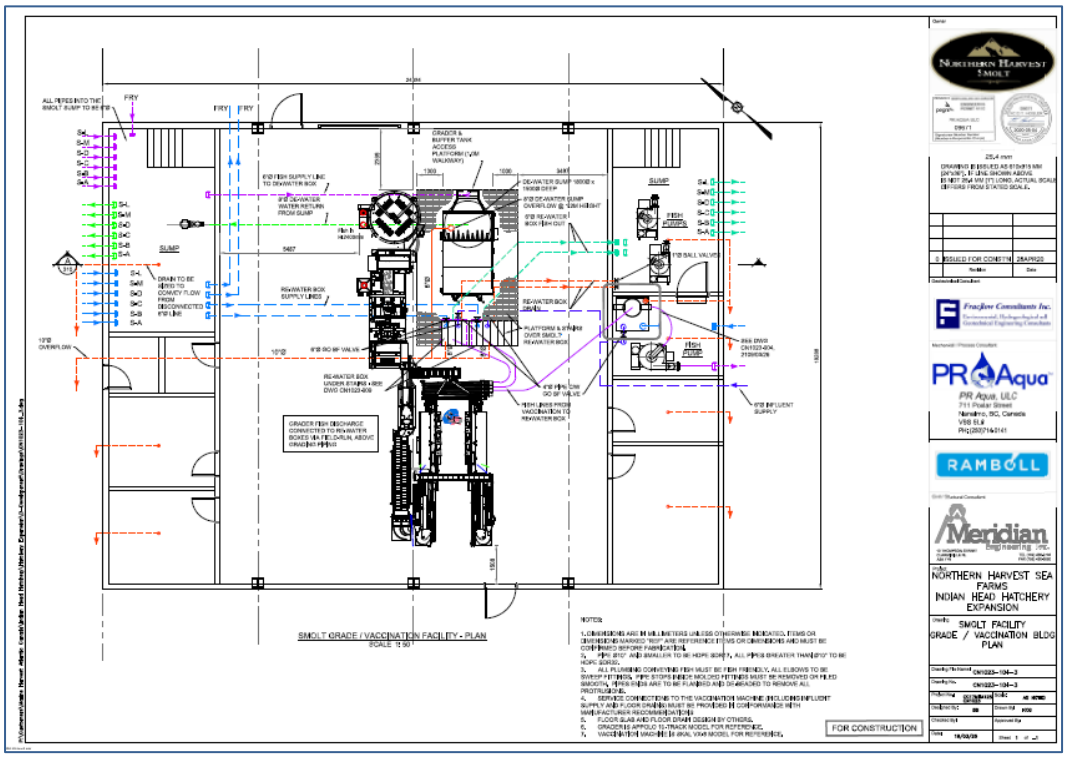
- The building is located behind the Incubation/Fry Building.
- Components include: an anaesthetic tank, a fish recovery tank, vaccination systemhttps://en.skalamaskon.no/aquaculture2/vaccination and grading system Live Product Handling (innovasea.com),
- A fish dewatering box with a sump of 1.8 m x 1.5 m depth is located under the grading platform.
- Fish are transferred from the culture buildings to the vaccination/grading building via underground permanent transfer lines and are returned to the culture buildings in the same manner.
- For biosecurity, the water used to move fish in the transfer lines originates from the

culture system with the fish and is returned to the source building as the fish are returned.

- The building layout minimizes the distance between the grading and vaccination equipment, reducing the time the fish are out of water.
- Equipment is centralized to facilitate technician access from all sides.
- Large equipment can be removed and/or installed via the roll-up door on the north wall.

Figure 9 provides the layout of grading and vaccination equipment as well as the transfer lines used to move fish between the culture areas and the Grading/Vaccination Building.

Figure 9 Grading/Vaccination Building Equipment Layout



Influent Water Supply

All fish culture water is sourced from the nearby aquifer. The domestic water supply is not used for fish culture.

Since 2011, fish culture water has been sourced from the aquifer across Connecticut Drive from the hatchery in a Protected Well Field area. The Hatchery Expansion includes additional wells for fish culture water providing increased volume for the proposed increase in smolt production and backup to the source for production security. The Hatchery Expansion freshwater wells are constructed, and water is being used for fish culture.

The Hatchery Expansion also includes culture of post-smolt—- larger smolt that are saltwater acclimatized—- and this requires saltwater. The construction of the saltwater wells and the lines carrying saltwater to the Water Treatment Building is not complete. Please refer to section 4.2a Hatchery Expansion Construction for details of the status of construction and the estimated dates for completion.

Freshwater Wells

- Four freshwater wells are located to the northeast of the hatchery across Connecticut Drive, see Figure 10.
- Wells are 70-80 m deep below surface and have 250 mm diameter well screen, straight well assembly.
- 300 mm HDPE freshwater transport lines run subsurface (1.8 m depth) from the freshwater well house to the Water Treatment Building.

Saltwater Wells

- Three saltwater wells are located on Seaside Links Golf Course, to the west of the hatchery across the waters of Port of Stephenville, see Figure 10. Table 4 provides explanation of the well acronyms used in the figure.
- 250 mm HDPE saltwater transport line,1.8 m below the surface, laid in the same trench as the wastewater effluent line, runs along the north and east shores of the waters of Port of Stephenville and across the hatchery site. The saltwater line leaves the effluent trench on the hatchery site and runs under Connecticut Drive to the Water Treatment Building, Figure 11.

Figure 10 Indian Head Hatchery Freshwater and Saltwater Wells

Table 4 Salt and Freshwater Wells and Well Number

Well Number	Freshwater/Saltwater
MHPW1	Freshwater
MHPW2	Freshwater
MHPW3	Freshwater
MHPW4	Freshwater
MHSW1	Saltwater
MHSW2	Saltwater
MHSW3	Saltwater

Water Treatment Building

- Located across Connecticut Drive from the hatchery.
- The building is approximately 1,116 m^3.
- Salt and freshwater influent streams are kept separate within the building.
- Both saltwater and freshwater pass through separate two-stage Ultraviolet treatment

with the capacity to dose a minimum of 200 mJ/cm^2. Please refer to section 4.3b Biosecurity Protocols for freshwater fish pathogens and dosage required to inactivate.

- Treated water is stored separately in two 800 m^3 reservoirs.
- 250 mm lines transport water by gravity under Connecticut Drive to the hatchery fish culture buildings.

Figure 11 shows the saltwater supply (influent) line that runs from the saltwater production wells to the Water Treatment Facility. Figure 12 shows the saltwater lines from the saltwater wells to the Water Treatment Building and Figure 13 shows the lines running from the Water Treatment Building to the fish culture systems.

Figure 11 Saltwater Influent Line from Wells to the Hatchery

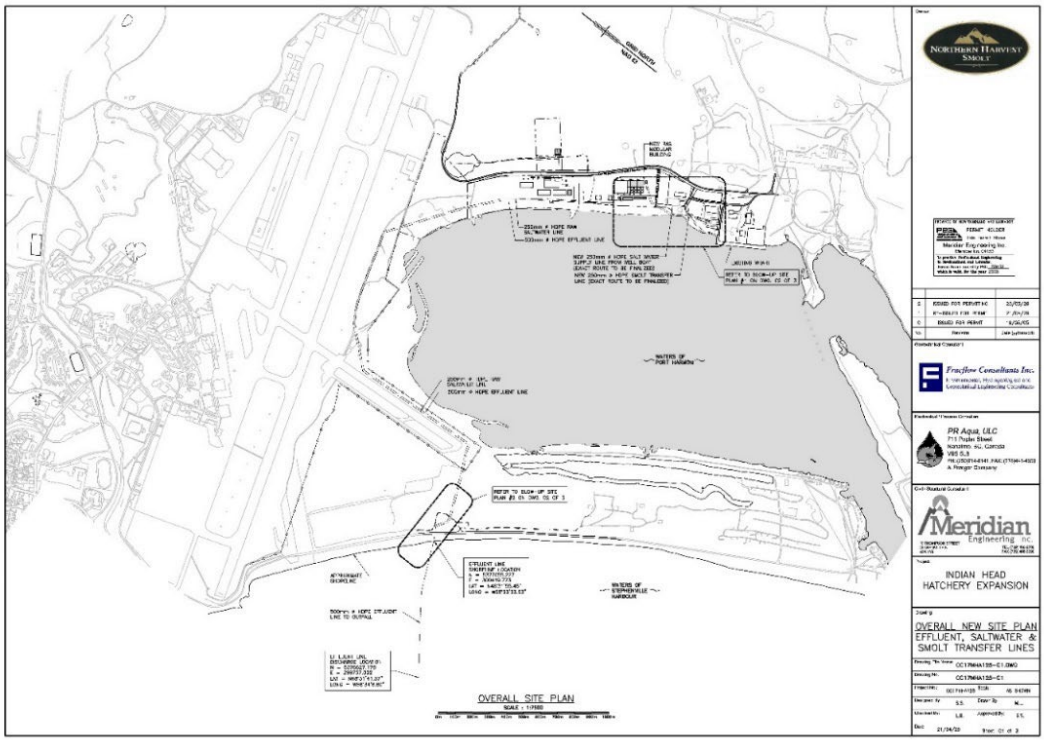


Figure 12 Location of Proposed Saltwater Line from Hatchery to the Water Treatment Building

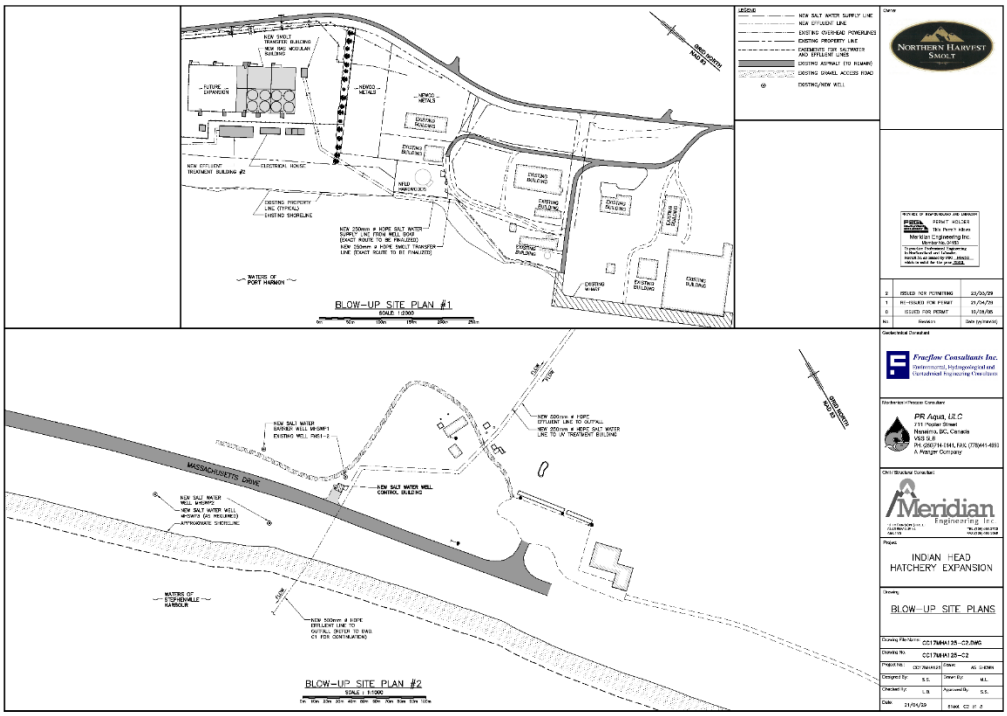
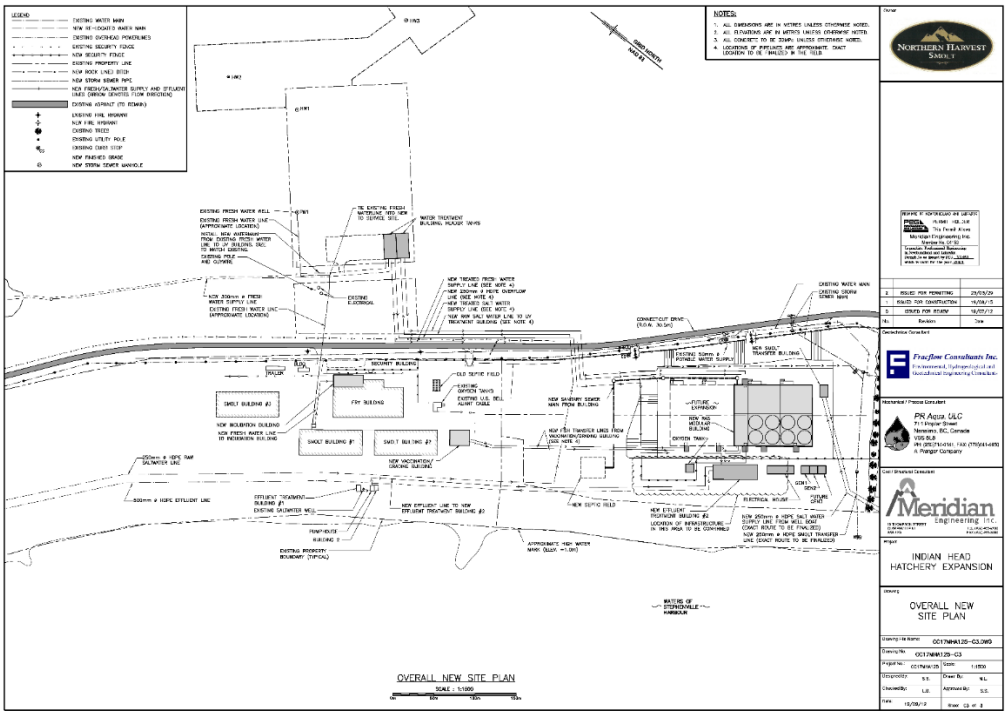


Figure 13 Proposed Saltwater Line from the Treatment Building to Modular RAS Production Units



Fish Culture Waste Management

The hatchery waste management system consists of subsurface lines that transport pumped waste from the fish culture systems to two effluent treatment buildings and a subsurface line for pumping treated and disinfected effluent from the Effluent Treatment Building 2 to a deep-water ocean outfall.

All fish culture liquid waste is processed through Effluent Treatment Buildings 1 and/or 2. Not at any time is the domestic septic system used for fish culture effluent.

All fish culture systems at the hatchery have dedicated Recirculating Aquaculture Systems (RAS) technology. The purpose of RAS technology is to remove fish culture waste and treat the remaining water for re-use in the fish culture tanks. The RAS technology removes larger solids and diverts smaller particles along with liquid waste for further treatment. Depending on the culture system, up to 97% of fish culture water is treated and recycled to the fish culture tanks with maximum 5% discarded.

Effluent from the fish culture systems has larger solid wastes settled out and amalgamated in a sump for disposal. The remaining liquid is processed through Treatment Buildings 1 and 2 and disposed of through an ocean outfall.

The Effluent Treatment Building 2 and the deep-water ocean outfall are components of the Hatchery Expansion and are fully constructed.

Effluent Treatment Building 1

- Located on the main hatchery site behind Smolt Buildings 1 & 2, please refer to figure 4.
- Building approximately 30mx30m (900m^2).
- Solids are settled out and amalgamated in a sump.
- Two 80-micron drum filters remove suspended solids.

Pumps and a 500 mm subsurface line transport liquid effluent to Effluent Treatment Building 2 for further treatment, please refer to Figure 14.

Effluent Treatment Building 2

- Located between the Modular RAS (post-smolt) Building and waters of the Port of Stephenville, see figure 4.
- Building approximately 30mx30m (900m2).
- 500 mm subsurface lines transport liquid effluent from Waste Treatment Building 1 and from the Modular RAS Building.
- A radial flow separator (RFS) is used as a pre-filtration device to passively (gravity

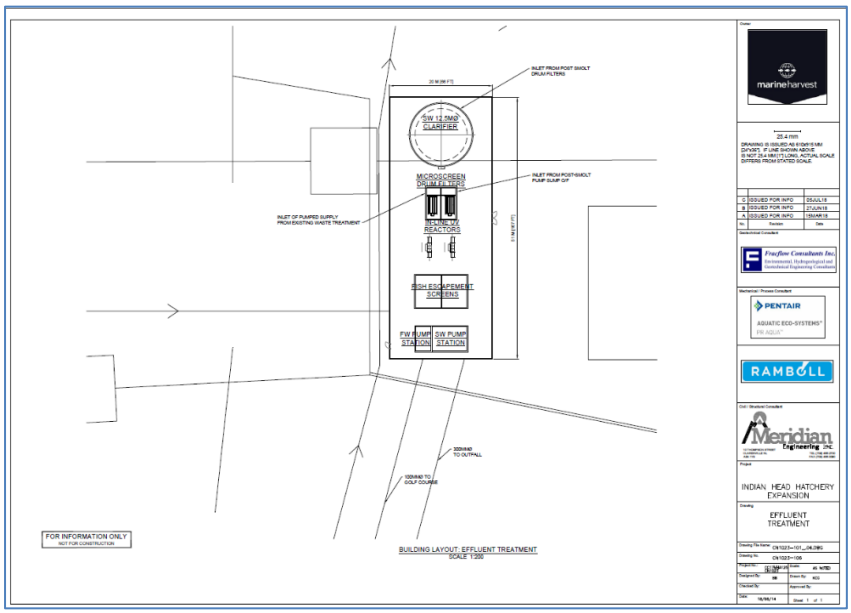
fed) remove up to 85% of settleable solids from the liquid effluent.

- Two 37-micron drum filters remove smaller suspended solids.
- Ultraviolet sterilization unit, providing a continuous minimum dose of 200 mJ/cm^2, disinfects liquid effluent prior to disposal. This dose has been proven to eradicate waterborne pathogens commonly associated with aquatic recirculating systems. Please refer to section 4.3b Biosecurity Protocols for freshwater fish pathogens and UV dose required to inactivate.
- Wastewater is triple screened to ensure no fish can escape prior to being discharged.

Effluent Treatment Building 1 is an existing building that currently provides treatment for the effluent from all functioning fish culture buildings. Effluent Treatment Building 2, a component of the Hatchery Expansion designed to provide enhanced effluent treatment, is complete and currently being commissioned. Effluent processed in Building 1 is pumped to Building 2 for further treatment and the fish culture waste from the proposed Modular RAS Post-smolt Building will be pumped directly to Effluent Treatment Building 2.

Effluent Treatment Building 2 equipment is provided in Figure 14.

Figure 14 Effluent Treatment Building 2 Equipment and Layout



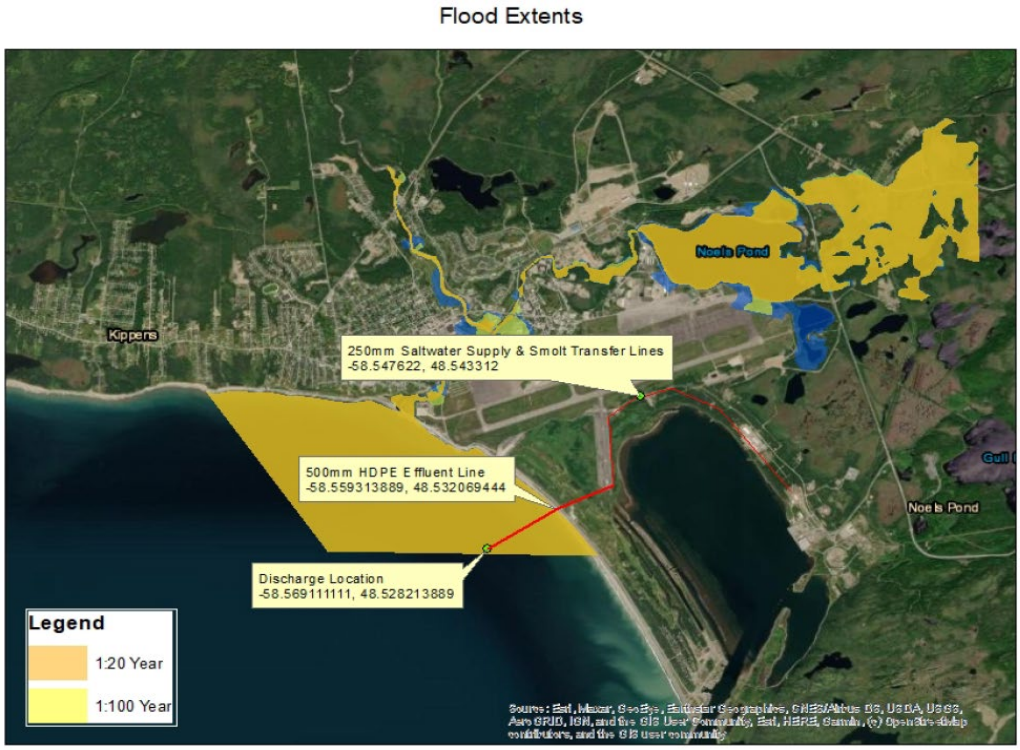
Effluent Discharge

- A 500 mm HDPE effluent discharge line was installed in the same trench as the saltwater influent line, 1.8 m below surface, from Effluent Treatment Building 2 around the Port of Stephenville to "*a length of 100 m into the 20 year flood risk area of St. George Bay*" (File No 526, Permit No. ALT11979-2021 Department of Environment and Climate Change, Water Resources Management Division), please refer to Figure 15 for the location.

Solid Waste Disposal

- Solid wastes are combined onsite and disposed of on-land under contract with Gales Septic Cleaning.

Figure 15 Effluent Outfall Discharge Line from the Hatchery to Outfall in St. George's Bay



Domestic Sewage System

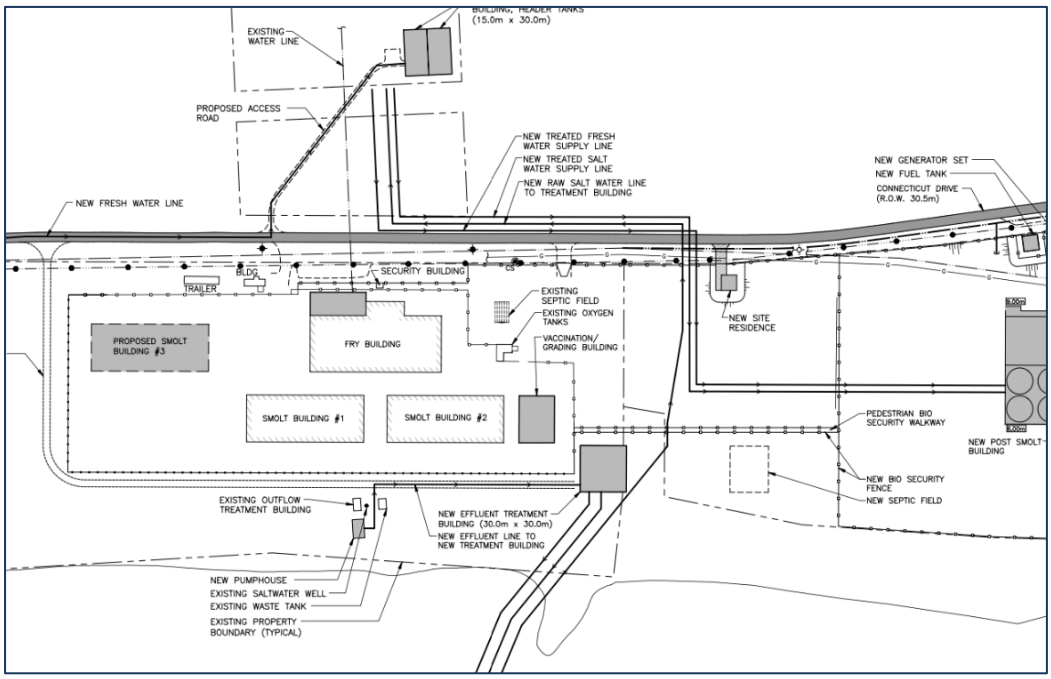
All fish culture effluent is processed through Effluent Treatment Buildings 1 and 2 and discharged through a deepwater ocean outfall. The domestic sewage system is not used for fish culture effluent.

The Hatchery Expansion includes installation of a new sanitary domestic sewage disposal. This system has been constructed and is located on the property as indicated in Figure 16.

Using *Daily Sewage Flows for Various Types of Commercial Establishments*, published by Government Services Center, Government of Newfoundland and Labrador, it was determined that a flow rate of 340 liters per person per day would be adequate for the site.

The sewage disposal system includes a septic tank, distribution box, and disposal field. The system and installation are aligned with the most current edition of the Private Sewage Disposal and Water Supply Standards, as published by Government Services, Government of Newfoundland and Labrador and the final installation has been inspected.

Figure 16 Septic Sewage System Location



4.1b Transport from Hatchery to Saltwater Farms

Guidelines: Provide an accurate description of the facilities, infrastructure and equipment, including GPS location coordinates.

- *4.1b all infrastructure associated with transport of smolts from the hatchery to sea cages; Well boat size, carrying capacity (volume/number of fish/transport)*

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture (FFA), Aquaculture Policies and Procedures Manual 2019, are used to govern salmon farming and pertain to the transport of salmon from the hatchery to the saltwater farms. Specific references are also included within the information provided in this section. Mowi strictly adheres to all aquaculture policies and government regulations governing the transport of salmon in the province of Newfoundland and Labrador.

Table 5 Aquaculture Policies That Pertain to Section 4.1b

AP #	AP Title	Description
AP 12	Transfer and Transport Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the Minister or designate. Health of all fish to be transported to be assessed by the Aquatic Animal Health Division Chief Aquaculture Veterinarian prior to transporting.
AP 36	Aquaculture Motor Vehicle, Vessel, Boat, and Barge Biosecurity	All motor vehicles and trailers used to move aquaculture fish, products, or equipment will be subject to an audit by the Aquatic Animal Health Division (FFA) as per the Biosecurity Audit plan
AP 37	Aquaculture Equipment Biosecurity	All aquaculture equipment moving between BMAs must follow the BMA biosecurity plan and will be subjected to an audit by the Aquatic Animal Health Division (FFA). The Chief Aquaculture Veterinarian must be informed prior to movement.
AP 38	Inflow and Outflow Wharves	An inflow wharf (as designated by the Wharf User Agreement) will be associated with a Bay Management Area (BMA) or group of BMAs. All users must use an inflow wharf designated for that BMA.
AP 42	Animal Welfare	Licensee must ensure optimal animal welfare during transport, sampling, fish handling, depopulation, and normal operations.

When the Indian Head Hatchery salmon smolt are ready for the marine environment, they are transported to saltwater farms on the south coast of the province. The transport has two components 1) conveying salmon smolt from the hatchery culture systems to the transport vessel at the Port of Stephenville, and 2) transporting smolt by vessel from the Port of Stephenville to the saltwater farm.

The Port of Stephenville is a privately owned facility with a deepwater dock located in the Port of Stephenville Industrial Park that provides services for docking transport vessels by contract. It is located at 48°31'45.51"N 58°31'36.74"W.

Hatchery to the Port of Stephenville

Currently salmon are transferred from the hatchery in live fish trailers of approximately 30 m^3 in volume each and the trailers are driven to the dock where the fish are pumped into the transport vessel. The driving distance is less than 1 km, and the route is via established paved roads adjacent to the Industrial Park. Trailering of fish to the transport vessel is an established practice; however, a more ecologically sound option is the Fish Transfer System included in the Hatchery Expansion.

Fish Transfer System

The Fish Transfer System consists of the following.

- A transfer landing station
- A permanent and fully enclosed fish discharge line running from the hatchery to the Port of Stephenville.
- A water return line that allows the water used in moving fish to be returned to the hatchery.

This enclosed system eliminates the opportunity for fish escape and for loss of fish culture water to natural waterways, and unlike the current truck transport, does not require carbon-based fuel.

The discharge line and water return line are not complete. Please refer to section 4.2b Fish Transport Construction for construction status and estimated dates for completion.

Once constructed, the system will be efficient and secure with improved fish health and welfare.

- Fish transport landing station is approximately (3m x 3m) 9 m^3. Located near the southeastern section of the Modular RAS Building, see Figure 17.
- The station is upland from the Port of Stephenville and the natural 15% grade will allow gravity to assist the fish transfer, see Figure 18.

- The 600 m fish discharge line is 250 mm diameter HDPE. It is sized to transport smolt and post-smolt and to fill the fish hold of the transport vessel with 70-75 tonnes of fish, not including water, in approximately 2 hours.
- The section of the discharge line from the transfer station to the boundary of the hatchery property is installed. This remaining section to the Port of Stephenville is not completed.

Figure 17 Fish Transfer System Components

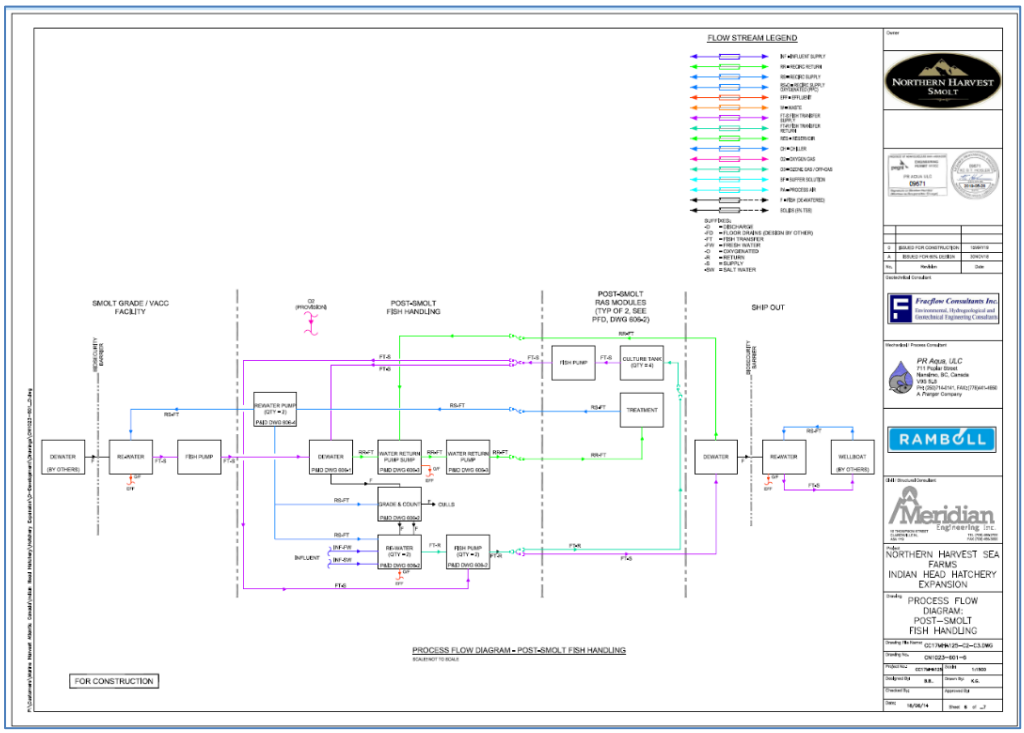
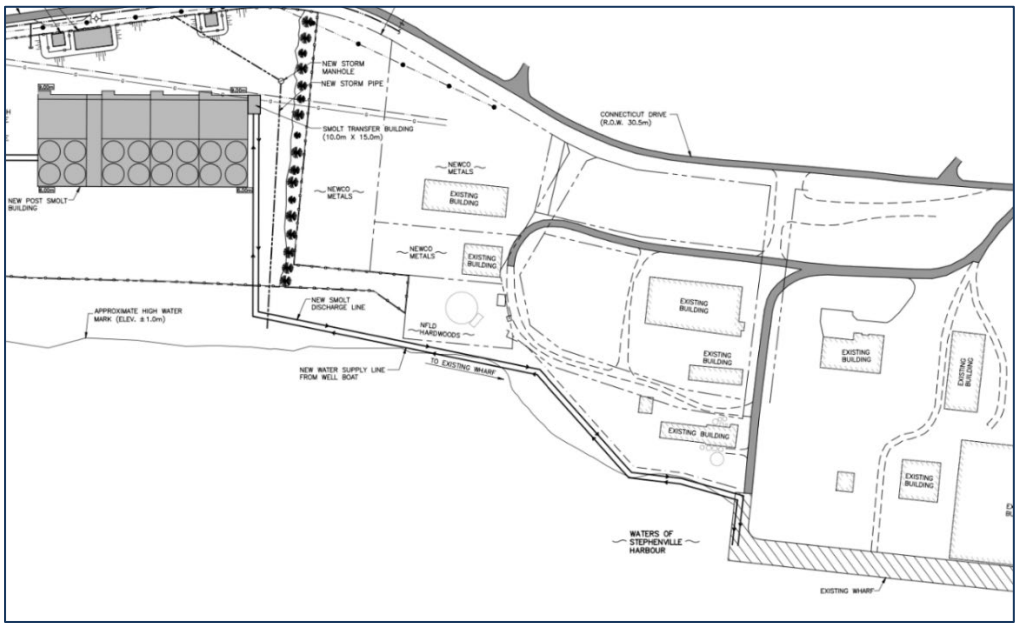


Figure 18 Location of the Fish Transfer System



Port of Stephenville to Saltwater Farms

Atlantic salmon need saltwater to continue their growth after the early life stages in freshwater. To mimic this in the culture environment, smolt (salmon ready to enter saltwater) are transported by vessel from the Port of Stephenville to saltwater farms.

The vessel used by MCE has a fully enclosed fish hold with continuous monitoring of the fish environment during transport. This level of supervision ensures fish health and welfare during transfer. A typical transport vessel configuration is provided in Figure 19.

Figure 19 Typical Transport Vessel Configuration

A new state-of-the-art vessel, the InterAtlantic, is currently being constructed for transport of smolt from the Indian Head Hatchery. The following information pertains to this vessel.

- Vacuum/pressure system for loading and off-loading fish with fish counting equipment.
- Two separate fish holding tanks 1100 m^3 each.
- Ability to transport fish with open, semi-closed, and closed circulation to the fish holding tanks. For fish transported from the Indian Head Hatchery all trips are closed.
- Circulation system capable of pumping water 15,600 m^3/h.
- Water filtration with capacity of 10,400 m^3/h at 150 microns.
- Reverse osmosis plant for freshwater production with a capacity of 5,000 m^3/24h.
- Fully automated cleaning system for efficient and thorough cleaning and disinfection with manual options to use as needed.

Please refer to the following sections for additional information on moving cultured salmon.

- Section 4.2b Fish Transport Construction for status of construction and estimated date to complete.
- Section 4.2d Waste Management During Construction
- Section 4.3a Salmon Rearing Operations
- Section 4.3b Biosecurity Protocols
- Section 4.3i Waste Management Normal Operations

4.1c Saltwater Farms

Guidelines: Provide a complete overview of the project in the following subsections, including information about the preferred choice of location, design, construction standards, operation, and maintenance standards, etc.

- *Section 4.1 Provide an accurate description of the proposed site, access road, facilities, infrastructure, and equipment, including GPS location coordinates. Attach an original base map (1:25,000 scale) and/or recent air photos. This description shall include, but not be limited to:*
- *Section 4.1c site locations and layout of all existing licensed sea cages that will receive smolts produced by the hatchery expansion project.*

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture (FFA), Aquaculture Policies and Procedures Manual 2019, provide the standards and requirements to establish a saltwater farm in the province. Specific references are also included with the information in this section. Mowi meets or exceeds all policies and procedures guiding saltwater farms in the province of Newfoundland and Labrador

Table 6 Aquaculture Policies That Pertain to Section 4.1c

AP #	AP Title	Description
AP 2	Aquaculture Application Requirements	A site map that shows the exact location and details of site layout, including any existing or proposed structures and an overview of the proposed operation, including details of planned capital expenditures. Submission of biophysical data to include, but not limited to, dissolved oxygen, temperature and salinity at different depths at all active aquaculture marine, sites daily. Submission of this data quarterly to Aquatic Animal Health Division of the FFA.
AP 4	Aquaculture Licensing	Demonstration of ISO or certified third-party engineering standards for sea pen system, pen components and installation for new Atlantic salmon operations as of January 1, 2020.
AP 8	Site Utilization	All licensed sites should be developed in accordance with approved business and production plans on file with the department. Production plan updates must be submitted to the department on an annual basis outlining stocking plans and contingency plans.
AP 14	Moorings	All site moorings are to be contained within the area and approved by Transport Canada as per *Navigation Protection Act*. Shore-fastened moorings are prohibited.

In addition to the Aquaculture Policies above, the FFA Code of Containment for the Culture of Salmonids in Newfoundland and Labrador (The Code) has equipment standards to ensure effective containment of farmed salmon – the base for sustainable industry development.

This section provides information on the licensed saltwater farms receiving smolt produced currently by the Indian Head Hatchery and the proposed smolt produced from the Hatchery Expansion.

For related information on the saltwater farms, please refer to the following sections.

- Section 4.1f Ownership and Zoning for information on licences, permits and approvals.
- Section 4.2c. Saltwater Farm Construction
- Section 4.2e Construction for Site Decommissioning and Restoration
- Section 4.3a Salmon Rearing Operations for details on operational procedures and maintenance standards
- Section 4.3j Fish Culture Stocking Densities
- Section 4.3m Fish Containment Saltwater Farms
- Section 6j Avoiding Interference with Other Legitimate Marine Users

Production Farms

Thirty-nine farms, as described in this section, are the full complement of Mowi Canada East Inc. (MCE) farms for salmon production in the province. Table 7 provides the history of MCE saltwater licences – starting with acquisition of thirty-three farms in 2018 through to the thirty-nine licences in 2020 which are the same licences as in 2023.

Table 7 History of Saltwater Farm Acquisition in the Province of Newfoundland and Labrador and Farms in Production Plan

Year	Farms Removed	Farms Added*	Farms in Production Plan	Reason for Addition or Removal+
2018	0	33*	33	Acquisition of established salmon farming company
late 2018	3	7	37	Acquisition other companies (7 farms that require re-licencing) Trout farms removed after 2017 harvest (3 licences)
2019	0	7	44	Re-licensed farms BMA 9 & BMA 10 (7 licences listed in 2018) New licences approved BMA 11 & BMA 12 (7 licences)
2020	8	3	39	Not actively farming in BMA 8 (4 licences) & BMA 9 (4 licences) shared with other companies according to MOU agreement New licences approved BMA 13 (3 licences)
2021	0	0	39	
2022	0	0	39	
2023	0	0	39	

*Thirty-three farms owned by Northern Harvest Sea Farms Ltd. Acquired along with Indian Head Hatchery in purchase agreement.

+BMA: Bay Management Area, principles established by the Government of Newfoundland and Labrador for sustainable aquaculture development that takes into consideration rearing requirements for fish health and welfare, safeguarding the environment, and the business production needs of the industry.

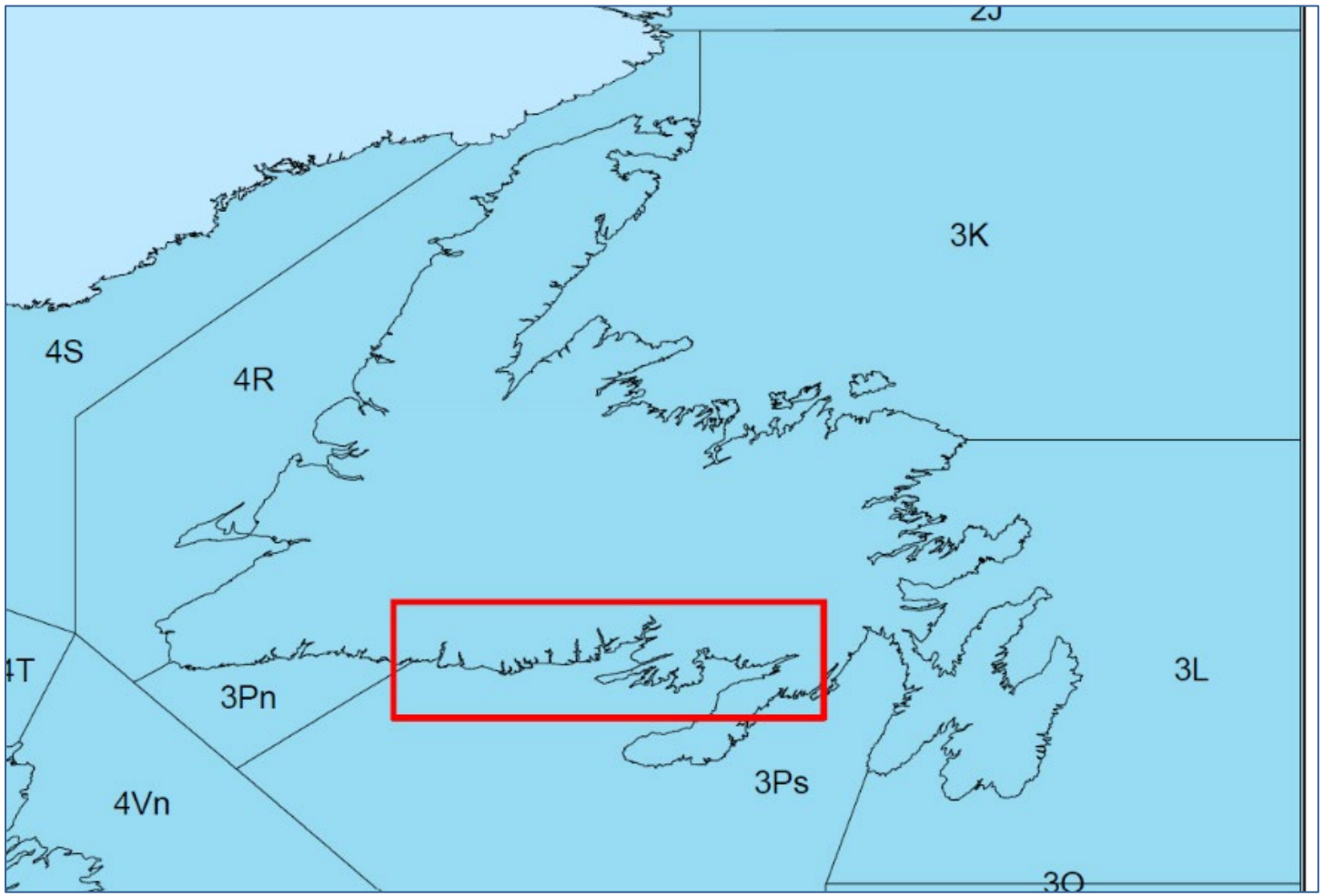
The thirty-nine farms each have a valid Aquaculture Licence, Crown Lands Lease, Water Use Licence, and Transport Canada (*Navigation Protection Act*) approval.

In 2022, MCE submitted applications for six new aquaculture sites. These applications are currently under review. The proposed farm sites have been surveyed and production plans prepared and the rigorous review process that involves several federal and provincial agencies has been initiated. At the time of writing, the new site licences have not been issued. As the site and/or production conditions may require changes identified through the review process, these sites are not ready for stocking and are available to be considered in the current production planning process.

Farm Locations

MCE saltwater farms in the Province of Newfoundland and Labrador are all located on the south coast. Figure 20 shows the Island of Newfoundland with the south coast area indicated in red. The south coast has protected bays with deep cold water which are ideal for salmon farming. The area is remote with only a few small communities accessed by a limited network of roads or by water.

Figure 20 Island of Newfoundland with the South Coast Area Where MCE Saltwater Farms are Located



Bay Management Areas

In 2013, the Government of Newfoundland and Labrador transitioned to Bay Management Area (BMA) system–- a strategy for sustainable aquaculture that takes into consideration rearing requirements for fish health and welfare, safeguarding the environment, and the business production needs of the industry. Each BMA is a geographic area designed to distance farms to prevent the spread of infectious agents, to enable stable and orderly management of industry practices and to ensure ecologically sound salmon rearing practices. All farms in one BMA are on the same production planning, stocking, and fallowing schedule. Fallowing refers to the time when no fish are grown on the site, after harvest and before the next stocking. This allows the area to rest for a period after every production cycle.

Licence owners have a Bay Management Agreement with FFA that includes compliance requirements and thresholds and is a component of the licensing renewal process. Table 8 provides the MCE saltwater farms with associated BMA, the farm name, and coordinates. Appendix A: Mowi Canada East Inc. Saltwater Farms by Bay Management Area provides maps of the BMAs with farm locations.

Table 8 MCE Farms in the Production Plan by Area with BMA, Farm Name and GPS Coordinates

Area	BMA Name	BMA #	Farm Site Name	Site Coordinates
BAYS EAST	Mal Bay	1	The Hobby	47°38’38.04”N 55°8’57.48”W
		1	Foshie’s Cove	47°39’40.68”N 55°8’12.48”W
		1	Benny’s Cove	47°40’37.56”N 55°7’48”W
	Rencontre East	2	Deep Water Point	47°39’11.52”N 55°14’15.72”W
		2	Rencontre Island	47°37’55.92”N 55°12’59.4”W
		2	Old Woman’s Cove	47°40’21.72”N 55°19’54.12”W
		2	Little Burdock Cove	47°38’17.88”N 55°14’2.4”W
	Fortune Bay West	3	Spyglass Cove	47°37’35.76”N 55°28’15.96”W
		3	Cinq Island Cove	47°22’51.6”N 55°16’44.4”W
		3	Tilt Point	47°38’35.16”N 55°27’5.4”W
		3	Spoon Cove	47°42’4.68”N 55°26’17.52”W
		3	Steamer Head	47°41’29.4”N 5°25’53.4”W
		3	Hickman’s Point	47°42’55.44”N 55°23’45.96”W
		3	South East Bight	47°42’34.2”N 55°21’40.32”W
		3	McGrath’s Cove South	47°39’33.84”N 55°22’11.64”W
		3	McGrath’s Cove North	47°39’50.04”N 55°22’45.9”W
		3	Belle Island	47°38’0.6”N 55°21’14.04”W
		3	Ironskull Point	47°34’5.16”N 55°24’11.52”W

	BMA Name	BMA #	Farm Site Name	Site Coordinates
	Great Bay de l'Eau	4	Dog Cove	47°32'10.32"N 55°37'32.88"W
		4	Salmonier Cove	47°30'4.752"N 55°35'43.08"W
		4	Red Cove	47°31'21.72"N 55°36'59.04"W
		4	Murphy Point	47°29'52.8"N 55°42'14.76"W
	Harbour Breton Bay	5	Broad Cove	47°30'27.72"N 55°46'24.24"W
		5	Harvey Hill North	47°33'39.6"N 55°45'24.48"W
		5	Harvey Hill East	47°32'18.6"N 55°45'22.32"W
		5	Harvey Hill South	47°31'40.8"N 55°46'24.24"W
BAYS WEST	Facheux Bay	10	Wallace Cove	47º 42' 56.3"N 56º 19' 07.9"W
		10	Dennis Arm	47º 40" 50.2N 56º 18" 59.2W
		10	Indian Tea Point	47º 43' 56.0"N 56º 19' 24.2"W
		10	Wild Cove	47º 38.479'N 56 º 19.066'W
	Hare Bay	11	Mare Cove South	47º 39' 42.7"N 56º 31' 10.7"W
		11	North Bob Locke Cove	47º 38' 39.6"N 56º 31' 07.9"W
	Rencontre West	12	Devil Bay	47º 38' 39.4"N 56º 31' 07.7"W
		12	Little Bay	47º 37' 46.2"N 56º 39' 57.7"W
		12	Rencontre Bay	47º 37' 23.1"N 56º 40' 56.4"W
		12	The Gorge	47º 37' 59.3"N 56º 42' 09.7"W
	Chaleur Bay	13	Chaleur Bay	47º 37' 19.4"N 56º 44' 54.2"W
		13	Friar Cove	47º 36' 04.9"N 56º 44' 48.0"W
		13	Shooter Point	47º 35' 09.95"N 56º 43' 24.83"W

Salmon farming on the south coast can be generally divided into Bays East and Bays West areas. Bays East covers the area east of Hermitage and includes BMAs 1-8. Bays West includes BMAs 9-13 located to the west. Of the thirty-nine MCE saltwater farms, twenty-six are in Bays East and thirteen in Bays West. Figure 21 and Figure 22 show the locations of the farms in the two areas.

- Bays East was an early area for salmon farming in the province. The farms to receive Hatchery Expansion smolt are in Fortune Bay, Rencontre East, Mal Bay, Great Bay d'Eau, and Harbour Breton Bay as indicated in Table 8. These farms were obtained through acquisition of other salmon farming companies.
- Bays West is a relatively new area for salmon farming with farms acquired by company acquisitions and re-licencing, and applications for new sites. The area is very remote with sheltered narrow fjord-type bays with steeply sloping ocean floor from the shoreline. Farms are located in Facheux Bay, Hare Bay, Rencontre West, and Chaleur Bay.

Figure 21 MCE Saltwater Farms in Bays East on the South Coast of the Province

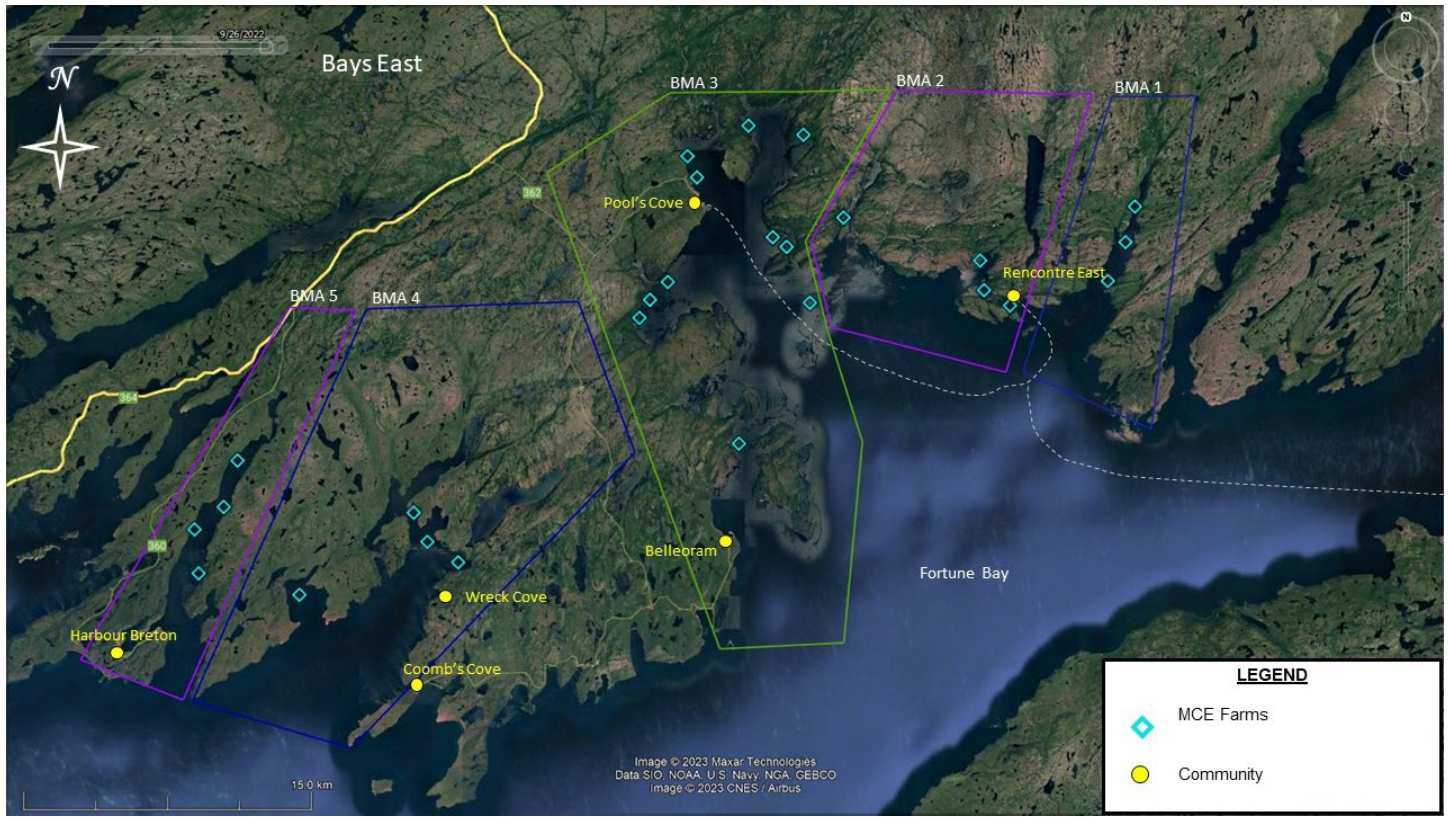
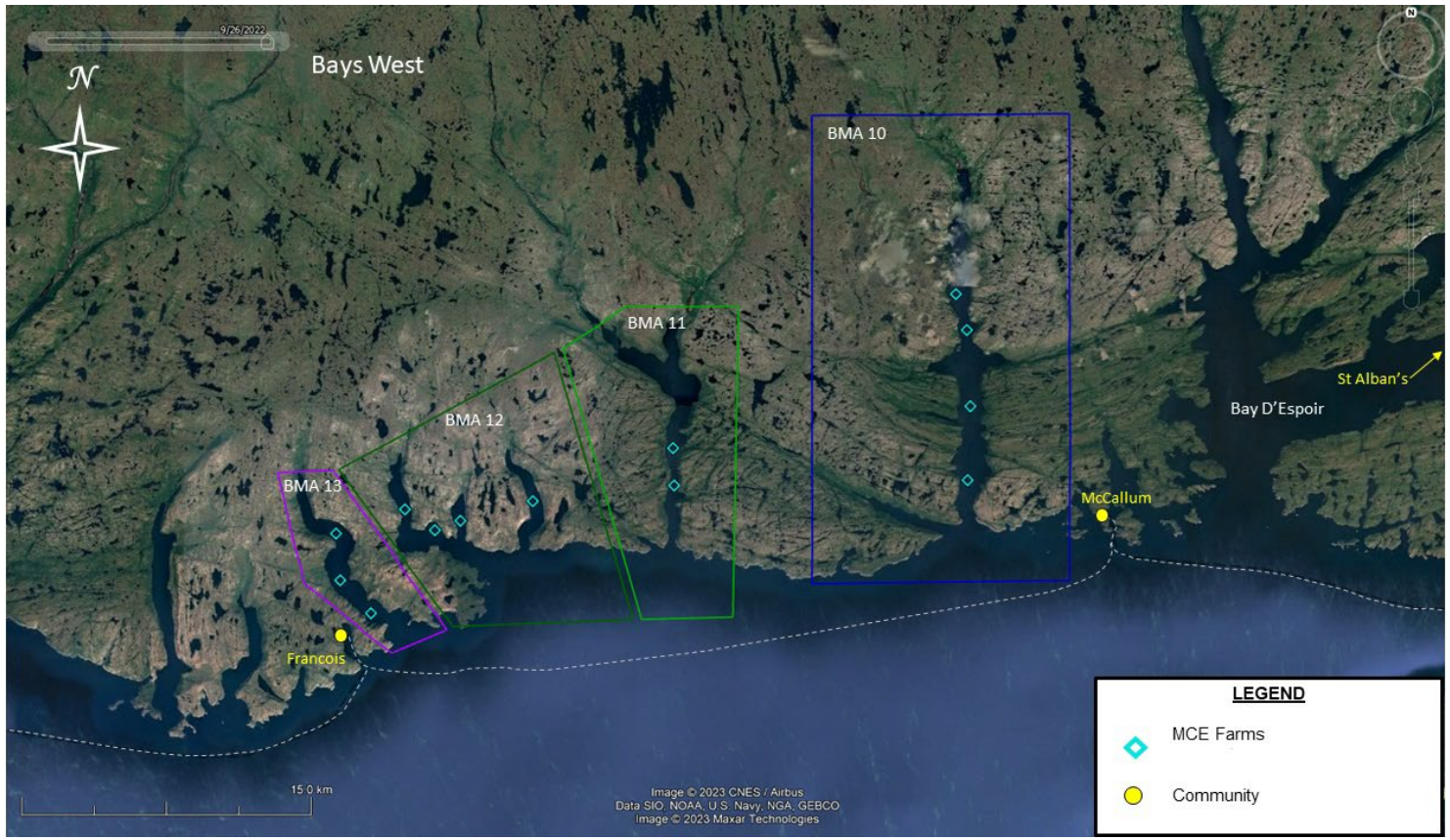


Figure 22 MCE Saltwater Farms in Bays West on the South Coast of the Province



Farm Infrastructure Design and Site Layout

Salmon farming is changing at a rapid pace. The technology and practices at MCE farms are continuously improving, improving how salmon are cultured and enhancing fish health and welfare during culture. Aquaculture regulations and policies are also being revised to reflect current research and knowledge, especially for safeguarding the environment. These processes drive new salmon farming standards which provide the framework for the design and development of saltwater farms.

For existing farms, new operational standards or policies can often be put into practice immediately. If this is not the case, revisions are scheduled according to the production plan with equipment upgrades, if required, most often completed after the current production is harvested and before the next stocking. The process of altering licensed saltwater farms to meet the new standards is actively managed by FFA. All new farms are built to meet the latest regulations, policies, and standards.

Saltwater Farm Infrastructure

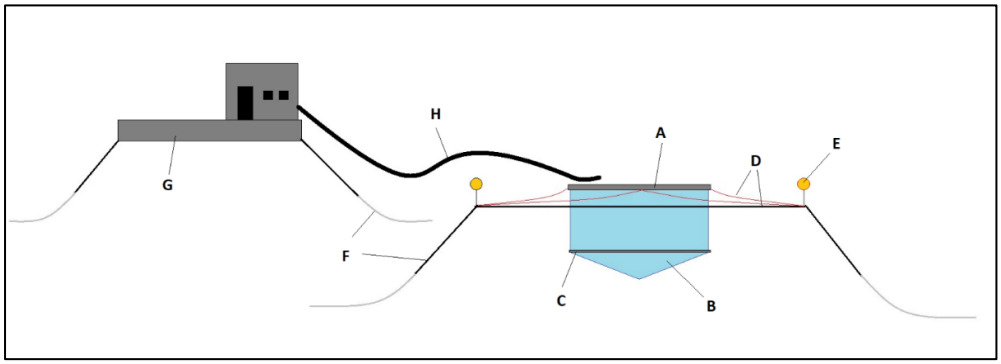
Aquaculture Policies 2 and 4 state saltwater farm infrastructure design and installation to be ISO certified or have a third-party certified engineer stamp of approval. The design process specifies the type of materials to be used, taking into consideration the specific site characteristics, expected equipment life in the marine environment, repair and/or replacement requirements which must coordinate with the salmon three-year culture cycle in the province, and all provincial aquaculture regulations and policies, such as a minimum depth for fish culture nets of 20 m.

All MCE farms have third-party engineer approved designs or have a Department of Fisheries, Forestry and Agriculture (FFA) approved plan for revisions. Please refer to section 4.3m Fish Containment Saltwater Farms for details of The Code and its requirements and technical standards.

Standard salmonid saltwater farm components include the following, see Figure 23.

- HDPE floating pen or collar to provide a base of the infrastructure.
- Fish culture or containment net that hangs from the collar.
- A weighted ring to keep the culture net shape.
- A mooring system to anchor the collar in place and navigational markers.
- Feed and/or accommodation barge with associated feed lines.

Figure 23 Standard MCE Salmon Saltwater Farm Components



A – Floating HDPE plastic collar that forms the basis of the farm and support for fish culture net

B – Fish culture net (containment net)

C – Weighted bottom ring (HDPE pipe filled with concrete)

D – Roped mooring grid

E – Mooring grid marker buoys

F – Mooring system (mooring rope, chains, and anchors/pins)

G – Feed barge

H – Feed pipe

Farm Layout

The layout of salmon saltwater farms in the Province of Newfoundland and Labrador has taken into consideration the following.

- Natural forces which may act upon the farm such as prevailing and storm winds, water currents and tidal flow. Ensuring the design and the equipment is robust enough to withstand such forces.
- Avoidance of areas of known activities of other users to avoid interference and avoid sensitive habitats, both marine and terrestrial.
- Lease boundaries as all infrastructure, including sub-surface equipment such as anchors, must be located within the lease boundaries.
- Requirement for a minimum 40 m navigation channel between farm infrastructure and the shoreline is a requirement of all newly developed aquaculture farms.
- Installation of all aids to navigation such as buoys, day beacons, lights etc. as required by Transport Canada.

Infrastructure and Layout Approval

The outputs from the farm design process are two sets of detailed engineer-certified drawings.

- The Lease Layout provides an aerial view of the lease boundaries including the shoreline and navigational channel with the layout of the fish culture pens, anchors and other infrastructure within the lease.
- The Infrastructure Design has aerial and side views showing lease bathymetry, farm infrastructure, and the position of farm infrastructure within the water column.

As part of the application for a fish farm licence, this information is provided to provincial authorities FFA, and Department of Environment and Climate Change (ECC), and the federal agencies Department of Fisheries and Oceans (DFO) and Transport Canada (TC) for review and approval.

These authorities may also distribute the application to other agencies with specific areas of knowledge and responsibility, such as Environment Canada. Questions or concerns are addressed during the review, design changes are made, and approval is required prior to the licence being granted.

Receiving an aquaculture licence, Water Use Licence, Crown Lands Lease and *Navigable Waters Protection Act* (NPA) approval, as listed in Table 13 in section 4.1f, indicates the thirty-nine farms are fully compliant with all regulatory requirements.

Bays East Farms

Figure 24 and Figure 25 provide typical layout and infrastructure for Bays East farms, including lease boundaries and dimensions of the lease fish culture pens, distance from the shoreline, navigational buoys, depths below fish farm, anchor chains and mooring lines.

Figure 24 Typical Layout for MCE Farms in Bays East

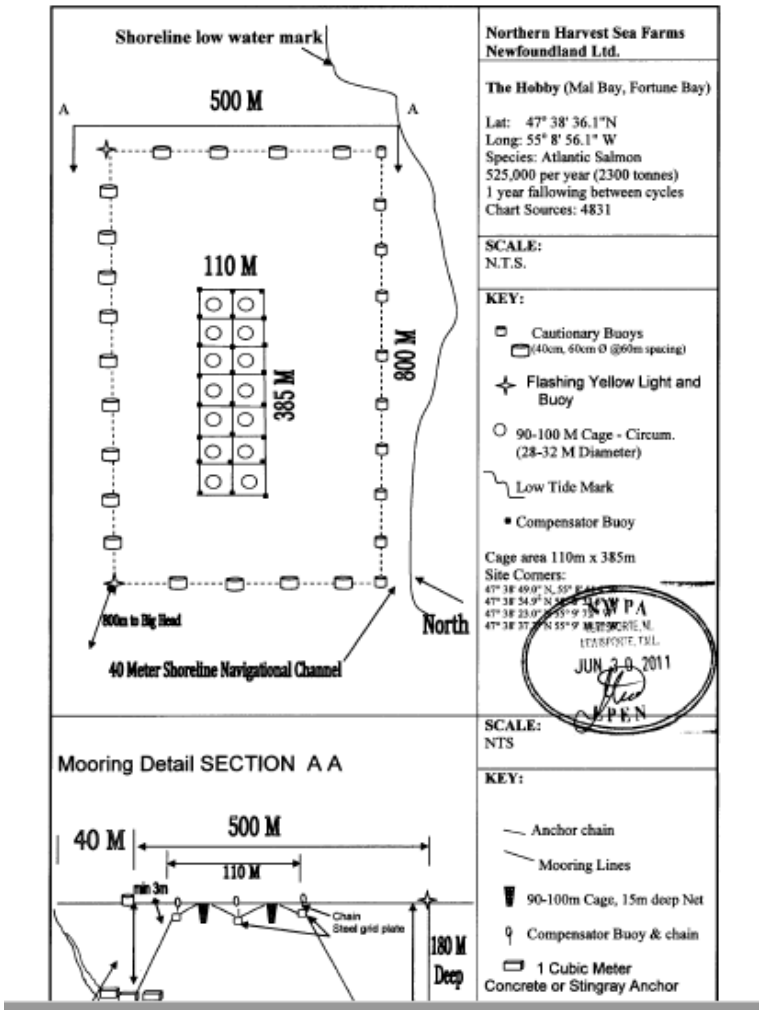
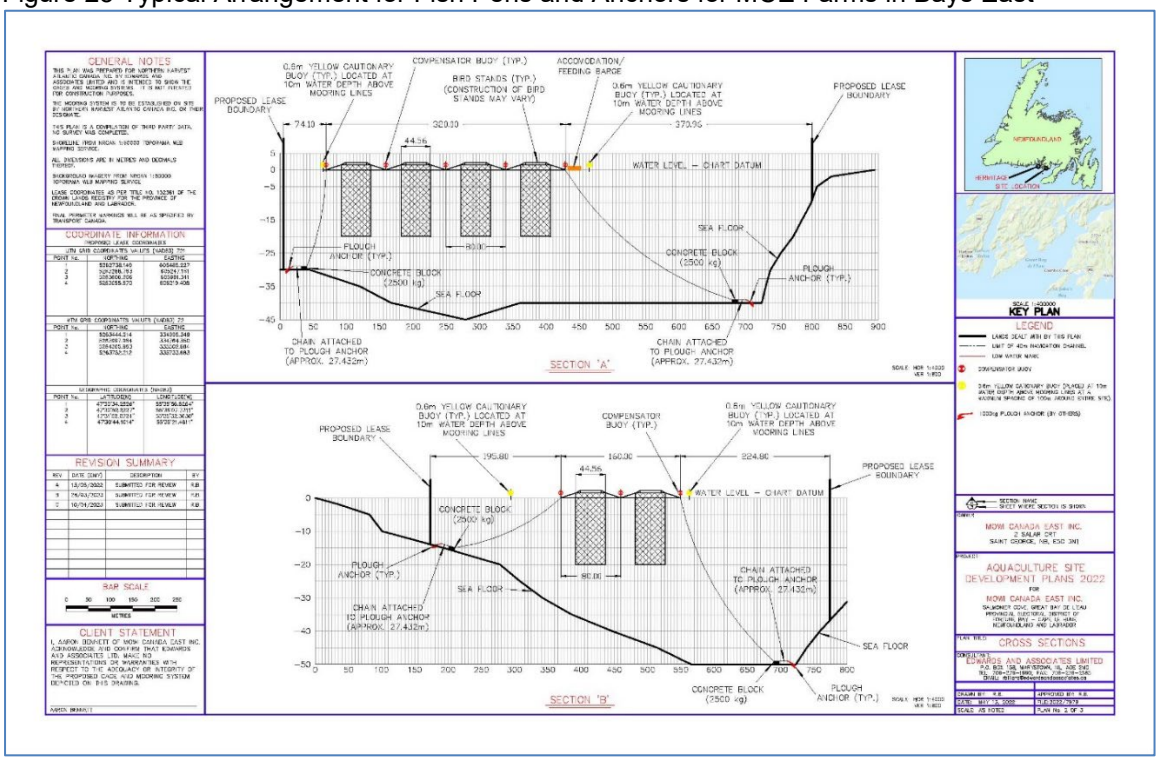


Figure 25 Typical Arrangement for Fish Pens and Anchors for MCE Farms in Bays East



Bays West Farms

Bays West farms have been licensed since 2019 and Figure 26 and Figure 27 provide the layout and design of a typical farm in this area. Figure 26 shows the lease area and boundaries with the layout of the farm infrastructure within the lease as well as the 40 m navigational channel. Figure 27 provides side views with lease bathymetry, depth below the fish culture pens, and how the infrastructure is oriented within the water column.

Figure 26 Typical Layout for MCE Farms in Bays West

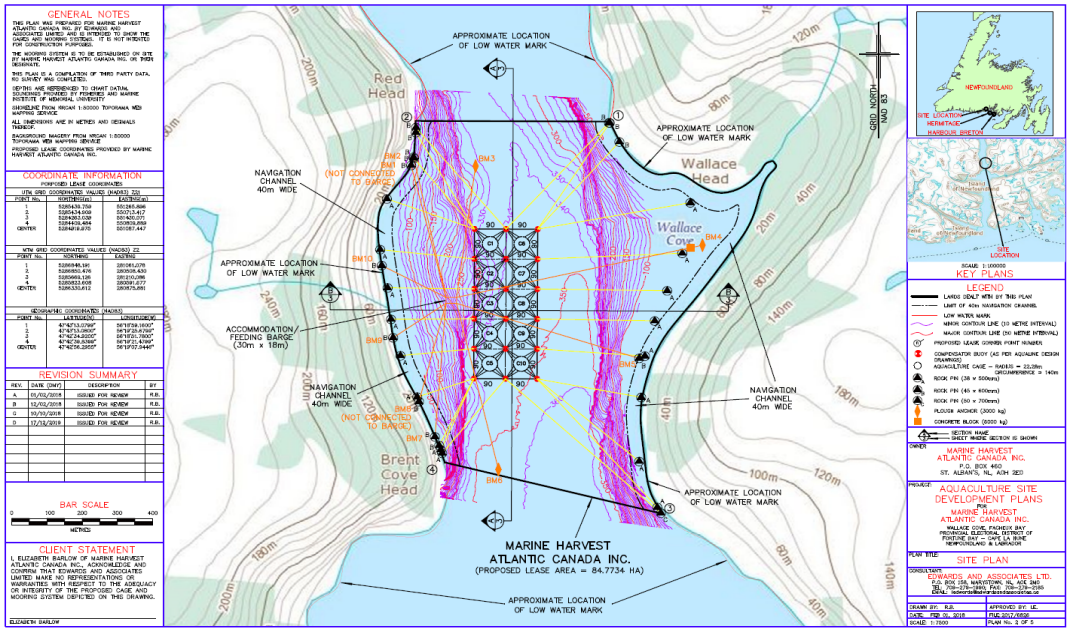
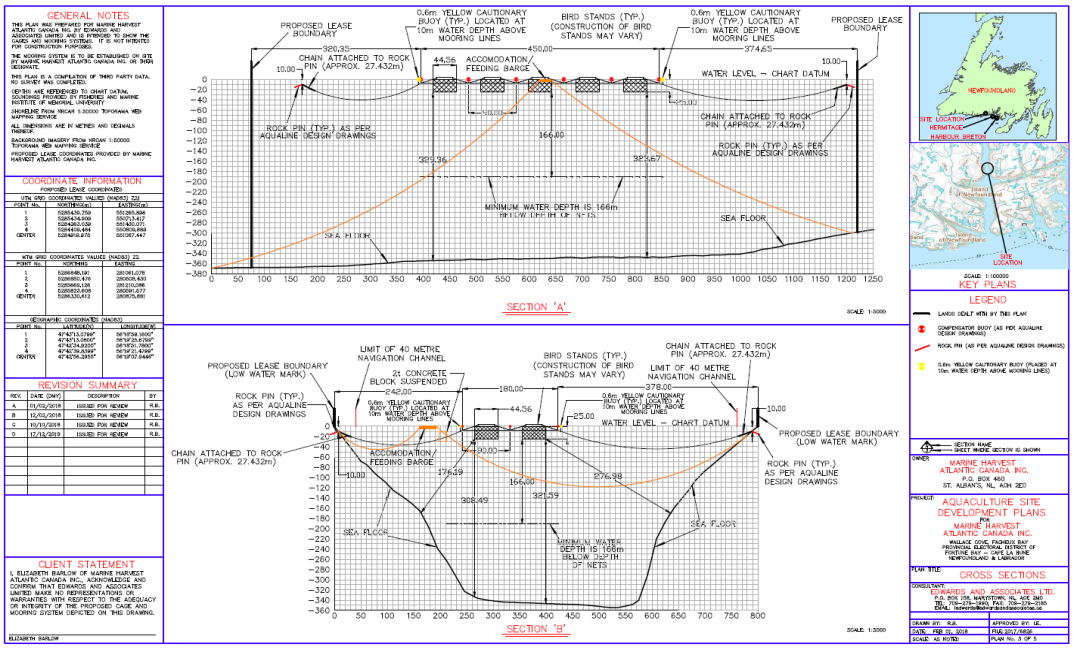


Figure 27 Typical Arrangement for Fish Pens and Anchors for MCE Farms in Bays West



4.1d New Saltwater Farms

Guidelines: Describe the site locations and layout of any proposed new sea cages required to receive smolts produced by the hatchery expansion project.

The previous section provided information on the thirty-nine farms currently available for growing salmon in the Province of Newfoundland and Labrador.

As indicated in the previous section, there are six applications submitted for new aquaculture sites in Bays West. The applications are under review since 2022 but at the time of submitting the EPR the new site licences have not been issued and these sites are not approved for salmon farming. Only fully licensed farms can be used in production planning. Therefore, the proposed Hatchery Expansion 2.2 million smolt will only be reared on the thirty-nine farms listed in section 4.1c.

4.1e Proximity to Pollution Sources

Guidelines: Describe the proximity of hatchery and sea cage sites to pollution sources such as sewer outfalls, ocean disposal sites or industrial effluents.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, govern other industrial, fishing, and aquaculture activities in the vicinity of saltwater farms and are strictly adhered to by Mowi Canda East Inc. (MCE). Where applicable, other APs or regulations or policies are referenced in the information provided.

Table 9 Aquaculture Policies That Pertain to Section 4.1e

AP #	AP Title	Description
AP 9	Onshore Developments in Vicinity to Aquaculture Sites	For municipal sewer outfall developments located at a distance of less than 500 meters from the existing aquaculture operation, the Department Fisheries, Forestry and Agriculture will not recommend approval.
AP 13	Lobster Fisheries and Aquaculture Facilities	Licensees may allow access to their site to licensed commercial lobster fishers who have traditionally fished the site to enable the traditional lobster fishery to continue, with the exception of when a site is officially quarantined.
AP 26	Site Separation	New site applications must be located a distance of 5000 meters or greater from any existing fish processing facility

Indian Head Hatchery

The Indian Head Hatchery is located in the Port of Stephenville Industrial Park that has adequate land area to accommodate all current users and their activities. To date, no activities of the commercial neighbours have adversely affected fish culture at the hatchery. There is room for additional businesses and future development is managed by the Town of Stephenville to municipal and provincial pollution standards.

The Indian Head Hatchery site has been used for industrial purposes since the 1950's. A ground survey conducted in 2018 showed the site had been previously disturbed but had only one section contaminated with hydrocarbons. The hatchery development has avoided use of the contaminated section. The general slope of the area is to the southwest and any new run-off with contaminants would be expected to flow away from hatchery infrastructure.

Freshwater for fish culture is sourced exclusively from the nearby aquifer located in a Wellhead Watershed Protection Area. This area is protected from development or use that would compromise the quality of the aquifer water and/or the available volume of water for existing users. The protected area is shown in Figure 29 in section 4.1f Ownership and Zoning.

Saltwater Farms

MCE farms are located in remote areas with limited human activity and few small communities, please refer to the maps provided in Appendix A: Mowi Canada East Inc. Saltwater Farms by Bay Management Area and Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Activities the Bay Management Area. There are no direct pollution sources, such as sewer outfalls, ocean disposal sites, or industrial effluent disposal sites, near any of the MCE saltwater farms.

Communities and commercial facilities are listed in Table 10 with the distance to the nearest MCE farm. This information is also shown on the maps provided in Appendix B: Mowi Canada East Inc. Saltwater Farms and Potential Pollution Sources by Bay Management Area.

Except for two saltwater farms, the distance to the closest community is greater than 2.5 km. The communities in the area are small with most having a population of less than 500. Due to the low population and distance from the farms, the communities and commercial enterprises within the communities are not of concern as potential pollution sources.

Table 10 Information on Communities and Commercial Facilities Near a Saltwater Farm

Community	Population*	Waste System	Commercial Facilities	Nearest MCE Farm	Distance (km)
Harbour Breton	1477	Municipal sewage system	Commercial Wharves, Fish Plant and Wharf	AQ1045 Broad Cove	4.2
Belleoram	348	Septic	Fishing Wharf, Lumpfish Hatchery	AQ865 Ironskull Point	4.8
Pool's Cove	143	Septic	Ferry Wharf, Fishing Wharf	AQ1050 Steamer Head	1.2
Rencontre East	115	Septic	Ferry Wharf, Tourism	AQ1081 Rencontre Island	0.6
Wreck Cove Coombs Cove	546	Septic	Fishing Wharf	AQ1048 Salmonier Cove	2.8
English Harbour	117	Septic	Fishing Wharf, Government Wharf	AQ865 Ironskull Point	13.8
Francois	64	Septic	Ferry Wharf, Fishing Wharf	AQ1149 Shooter Point	5.6
McCallum	45	Septic	Ferry Wharf, Fishing Wharf	AQ1131 Dennis Arm	12.8

*2021 census

Other Users

There are other activities, such as recreational boating and cabin locations, fishing, and tourism, around some of the MCE farms, with greater activity in a few of the Bays East areas. Please refer to section 6j Avoiding Interference with Other Legitimate Marine Users for details and maps and Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Activities the Bay Management Area. Many of these activities were present prior to establishing salmon farms and they continue to take place around the farms without creating a source of pollution or other issues.

4.1f Ownership and Zoning

Guidelines: Provide information regarding ownership and/or zoning of the land upon which the project is to be located and any restrictions imposed by that ownership or zoning, including municipal ownership/zoning, Crown, and private land.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide information on aquaculture licence holders responsibilities and requirements. Additional regulations and policies are included in the section information where appropriate.

Table 11 Aquaculture Policies That Pertain to Section 4.f

AP #	AP Title	Description
AP 1	Classification of Licence	It is the responsibility of Licensees to ensure compliance with the requirements for each licence class.
AP 2	Application Requirements	Commercial aquaculture licence applications must include information to show that technical, business planning, and financial capability requirements have been met by the applicant.
AP 5	Aquaculture Licencing Process	Licensees are responsible for ensuring that all permits and approval are in place prior to developing or stocking an aquaculture site

Indian Head Hatchery

The Indian Head hatchery and Hatchery Expansion infrastructure are located on adjoining properties and nearby leases in the Port of Stephenville Industrial Park. Information is provided in this section for the components of both the Indian Head Hatchery and the Hatchery Expansion sites.

Land Ownership

The Indian Head Hatchery and the Hatchery Expansion components are located on land owned by MCE or areas with easement agreements. These agreements are either are in place or in negotiation as indicated in Table 12. Depending on when the purchase or easement agreement was made, the arrangements are with Northern Harvest Smolt or Marine Harvest Atlantic Canada. These companies are owned by MCE.

There are no restrictions on use of the land that would impede the hatchery production activities

or the Hatchery Expansion development. Table 12 lists the hatchery components, as EXISTING, and the Hatchery Expansion components as EXPANSION. The associated ownership, property details and land parcel identification are also provided. The land parcel identification corresponds to the Land Ownership Map provided as Figure 28.

Table 12 Hatchery Infrastructure, Ownership, Registration, Land Size and Corresponding Number on Land Ownership Map

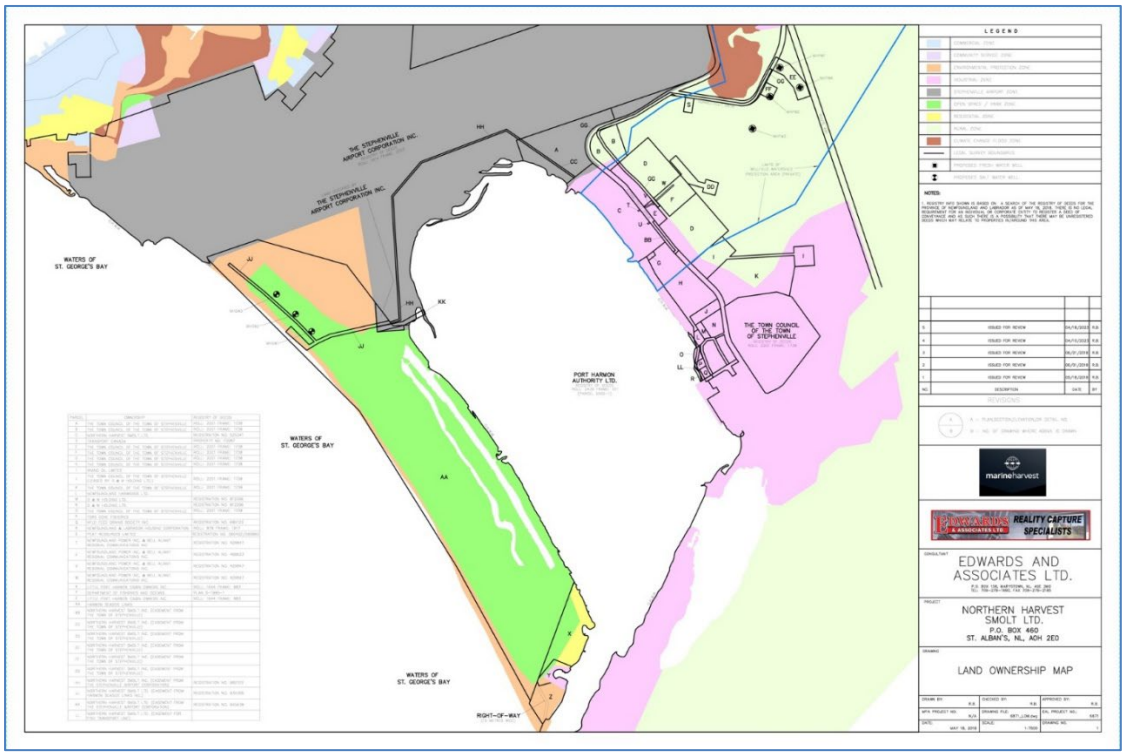
Existing or Expansion Project	Infrastructure	Land Ownership Type and Status	Reg #	Size	*Land Parcel #
EXISTING	Indian Head Hatchery	Owned	525341	11ha	C
EXPANSION	Modular RAS Building	Owned	899710	13.86ha	H
EXPANSION	Effluent Treatment Building 2	Owned	899710	13.86ha	H
EXISTING	Warehouse	Purchase pending	995900	4087m^2	S*
EXISTING	Utility Easement	Easement	990076	1774.5m^2	
EXPANSION	Water Treatment Facility*	Purchase pending		4.156 ha	E & F*
EXISTING	Existing Freshwater Well*	Purchase pending		2.832 ha	DD*
EXPANSION	New Freshwater Wells	Easement		2.80 ha	GG
		Easement		2.348ha	EE&FF
EXPANSION	Water Line Trench from Water Treatment Facility under Connecticut Drive to Hatchery	Easement		3757m^2	BB
EXPANSION	Effluent Discharge Trench to Airport	Easement		0.412ha	A
	Saltwater Wells and Influent Line				
EXPANSION	Effluent Discharge and Saltwater Influent Trench through Airport to Golf Course	Easement	945638	8485m^2	HH
EXPANSION	Effluent Discharge through Airport	Easement	982103	1.76ha	JJ

Existing or Expansion Project	Infrastructure	Land Ownership Type and Status	Reg #	Size	*Land Parcel #
EXPANSION	Effluent Discharge (outfall) Trench through Golf Course and Saltwater Wells	Easement	935306	2.86ha	AA
EXPANSION	Fish Transport Line*	Easement		1774.5m2	LL

*Easement or land purchase contract in negotiation

Figure 28 is a land ownership map of the area showing the location of the parcels of land listed in Table 12. The Water Treatment Building is located on parcels E and F. These two parcels are in the process of being purchased from the Town of Stephenville. Negotiation is ongoing for an easement for the section of the Fish Transfer System line that runs from the boundary of the hatchery property to the Port of Stephenville. It is expected both agreements will be complete in 2023.

Figure 28 Land Ownership and Locations



Zoning

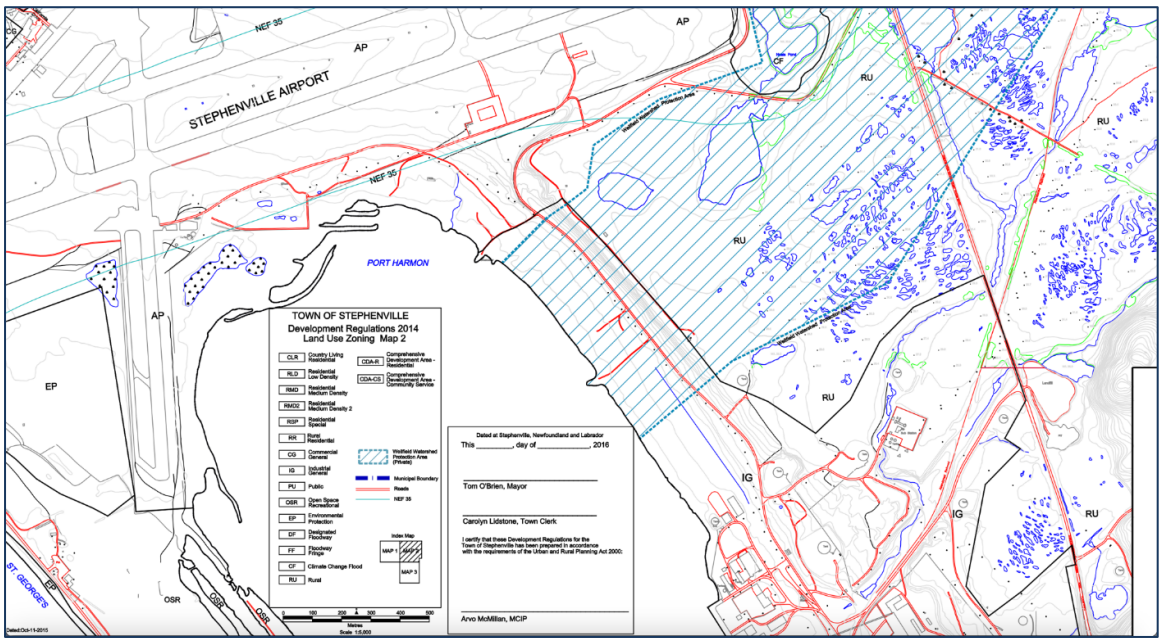
The Indian head Hatchery is in the Port of Stephenville Industrial Park. This area is zoned Industrial General (IG) by the Town of Stephenville which allows the following uses.

> *"All uses in the Assembly Use group except Educational, All uses in the Business Professional and Personal Service Uses group, Commercial-Residential (Condition 3), Conservation, General Industry, Light Industry, all uses in the Mercantile Uses group, Recreational Open Space, Service Station, Transportation, and Antenna".*

From: Schedule C of the Town of Stephenville Development Regulations, 2014 as supplied by the Department of Municipal Affairs:
http://www.mae.gov.nl.ca/registry/community/stephenville/files/DR.pdf

Figure 29 shows the areas set aside for commercial development by the Town of Stephenville and the Watershed Protected Area where the fish culture water source is located.

Figure 29 Town of Stephenville Land Use Zoning Map



From: Plans and Regulations | Town of Stephenville

Saltwater Farms

All MCE licensed saltwater farms in the province are located on the south coast and are 100% on the water. There is no land ownership, shore-based farming facilities or activities associated with the thirty-nine saltwater farms. Please refer to section 4.1c Geographic Location, Saltwater

Farms and Figure 21 and Figure 22 for farm locations

For the saltwater farms listed in Table 8, restrictions on use are set by the regulatory agency issuing the permit or licence and included as conditions in the lease agreement, operational licences, and navigational approval. A valid Crown Lands Lease is required to occupy the marine site, Transport Canada approval and a Water Use Licence (WUL) are required to install and operate the farm infrastructure, and an Aquaculture Licence (AQ) is required to conduct salmon farming operations at the site.

MCE respects and adheres to all conditions of the licences and approvals required for salmon farming. Table 13 provides the licences and approvals for each farm and Table 14 Salmon Aquaculture Regulators, Licence Application Referrals with Applicable Legislation and Permits or Programs that control salmon aquaculture activities in the province.

Table 13 Saltwater Farms with Licence and Approvals Information

Farm Name	AQ Licence #	Year Licence Approved	Crown Lands Lease	Water Use Licence	*Navigation Protection Act* (NPA) Approval
The Hobby	1086	2012	138315	12-172	8200-2012-700223
Foshie's Cove	1085	2013	138313	13-040	8200-2012-700221
Benny's Cove	1084	2013	138314	13-039	8200-2012-700220
Deep Water Point	1080	2011	137542	10-120	2010-700215
Rencontre Island	1081	2011	137541	10-121	2010-700257
Old Woman's Cove	1082	2011	137814	10-122	2010-700222
Little Burdock Cove	1083	2011	137537	10-123	2010-700214
Spyglass Cove	881	2002	118701	08-096	8200-01-1396
Cinq Island Cove	883	2003	118707	08-098	8200-01-1397
Tilt Point	976	2004	130566	08-099	8200-04-1052
Spoon Cove	882	2006	125724	08-097	8200-01-1491
Steamer Head	1050	2006	131825	08-100	8200-08-1003
Hickman's Point	1002	2008	126117	09-030	8200-04-1227
South East Bight	1046	2011	131986	11-037	8200-08-1002
McGrath's Cove	885	2002	118697	13-042	8200-01-1399
McGrath's Cove	886	2002	118703	13-043	8200-08-1066
Belle Island	888	2002	118704	13-044	8200-08-1064
Ironskull Point	865	2003	118647	13-041	8200-08-1065
Dog Cove	1049	2010	131993	09-029	8200-07-1366
Salmonier Cove	1048	2010	132361	08-044	8200-07-1365
Red Cove	1065	2011	136211	10-041	8200-10-1005
Murphy Point	1088	2012	140767	12-009	8200-11-700181
Broad Cove	1045	2007	125709	09-072	8200-04-1105
Harvey Hill North	993	2008	125719	13-087	8200-04-1108
Harvey Hill East	991	2009	125712	12-028	8200-04-1106
Harvey Hill South	1121	2016	136213	10-042	8200-10-1023

Farm Name	AQ	Year	Crown	Water Use	Navigation
Wallace Cove	1123	2018	153812	18-9804	2018-200078
Dennis Arm	1131	2019	154607	19-10217	8200-03-1025
Indian Tea Point	1126	2019	154564	18-9956	2013-700003
Wild Cove	1127	2019	154535	18-9957	2018-200138
Mare Cove South	1125	2019	154581	18-9955	2013-200064
North Bob Locke	1124	2019	154582	18-9954	2018-200167
Devil Bay	1133	2019	154556	189964	2013-200065
Little Bay	1134	2019	154559	18-9966	2018-200137
Rencontre Bay	1136	2019	154584	18-9967	2018-200166
The Gorge	1135	2019	154723	19-10214	2019-200039
Chaleur Bay	1147	2020	156617	20-10998	2020-201953
Friar Cove	1148	2020	156618	20-10999	2020-201956
Shooter Point	1149	2020	156619	20-11000	2020-201980

Depending on when the licence approvals were issued, the farms are licensed to either Northern Harvest Sea Farms Ltd. or Marine Harvest Atlantic Canada Inc. Both companies are owned and directly managed by MCE.

Aquaculture Licence

The aquaculture licensing process is administered by FFA in accordance with the *Aquaculture Act* and associated regulations and departmental policies. *RSNL1990 CHAPTER A-13 - AQUACULTURE ACT (assembly.nl.ca) (subsections 4(1), (5) and (7))*.

Table 14 provides a list of the regulators, legislation, and permits or programs that pertains to salmon aquaculture in the province and indicates where the licence application is referred.

Table 14 Salmon Aquaculture Regulators, Licence Application Referrals with Applicable Legislation and Permits or Program

Reproduced from Department of Fisheries, Forestry and Agriculture, Environmental and Waste Management Guidelines DOC 2022/00210.

Regulator	Licence Application Referral	Applicable Legislation	Permits and/or Programs
Provincial Regulators, Applicable Legislation, and Permits or Programs			
Environment and Climate Change	No+	*Environmental Protection Act*: Environmental Assessment Regulations *Water Resources Act:* Environmental Control and Water Sewage Regulations	Water Use Licence Permit for construction of non-domestic well S48 Permit for intakes, infilling etc.
Fisheries, Forestry and Agriculture	Yes	*Aquaculture Act:* Aquaculture Regulations *Fish Inspection Act*: Fish Inspection Operations Regulations *Lands Act* *Wildlife Act*	Administration aquaculture licencing process Aquaculture Licence Fish Transfer Licence Fish Processing Licence Crown Land Lease
Tourism, Culture, Arts, Recreation	Yes	*Historic Resources Act*	Archaeological management and protection
Canadian Food Inspection Agency	No*	*Feeds Act:* Feed Regulations *Health of Animals Act:* Health of Animals Regulations, Reportable Disease Regulations	National Aquatic Animal Health Program Aquatic Animal Health Import Permit
Environment and Climate Change Canada	No*	*Canadian Water Act* *Environmental Protection Act* *Migratory Bird Convention Act 1994*: Migratory Birds Regulations, Migratory Bird Sanctuary Regulations	
Health Canada Pest Management Regulatory Agency (PMRA)	No*	*Food and Drugs Act*: Food and Drug Regulations *Pest Control Products Act:* Pest Control Products Regulations	Veterinary Drugs Directorate
Fisheries and Oceans Canada	Yes	*Fisheries Act:* Aquaculture Activities Regulations, Aquatic Invasive Species Regulations, Fishery (General) Regulations *Species at Risk Act* *Oceans Act*	Aquaculture public reporting Introductions and Transfer Committee & Licence Protecting fish health Protecting aquatic ecosystems
Transport Canada	Yes	*Canadian Navigable Waters Act* *Canadian Shipping Act 2001:* Private Buoys Regulations *Transport of Dangerous Goods Act* *Wrecked, Abandoned or Hazardous Vessels Act*	Navigation Protections Program *Canadian Navigable Water Act* Approval

+Shellfish application only
*Some regulators regulate a supply and are not directly involved in the assessment of an aquaculture site, however, that licence holder is responsible to source from an approved supplier or service provider.

Having a valid Crown Lands Lease is required to be granted an aquaculture licence and the licence will not be extended beyond the term of the Crown Lands lease.

The Code of Containment of Salmonids in Newfoundland and Labrador (The Code) states licence applications must include detailed site-specific ISO certified or third-party certified engineer approved infrastructure plans. These plans along with the surveys of the proposed site and operational production plans are reviewed by several levels of government and prior to granting the licence. Any deviation from these plans during construction must be approved by FFA.

In addition to the development and operational plans, FFA provides site specific restrictions and requirements that are included in the licence. The conditions of licence are extensive and include clear guidelines and restrictions on the use of the lease and the salmon farming activities. The following provides an overview. For full details please refer to https://www.gov.nl.ca/ffa/programs-and-funding/fisheries-and-aquaculture/support/.

Regulatory Compliance

- The Department of Fisheries, Forestry and Agriculture (FFA) retains the right to disclose any or all information collected from Licensees.
- License holders must comply with all directives, policies and/or management strategies issued by FFA.
- License holders must ensure that a security bond is established and in accordance with departmental requirements.
- License holders must abide by the requirements of the following.
    - The Bay Management Area Agreement.
    - The Code of Containment for the Culture of Salmonids in Newfoundland and Labrador.
- License holders must ensure products harvested from sites are processed in a facility licensed in accordance with the requirements of the *Fish Inspection Act (RSNL 1990 Chapter F-12)* and regulations.
- License holders must provide all required annual reports, statistics, and any other reports required within the timelines directed by FFA in order for the licence to be considered for annual validation and renewal.

Reporting - Abnormal Events

- Report abnormal mortality events within 24 hours of the event occurring to the Aquatic Animal Health Division and the Aquaculture Development Division of the Department of FFA

- For any abnormal mortality events, provide written updates to the Chief Aquaculture Veterinarian and the Director of Aquaculture Development, FFA every 10 days following the initial report. When the incident event and removal operations are complete the final numbers of fish removed are to be reported to the Chief Aquaculture Veterinarian and the Director of Aquaculture Development.
- Update FFA within 30 days of any production changes due to depopulation, mass mortality, or other incident event.
- Publicly report the detection of federally Reportable Diseases within 24 hours of the detection.
- Report to the Assistant Deputy Minister, FFA immediately through verbal notification and in writing, no later than 24 hours, all events that cause abnormal mortality, harm, or an imminent threat to farmed finfish, marine installations or structures or vessels.
- Publicly report within 24 hours, all events that cause abnormal mortality, harm, or an imminent threat to farmed finfish, marine installations or structures or vessels including any event that impairs the function of any equipment required to sustain aquatic fish health and prevention of escape, and any other event deemed to be reportable by the department.

Reporting – Operations

- Submit quarterly biophysical data to both the Aquaculture Development and the Aquatic Animal Health Divisions FFA.
- Report sea lice abundance numbers to the department on a monthly basis and post sea lice abundance numbers publicly on a monthly basis on the industry association or corporate website.
- Complete an annual report as per the Federal Aquaculture Activities Regulations (AAR) Section 16.
- Complete and return annual statistics to the Aquaculture Licensing Administrator before the licence will be considered for renewal.

For detailed information on aquaculture licence reporting requirements, please refer to section 4.3p Regulatory, Incident Management and Public Reporting.

Management Plans

- Provide proof of an Incident Management System that is effective and includes processes for internal reporting and analysis of hazards, incident events and for taking corrective actions to prevent their reoccurrence. The system must be reviewed and approved by applicable agencies.

- All required plans are to be submitted and approved by the department including Environmental and Waste Management Plan; Integrated Pest Management Plan; Biosecurity Plan; and Fish Health Management Plan.
- Implement mitigation measures to prevent mortality events approved by FFA and include and include a minimum of 20 m net depth, aeration devices, and optimal farmed fish stocking density.

Other Users

- May allow access to their sites to licensed commercial lobster fishers with the exception of when a site is quarantined.

Fish Health, Biosecurity and Waste Management

- All fish transferred from hatcheries to aquaculture sites/facilities are to be vaccinated against known fish pathogens.
- All feed bags are to be secured to prevent loss at sea immediately after being emptied of feed as per departmental policy on feed bag handling.
- All transfers of fish into Newfoundland and Labrador via well boat, vessel, or vehicle adhere to biosecurity policies contained within the FFA Aquaculture Policy and Procedures Manual.
- All transfers of equipment into the Province of Newfoundland and Labrador adhere to biosecurity policies contained within the FFA Aquaculture Policy and Procedures Manual.

Equipment Maintenance

- Regular cleaning of aquaculture nets to promote improved aquatic animal health.
- Nets are cleaned in-situ during the production cycle and are removed from the site and disinfected after each cycle.
- Nets are numbered and their maintenance tracked for government inspection.
- Complete and maintain records for below-surface fish culture system inspections every 30 days.
- Mark finfish aquaculture pens and bird stands with appropriate coding according to requirements.

Escape Management

- Publicly report suspected escapes within 24 hours of the detection on corporate or

industry association websites.

- Report all escape events, quarantine or depopulation orders or directives, issued by the Government of Newfoundland and Labrador, to the public within 24 hours of escape confirmation or the quarantine or depopulation orders or directive being given.
- Maintain record of escape events.
- Provide to FFA, an Emergency Recapture Licence issued by Fisheries and Oceans Canada, prior to the recapture of cultured fish.

Crown Lands Lease

The use of the marine environment for salmon farming is conveyed through a Crown Lands Lease. FFA administers all uses of Crown Lands in accordance with the *Lands Act.* *SNL1991 CHAPTER 36 - LANDS ACT (assembly.nl.ca)*.This includes the seabed for a saltwater salmon farm. The Crown retains ownership with the lessee having limited rights to use the area for a specific duration (50 years). In the case of saltwater salmon farming, an aquaculture licence and a Crown Lands Lease are required. Schedule C of the Crown Lands Lease provides the restrictions and conditions of use. MCE farming practices conforms to all conditions on the licence, the lease and the Transport Canada approval.

Water Use Licence

Department of Environment and Climate Change (ECC), Water Resources Management Division, administers the granting of a Water Use Licence which provides non-exclusive right to use the water in the Crown Lands lease to install and operate an aquaculture facility.

The restrictions are provided in Schedule A of the licence and include the following.

- Designated use for Commercial (Marine Aquaculture) only.
- Licence holder shall not impair, pollute, or cause to be polluted the quality of the water.
- All site gear is to be secured to prevent dislodgement due to wave action.
- Ownership of all water rights remains with the Crown.

Navigational Protection Act Approval

Transport Canada (TC) reviews the proposed farm layout and infrastructure to ensure no navigational hazards are created during the construction of the farm or during the operational activities. An approval of the proposed lease layout and infrastructure design, issued by TC in accordance with *Navigational Protection Act* (NPA) subsection s.6(1), must be received prior to the construction being initiated.

General restrictions and conditions are as follows. Farm specific conditions are included in the approval letter.

- No person shall permit any tools, equipment, vehicles, temporary structures, or parts thereof used or maintained for the purpose of building or placing a work in navigable water to remain in such water after the completion of the project.
- Where a work or portion of a work that is being constructed or maintained in a navigable water causes debris or other material to accumulate on the bed or on the surface of such water, the owner of that work or portion of that work shall cause the debris to be removed to the satisfaction of the Minister.

4.2 Hatchery Expansion Construction

Guidelines: State the time period for proposed construction (if staged, list each stage and its approximate duration) and anticipated final construction. The details, materials, methods, schedule, and location of all planned construction activities must be presented.

This section provides information on construction of the proposed components of the Hatchery Expansion, construction of saltwater farms, waste management during construction, and specific construction requirements for decommissioning the site if required.

The following related information can be found in other sections of this report.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery
- Section 4.1b Geographic Location and Physical Components, Transporting Smolt to Saltwater Farms
- Section 4.1c Geographic Location and Physical Components, Saltwater Farms
- 4.3a Indian Head Hatchery Expansion Construction

4.2a Project Status and Remaining Work

Guidelines:4.2a) expansion work completed to date as a result of the initial release decision for EA 1975 – Indian Head Hatchery Expansion Project and the remaining work required to complete the hatchery components.

Due to the EPR process where the project was released and the subsequent court's reversal of the 2018 release decision, some components of the Hatchery Expansion are fully constructed, and some are not complete. This section provides information on the components completed to date and the remaining work to complete the project.

Please refer to Section 4.1a Geographical Location and Physical Components Indian Head Hatchery.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture (FFA), Aquaculture Policies and Procedures Manual 2019, provide directions used to develop Mowi's aquaculture sites. All policies and procedures are strictly adhered to. Specific references are also provided for the development of saltwater farms in this section.

Table 15 Aquaculture Policies That Pertain to Section 4.2a

AP #	AP Title	Description
AP 8	Site Utilization	Licensees are required to notify the department of modifications to a business or production plan for a licensed aquaculture. Modifications to plans will be reviewed and approved by FFA on a case-by-case basis.
AP 9	Onshore Developments in Vicinity to Aquaculture Sites	For municipal sewage outfall developments located at a distance of less than 500 meters from the existing aquaculture operation will not be recommended
AP 14	Moorings	All site moorings are to be installed in accordance with the NPA formal approval document and subject to any other applicable legislation or policy.

The Hatchery Expansion components are provided in Table 16 with a description of the components as provided in ER 1975. The section that follows has the design changes.

Table 16 Hatchery Expansion Components and Description

Hatchery Expansion Components	Description
Expansion Site Preparation	Removal of overburden and drainage system installation for Modular RAS Building
Modular RAS Production System	New building, RAS Modules 1-4
Upgrades to Existing Production Systems	New building with centralized vaccination and grading equipment New egg incubation system
Fish Culture Freshwater Supply	Three wells and lines to Water Treatment Building
Fish Culture Saltwater Supply	Two or three wells and influent lines to Water Treatment Building
Influent Water Treatment Building (Fish Culture)	New building with UV disinfection and reservoirs for salt and fresh water Supply lines to hatchery fish production buildings
Fish Culture Water Monitoring (see below)	Real-time monitoring of water level and flowrate/discharge for each freshwater well Continuous monitoring of aquifer water levels Annual reporting
Fish Culture Effluent Treatment System	New waste management building with solids removal for composting, UV disinfection, additional screening, discharge lines to ocean outfall
Hatchery Expansion Components	**Description**
Fish Transfer System	Sub-surface fish transfer line conveys fish between existing hatchery and between Modular RAS building and above ground line transfers fish from Modular RAS building to the transport boat at the dock
Related Municipal Infrastructure	Potable water supply and fire-fighting support Hatchery access and paved parking Septic system
Electrical Services	Connection to existing power distribution system Diesel generator emergency power backup

Design Changes

The extended environmental assessment process and normal business practice of incorporating the current and most appropriate solutions have created alterations in the original Hatchery Expansion design for the following reasons.

- To not compromise work completed prior to the court's reversal of the release decision.
- To avoid additional expense and unnecessary delay.
- To improve on the original design.

- To continue the safe operations of the existing hatchery facilities during construction in order to culture the currently licensed 4.5 million smolt.

The adjustments do not affect the purpose, nor the planned outcome of the Hatchery Expansion.

Electrical Services: Back-up Emergency Power

Planned: A single diesel generator to supply the emergency backup power for the site. Both the generator and fuel storage tanks to be located inside the property fence to the west of the entrance to the expansion site.

Modification: Diesel back-up generators are installed in individual buildings providing greater flexibility and ensuring the power is provided only to areas requiring it. The new design also provides 100-200% backup power for each building for up to 72 hours, see Table 17.

Table 17 Back-up Power Supply by Building

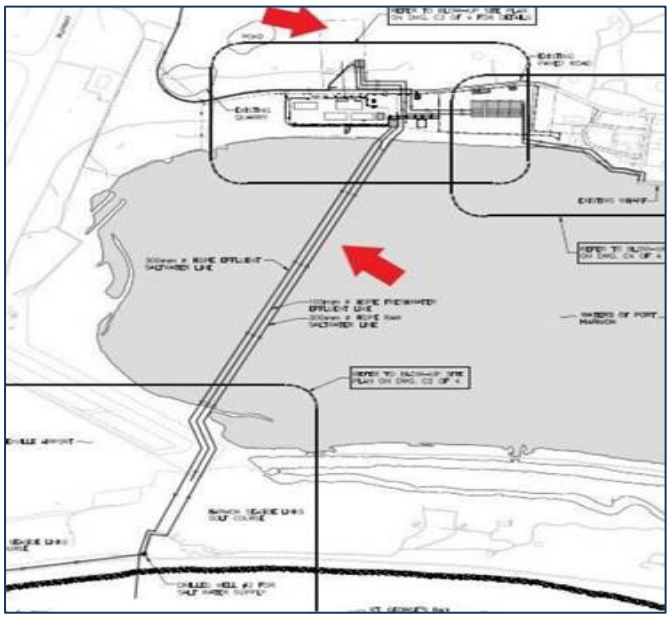
Building	Number of Back-up Generators
Modular RAS Building & Effluent Treatment Building	2
Incubation and Fry Building	2
Smolt Buildings 1-3	3 (1 for each building)
Water Treatment Building	1

Fish Culture Saltwater Supply: Influent Line

Planned: The saltwater influent lines to be installed across the Port of Stephenville fixed to the bottom under the water with weights or cement collars, see Figure 30.

Modification: The saltwater influent line was installed in the same trench as the effluent line that runs around the harbour, well back from the shoreline to avoid sensitive aquatic areas. The pipes are buried in a trench 1.8 m below the surface. The change was approved by the Department of Environment and Climate Change (ECC), and construction has been completed. Figure 30 shows the planned route of the saltwater influent line on the left and the modified route on the right.

Figure 30 Planned and Modified Saltwater Influent Line and Effluent Lines



Fish Culture Effluent Treatment System - Discharge Lines and Outfall

Planned: Effluent discharge to include two 400 mm HDPE lines to transport salt and freshwater effluent separately from the treatment plant across the Port of Stephenville and underground across the golf course to a deep-water outfall at 20 m depth below low tide, approximately 800 m from the shoreline in Bay St. George.

Modification 1: A single 500 mm HDPE line will carry mixed fresh and saltwater effluent as it is discharged from the Modular RAS Building culture tanks. Early-stage plan for using the freshwater effluent for golf course irrigation have not materialized and there is no longer a requirement to keep the two effluent streams separate. This modification allows the effluent line to be installed in the same trench as the saltwater influent line, 1.8 m below the surface, around the Port of Stephenville, away from the harbour and wet areas. The route is provided in Figure 30.

Modification 2: Due to the sharp increase in depth from the shoreline into Bay St. George, a shorter, 100 m, effluent pipe was installed for the deep-water outfall. Permit No: ALT9930-2018 Amendment No: 1.

Construction Status

In 2018, the Indian Head Hatchery Expansion was registered as ER 1975. The project was released from further environmental review the same year and construction initiated.

An Environment Preview Report was required in 2021, and Modules 3 and 4 of the Modular RAS Building were not permitted to be constructed until the Hatchery Expansion was released from further environmental assessment.

Modules 3 and 4 of the Modular RAS Building are not complete nor are the saltwater system and the Smolt Transfer System. Please refer to Table 18 for all components of the Hatchery Expansion with description and status of completion.

Table 18 Hatchery Expansion Components and Status of Completion

Hatchery Expansion Components	Description as Provided in ER 1975	Status as of July 2023
Expansion Site Preparation	Removal of overburden and drainage system installation for Modular RAS Building	complete
Modular RAS Production System	New building, RAS Modules 1-4	partially complete
Upgrades to Existing Production Systems	New building with centralized vaccination and grading equipment New egg incubation system	complete
Fish Culture Freshwater Supply	Three wells and lines to Water Treatment Building	complete
Fish Culture Saltwater Supply	Two of three wells and influent lines to Water Treatment Building	partially complete
Fish Culture Influent Water Treatment Building	New building with UV disinfection and reservoirs for salt and fresh water Supply lines to hatchery fish production buildings	complete
Fish Culture Water Monitoring	Real-time monitoring of water level and flowrate/discharge for each freshwater well Continuous monitoring of aquifer water levels Annual reporting	complete
Fish Culture Effluent Treatment System	New waste management building with solids removal for composting, UV disinfection, additional screening, discharge lines to ocean outfall	complete
Fish Transfer System	Sub-surface fish transfer lines to convey fish from Modular RAS building to Port of Stephenville dock	partially complete
Related Municipal Infrastructure	Potable water supply and fire-fighting support Hatchery access and paved parking Septic system	complete
Electrical Services	Connection to existing power distribution system Diesel generator emergency power backup	complete

Schedule for Construction Completion

Components that are designated as partially complete in Table 18 are scheduled for future completion and Table 19 provides the estimated date to complete.

The estimated completion is based on the Hatchery Expansion being released from further environmental review by September 30, 2023. In addition to the uncertainty of the ER release date, the completion date may vary as normal company business processes are required to pre-approve expenditures. Construction progress is affected by environmental conditions on site and must also take into consideration the salmon culture activities at the hatchery.

Table 19 Hatchery Expansion Infrastructure to be Completed and Estimated Completion Date

Infrastructure	Construction and Other Work to be Completed	Estimated Completion
Modular RAS Post Smolt	Construction of fish culture Modules 3 & 4 adjacent to Modules 1 & 2 System commissioning	December 2024
Saltwater Supply	Installation of additional barrier well Installation of pump house power near wells 1 & 2 on Seaside Links Golf Course Well flushing, water quality testing System commissioning	December 2023
Smolt Transfer System	Installation of transport line from MCE property to Port of Stephenville dock System commissioning	December 2023

Location of Construction Activities

All remaining hatchery construction activities will take place on land owned or leased by Mowi Canada East Inc. (MCE) in the Port of Stephenville Industrial Park. For more information on ownership and land use, please refer to section 4.1f Ownership and Zoning.

Methods and Materials for Construction

The following activities and resources are required to complete the Hatchery Expansion.

Modular RAS Building - Modules 3 and 4

The area for the Modular RAS Building footprint, including Modules 3 and 4, has already been prepared with surface materials removed and sub-surface drainage installed. Construction is complete for Modules 1 and 2, fire hydrants are in place for the full building, and power has been supplied to the building.

The design and construction drawings for Modules 3 and 4 were completed during the design phase of the project. The methods of construction and materials will be the same as for Modules 1 and 2. The components and materials are provided in 4.1a Physical Components Indian Head Hatchery Modular RAS (post-smolt) Building.

General construction activities are provided below, please note some activities will be undertaken concurrently.

1. Advise Department of Fisheries, Forestry and Agriculture (FFA), Department of

Environmental and Climate Change (ECC), Town of Stephenville, Service NL, and Occupational Health and Safety (OH&S) of construction schedule and provide additional information as requested and determine reporting requirements during or after construction.

2. Advise local stakeholders and discuss any concerns.
3. Order equipment not currently onsite, especially long lead items such as the building infrastructure and RAS drum filters.
4. Contract construction work with preference for local service providers.
5. Excavate footprint for Modules 3 and 4.
6. Install concrete foundation.
7. Install below floor plumbing.
8. Pour concrete for Moving Bed Bioreactor (MBBR) sump and the sub surface reservoir.
9. Construct exterior building shell and building accesses.
10. Coat exposed interior concrete surfaces with polyurethane.
11. Install large equipment for fish culture systems and RAS.
12. Complete building interior construction including fire protection system.
13. Install electrical system and interior power.
14. Complete installation of water pumps, fish culture system, and RAS equipment.
15. Complete effluent lines to Effluent Treatment Building 2
16. Occupancy/fire permit inspection.
17. Commission water and effluent lines, fish culture systems, and RAS.
18. Complete construction reports and advise regulatory agencies.

Saltwater Supply

The original design included 2 saltwater production wells, 2 barrier wells, for the purpose of drawing freshwater from the area to keep the salinity high in the production wells, and a transport line to the Water Treatment Building. However, once the wells were constructed, the salinity was not adequate, and a third barrier well was indicated to potentially rectify the situation. The third well has not been installed and a section of the water line from the hatchery to the Water Treatment Building are not constructed.

The third barrier well will be located in the same area as the existing saltwater wells. All of the required equipment to complete the system is onsite at the hatchery and all permits are in place.

Construction of the third barrier well, installation of the power supply to the pump house, and

installation of the water line to the Water Treatment Building will require the following.

1. Advise FFA, ECC, and Town of Stephenville of construction schedule and determine reporting requirements during or after construction.
2. Advise local stakeholders and discuss any concerns.
3. Contract well installation company and hydro-engineer.
4. Contract excavation company for saltwater line trench.
5. Arrange with NL Power for power to pump house.
6. Install line from the hatchery to the Water Treatment Building
7. Construct the barrier well and test the salinity in production wells.
8. Commission saltwater pumps and flush the saltwater supply lines to remove debris.
9. Commission saltwater reservoir within Water Treatment Building
10. Provide reports as required.

4.2b Fish Transport Construction

Guidelines: The details, materials, methods, schedule, and location of all planned construction activities must be presented and shall include, but not be limited to, the following:

- *4.2b) any work required to permit the transport and transfer of hatchery fish to sea cages, including pipelines, right of way, access roads, wharves, slipways, or other physical structures.*

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture (FFA), Aquaculture Policies and Procedures Manual 2019, provide requirements for transporting fish in the provinces and were used as guiding principles when designing a Fish Transport System as part of the Hatchery Expansion. Specific references have also been included with the information where applicable.

Table 20 Aquaculture Policies That Pertain to Section 4.2b

AP #	AP Title	Description
AP 12	Transfer and Transport Permits	Prior to the issuance of transfer and transport permits, aquatic animal health information must be sent to the aquatic animal health division for a disease risk evaluation. Aquatic animal health information required can be obtained from the chief veterinarian
AP 23	Fish Disposal	Fish Disposal Plans must be submitted by the Licensee and approved by FFA, at the time of licensing, and on an annual basis.
AP 36	Aquaculture Motor Vehicle, Vessel, Boat, and Barge Biosecurity	Aquaculture vessels, boats and barges must not travel within 5 km of a marine site unless it is the destination site. Variance to this will be accepted when the vessel cannot safely stay outside of 5 km.
AP 39	Blood Water and Offal	Blood water transported off site with the harvest must be transported and disposed of in a bio-secure manner and is subject to an audit by the Aquatic Animal Health Division.
AP 42	Animal Welfare	A licensee must ensure optimal animal welfare during transport, sampling, fish handling, depopulation, and normal operations.

The transport of hatchery fish from the hatchery to the saltwater farms includes the conveying of salmon smolt from the hatchery to the transport vessel at the Port of Stephenville dock, and the marine shipping to the saltwater farms.

Transport by vessel to saltwater farms follows established procedures, uses vessels contracted specifically for this purpose and the Port of Stephenville dock by contract. No construction or other work is required to continue these activities for the existing smolt production nor the additional 2.2 million smolt proposed in the Hatchery Expansion.

The Hatchery Expansion includes construction of a Fish Transfer System to move fish from the hatchery to the transport vessel. The system is partially constructed, and this section provides information on completing construction.

Fish Transfer System

The Fish Transfer System is designed to be a permanent structure to convey salmon smolt efficiently and safely from the Modular RAS Building to the transport vessel at the Port of Stephenville.

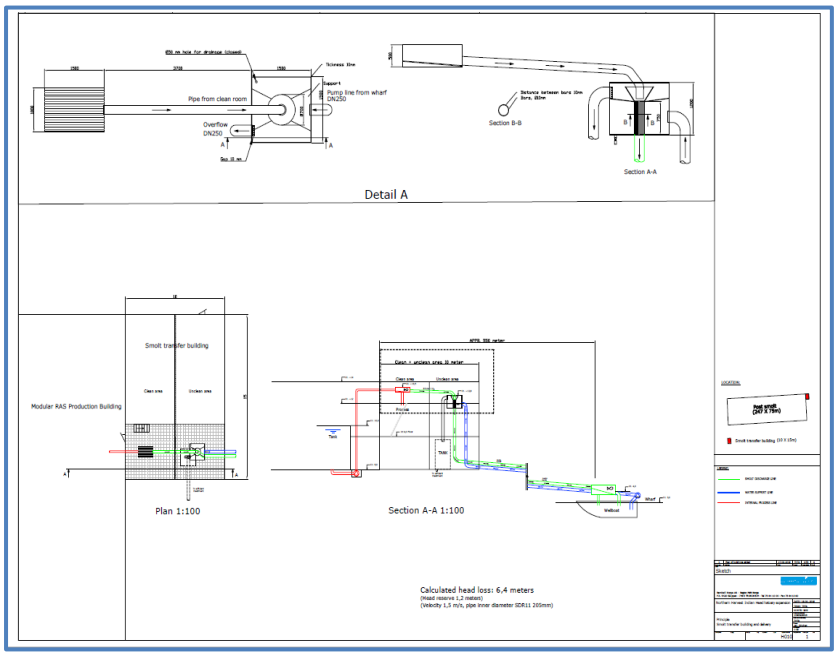
The system infrastructure is partially complete with the loading station at the Modular RAS building constructed, the fish transfer line from the loading station to the boundary of the MCE

property installed, and the line supports partially constructed along the remainder of the route.

The transfer line from the MCE property to the Port of Stephenville dock and the line that returns the fish transport water back to the hatchery are not constructed. The permits have been issued and all materials are onsite including 250 mm piping for the transfer line.

In Figure 31, the drawings on top and the left are components of the fish transfer station which are complete. The drawing on the lower right shows the elevation of the line from the hatchery to the vessel that allows for gravity to assist the fish movement. The transport line and the water return line are not constructed.

Figure 31 Smolt Transfer System



Construction of the Fish Transfer System components was not restricted in the Minister's letter of July 15, 2021. This work will be scheduled during the summer to take advantage of the seasonal weather and will require the following activities.

1. Land purchase agreement with the Town of Stephenville to be completed by 2023.
2. Advise ECC and Town of Stephenville of construction and schedule, provide additional information as required and determine reporting requirements.
3. Advise local stakeholders and discuss any concerns.
4. Check status of transfer line support posts installed previously and repair or replace as needed.

5. Install remaining supports and horizontal grid for fish discharge line.
6. Install discharge line on supporting infrastructure and complete inspection of the pipe as required.
7. Install fish transfer water return line on supporting infrastructure and complete inspection of pipe as required.
8. Flush both lines and commission the system.

4.2c Saltwater Farm Construction

Guidelines: The details, materials, methods, schedule, and location of all planned construction activities must be presented and shall include, but not be limited to, the following:

- *4.2c) any work required for construction, installation or modification of new or existing sea cages;*

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture (FFA), Aquaculture Policies and Procedures Manual 2019, provide direction and management of how salmonid saltwater farms are developed and operated in the province. These policies ensure the farm design, layout and infrastructure in all MCE farms meets or exceeds the provincial standards to safeguard the environment.

Table 21 Aquaculture Policies That Pertain to Section 4.2c

AP #	AP Title	Description
AP 2	Application Requirements	Demonstration of ISO or Certified third-party engineering standards for sea cage system cage components and installation for new Atlantic salmon operations as of January 1, 2020
AP 8	Site Utilization	All licensed aquaculture sites should be developed in accordance with approved business and production plans on file with the department. Production plan updates must be submitted to FFA on an annual basis outlining stocking plans and contingency plans.
AP 13	Lobster Fisheries and Aquaculture Facilities	The Minister may make adherence to this policy a condition of licence. A condition of licence will be added where there has been a traditional lobster fishery, as determined by FFA and Fisheries and Oceans Canada (DFO), where the aquaculture gear proposed will not be affected, and an access agreement is established with the Licensee.
AP 14	Moorings	All site moorings are to be contained within the area approved by Transport Canada (TC) *Navigation Protection Act* (NPA) formal approval document.
AP 26	Site Separation	New finfish sites growing Atlantic salmon must operate under the BMA principles.

This section provides information on the development of saltwater farms for first stocking of smolt and includes construction and equipment standards and construction methods.

Please refer to the following sections for additional information that pertains to this topic.

- Section 4.1c Geographical Location and Physical Components, Saltwater Farms
- Section 4.3a Salmon Rearing Operations
- Section 4.3m Fish Containment Saltwater Farms

Construction Standards

Code of Containment of Salmonids in Newfoundland and Labrador

The Code of Containment of Salmonids in Newfoundland and Labrador (The Code) is a management strategy for effective containment of farmed salmon and includes standards and protocols for farm site layout and infrastructure design.

The Code is managed by FFA and the Department of Fisheries and Oceans Canada (DFO). Both regulators are responsible for ensuring robust requirements to minimize farmed fish escapes. These requirements are incorporated into the infrastructure design and operations

and approved management plans are in place to effectively deal with escapes should they occur.

The following principles provide direction for design of saltwater farms, modification of the equipment, and record keeping.

- Licensees will ensure all farm equipment is in good working order and will take all precautionary steps to ensure cultured aquatic organisms remain contained and fish culture system integrity secured. FFA will conduct regular inspections and audits to ensure compliance with approved Management Plans and Standard Operating Procedures on file with FFA.
- Sites will be appropriately designed for specific site conditions.
- Licensees will maintain accurate Inventory Records of cultured aquatic organisms and reports related to net testing, net cleaning, and inspections. These records shall be made available for FFA auditing.

In addition, The Code recognizes salmon culture system design and installation relies on various levels of expertise and globally recognized standards and requires ISO certified or third-party certified engineer stamp of approval of farm design and installation according to the engineered site layout.

Please refer to section 4.3m Fish Containment Saltwater Farms for a full description of The Code, the responsibilities of all parties, and the MCE management procedures that meet the standards.

Third Party Engineer Standard

MCE follows The Code and AP 2 that requires all salmon farms be designed to a third-party engineering standard and have installation according to the engineered site layout. This certifies the infrastructure can withstand all potential environmental conditions and stay intact with all cultured salmon held within the culture pen. Since 2019, all new MCE farms in the province have been designed and constructed to this standard.

AP 2 covers all main design and infrastructure components – fish culture systems including moorings, floating collars that support fish culture nets, fish culture nets, barges, and auxiliary equipment. It incorporates site physical and environmental information, risk analysis, operations, and production requirements into a site-specific technology design and installation and operational protocols.

All MCE farms are constructed according to the regulatory requirements. In addition, the MCE fish culture systems are designed and constructed so all components work together to avoid friction and movement conflict in order to protect staff and protect the equipment to reduce

equipment failure that may lead to escapes. Examples include the following.

- Collars that hold fish culture nets made of flexible plastic and strong steel for maximum escape prevention.
- Extra strength HDPE culture nets, 18 mm mesh to contain 60+ g smolt which is the smallest size salmon are transported to the saltwater farms.
- Specially designed culture nets where lowering ropes do not come into contact with the net, eliminating a source of friction and potential damage.
- Improved customized fish net design and net tensioning system where all components complement one another for optimal interaction creating greater longevity and reducing risk of equipment damage.
- New innovations include power winches designed and are potentially planned for the future with controllable synchronized gradual lifting of the full circumference of the pen. This will reduce risks to equipment, fish, and farm workers and remove the requirement for service boats with hydraulic cranes.

Construction for First Stocking

Construction Schedule

Of the thirty-nine farms available for production, twenty-nine farms are currently in production and have been constructed, see Table 22. Of the remaining ten farms, seven have a scheduled construction and first stocking date, and three farms will be constructed at a future date to be determined.

In Bays East area, Belle Island and Red Cove are not constructed. The remaining eight farms to be constructed are in the Bays West area. Generally, farm construction is scheduled for the year preceding the first stocking.

Table 22 Status of Construction of Saltwater Farms for Hatchery Expansion Smolt

	BMA Name	BMA #	Site Name	AQ Licence #	Construction Status
1	Mal Bay	1	The Hobby	1086	Constructed
2		1	Foshie’s Cove	1085	Constructed
3		1	Benny's Cove	1084	Constructed
4	Rencontre East	2	Deep Water Point	1080	Constructed
5		2	Rencontre Island	1081	Constructed
6		2	Old Woman's Cove	1082	Constructed
7		2	Little Burdock Cove	1083	Constructed
8	Fortune Bay West	3	Spyglass Cove	881	Constructed
9		3	Cinq Island Cove	883	Constructed
10		3	Tilt Point	976	Constructed
11		3	Spoon Cove	882	Constructed
12		3	Steamer Head	1050	Constructed
13		3	Hickman's Point	1002	Constructed
14		3	South East Bight	1046	Constructed
15		3	McGrath's Cove South	885	Constructed
16		3	McGrath's Cove North	886	Constructed
17		3	Belle Island	888	Construction 2023
18		3	Ironskull Point	865	Constructed
19	Great Bay de l'Eau	4	Dog Cove	1049	Constructed
20		4	Salmonier Cove	1048	Constructed
21		4	Red Cove	1065	TBD*
22		4	Murphy Point	1088	Constructed
23	Harbour Breton Bay	5	Broad Cove	1045	Constructed
24		5	Harvey Hill North	993	Constructed

	BMA Name	BMA #	Site Name	AQ Licence #	Construction Status
25		5	Harvey Hill East	991	Constructed
26		5	Harvey Hill South	1121	Constructed
27	Facheux Bay	10	Wallace Cove	1123	Constructed
28		10	Dennis Arm	1131	Construction 2024
29		10	Indian Tea Point	1126	Construction 2024
30		10	Wild Cove	1127	Construction 2024
31	Hare Bay	11	Mare Cove South	1125	TBD*
32		11	North Bob Locke Cove	1124	TBD*
33	Rencontre West	12	Devil Bay	1133	Construction 2026
34		12	Little Bay	1134	constructed
35		12	Rencontre Bay	1136	Construction 2026
36		12	The Gorge	1135	Constructed
37	Chaleur Bay	13	Chaleur Bay	1147	Constructed
38		13	Friar Cove	1148	Constructed
39		13	Shooter Point	1149	Construction 2026

*Farms not scheduled for construction in the current development plan.

Table 23 provides the farm construction schedule by year for 2023-2026. For the locations of the farms on a map, please refer to section 4.1c Saltwater Farms.

Table 23 Construction Schedule by Year

Construction Year	BMA Name	BMA #	Site Name	AQ Licence #
2023	Fortune Bay West	3	Belle Island	888
2023	Rencontre West	12	The Gorge	1135
2023	Rencontre West	12	Little Bay	1134
2024	Facheux Bay	10	Dennis Arm	1131
2024	Facheux Bay	10	Indian Tea Point	1126
2024	Facheux Bay	10	Wild Cove	1127
2026	Rencontre West	12	Devil Bay	1133
2026	Rencontre West	12	Rencontre Bay	1136
2026	Chaleur Bay	13	Shooter Point	1149

Methods and Materials

For all MCE saltwater farms there are no terrestrial facilities. All construction is for marine infrastructure only and all activities are conducted on the water.

Each site has a unique layout and infrastructure that is designed and constructed to take advantage of the specific site characteristics. The fish culture systems dimensions, number of pens, and configuration can change according to the site properties. Table 24 and Table 25 provide examples of equipment installed, general period when the construction will be undertaken, construction work involved, resources required, and construction duration.

Table 24 Saltwater Farm Construction for First Stocking – Example Equipment and Construction Schedule

Example Equipment to be Installed	Number	Equipment Dimensions	Construction Period
140m HDPE fish culture nets and collar/pens	10	140 m - circumference	Spring prior to stocking
Floating feed and accommodation barge	1	15 m x 30 m concrete or steel barge	Spring prior to stocking
fish culture nets and pen collar mooring system and barge mooring system	1	10 cells, 90 m square, arranged in a 2 x 5 configuration. Anchor lines with a 3:1 scope	Spring prior to stocking

Table 25 Saltwater Farm Construction for First Stocking – Example Work, Resources, Duration of Work and Construction Period

Example Construction Work	Resources	Duration	Construction Period
Install anchors and mooring for 10 x 140m collars/pens, feed barge and accommodations	Large marine service vessel	45-60 days	Spring prior to stocking
Construct 10 x 140m collars/pens in Harbour Breton	Two tractors and large skidder	2.5 months	Fall – Spring prior to stocking
Tow to site and install collars/pens at marine farm	Tug and large marine service vessel	14 days	Spring prior to stocking
Tow to and install feed barge/accommodations at marine farm	Tug and large marine service vessel	7 days	Spring prior to stocking
Install fish culture nets and setup of 10 x 140m pens for stocking	Large marine service vessel and site work vessel	40 days	Spring prior to stocking

4.2d Waste Management During Construction

Guidelines: management of solid and liquid waste during construction.

MCE has comprehensive and approved waste management plans that pertain to construction activities. Effective waste management is important to reduce the potential for negative environmental interactions.

Unless otherwise indicated, the principles and operating practices in this section apply to the construction in all Mowi Canada East Inc. (MCE) farms the Province of Newfoundland and Labrador.

For additional information please refer to Section 4.3i Waste Management Normal Operations.

Material Storage, Handling and Waste Disposal Plan

MCE has a comprehensive Material Storage, Handling and Waste Disposal Plan (MSHWD) that dictates how waste is managed at both freshwater and saltwater facilities.

The MSHWD is a component of the Environmental Management and Waste Management Plan that is reviewed annually, revised as required, and provided to Department of Fisheries, Forestry and Agriculture (FFA) for review to ensure compliance with the Applicant Guidance Document - Environmental and Waste Management Guidelines, and all regulations and government policies.

The MSHWD outlines the policies and standard operating practices (SOPs) that ensures all waste materials are handled in a responsible manner to minimize volume of waste produced, recycle where possible, dispose of when necessary, and at all times reduce potential for situations that may harm the environment. This includes construction activities and applies to all contractors and others working at MCE sites.

The following principles apply to all waste management activities.

1. **Reduction** of the volume and non-recyclable wastes through efforts such as identifying and reducing single use plastics containers.

2. **Recycling** and re-purposing of waste materials over landfill whenever possible.

3. **Regular monitoring** of the environment and mitigation and/or clean-up undertaken as required.

MCE is committed to environmental stewardship as shown by Best Aquaculture Practices certifications. BAP certification ensures waste is managed in a way that reduces environmental impact.

Hatchery Expansion

The majority of the construction for the Hatchery Expansion has been completed and all construction wastes managed as per company management plans, provincial policies, regulations, and requirements.

Remaining construction includes the Modular RAS (post-smolt) Building Modules 3 and 4, the fish transfer system, and saltwater supply system. The same waste management processes used for the work completed will be used for the future work.

In addition to the MSHWD, direction was provided from the Department of Environment and Climate Change, Pollution Prevention Division upon the initial release of the Hatchery Expansion and the following conditions will also apply to the remaining construction.

- Any effluent or runoff leaving the site will be required to conform to the requirements of the Environmental Control Water and Sewage Regulations.
- The Pollution Prevention Division is contacted where analytical parameters are shown to exceed applicable provincial criteria for petroleum hydrocarbons and metals.
- With respect to soil, upon determination of soil impacts at any location on site, the Pollution Prevention Division or Service NL is notified, and action taken by the person responsible to ensure that such impacts are assessed and delineated, followed by properly addressing the nature of contamination through remediation or risk assessment.

The best practicable technology and methods are used to minimize waste and reduce potential for effects of construction on the environment. The following methods were used developed for the Hatchery Expansion construction and will continue until the project is complete.

General

- Minimizing construction waste destined for landfill disposal is a priority.
- No heavy equipment will be permitted to operate in any streams or brook crossings.
- Inlets and outlets of all culverts receive erosion control, such as rip-rap protection or concrete head walls.
- Hydro poles installed on the site meet all environmental regulations in relation to wood preservatives, location in wet areas, etc.
- Silt fences erected along the downward slope of the construction area to prevent silt infiltration to local brooks, streams or into Port Harmon.
- The area cleared for proposed expansion site controlled to minimize the footprint and

care exercised to ensure that activities near any wetlands or bog areas are kept to a minimum.

- Chemicals used during construction are minimized and contained.
- Excess and scrap building materials (e.g., steel, concrete, wood, adhesives, solvents, etc.) collected in a designated area on site and disposed of as per regulations.
- Excavated material (e.g., soil, rocks, pipelines, etc.) removed from the site and disposed of as per regulations through a waste management agency listed below.
- Appropriate washroom facilities provided for construction personnel. All sanitary waste generated during construction removed from the site and managed at an off-site location by a licensed operator of temporary sanitary systems.
- Storage and handling of construction chemicals on site minimized.
- Disposal of chemicals in designated containers and removed from site using approved procedures.

Non-hazardous Waste Management

- The site is kept tidy at all times by establishing staging areas to collate and sort waste.
- Construction waste and sewage collected for disposal.
- Recyclable waste is separated from other waste materials, trash, and debris.
- Waste collected and stored in containers that are off ground and covered.
- Waste is removed regularly to an approved landfill or recycling facility.
- Salvaged waste removed from the site.

Hazardous Waste Management

- Preferential use of chemicals with low levels of Hazardous Air Pollutants.
- An inventory of controlled products, including hazardous waste, maintained on site and updated as needed.
- Non-hazardous products used in place of hazardous products, wherever possible.
- WHMIS requirements followed, i.e., properly containerized, marked, etc.
- Each person on the project was trained to recognize hazardous waste and to respond appropriately.
- Hazardous waste treated and disposed of at a facility permitted or licensed for this purpose. Transportation of hazardous waste per law, regulation and/or standard.
- Spill cleanup kits are maintained on site at the storage location for easy and quick access should a leak or spill occur.

- Groundwater dewatering activities follow provincial construction industry practices.
- Appropriate washroom facilities provided for construction personnel.
- All sanitary waste generated during construction removed from the site and managed at an off-site location by a licensed operator of temporary sanitary systems.
- Travel routes adequately maintained to control dust emissions through the use of gravel and water applications.
- Piles of aggregate covered or watered to reduce dust emissions.
- Storage and handling of chemicals minimized.
- Preferential use of chemicals with low levels of Hazardous Air Pollutants (HAPs) and volatile organic compounds.
- Disposal of chemicals in designated containers and removed from site using approved procedures.

Sediment and Erosion Waste

Consideration will also be given to management of sediment erosion management of naturally occurring water on the construction site to reduce the sediment accumulation and water runoff.

- All soil removed during excavation remains on site to be re-purposed for fill.
- Alterations to existing drainage patterns avoided, if possible.
- Perimeter controls and sediment barriers built, as needed.
- Phased construction activity, controlling duration of exposed surfaces.
- Land disturbance should be kept to a minimum as a method to implement sediment control.
- Ditches are constructed to intercept surface water that would enter the site as well as constructed from low to high elevations to avoid water ponding.
- Ditches constructed have short, shallow, protected slopes to avoid erosion, if possible.
- Culverts were installed to prevent ponding, as necessary.
- Storm drain inlets protected with technology, e.g., check dams and catch basins where applicable.
- Methods to limit soil exposure used and include covering excess soil to reduce contact, removing excess soil, as necessary, as well as maintaining surrounding vegetation and other shelters to divert excess water or protect from wind.
- Retention of sediment on-site with sediment control measures (barriers, silt fence, etc.) and control dewatering practices.
- Regular inspection and repair of sediment/erosion control techniques.
- Groundwater dewatering to follow accepted provincial construction industry practices

defined for transportation and building systems developments.

Liquid Waste

- Fuel, lubricants, and chemicals stored and disposed of in a safe and responsible manner and oil may be used in MCE waste-oil furnaces.
- Storage and transport of containers of gases or other chemicals will be approved and regulated standards. This includes the quantity of containers that can be transported, and personnel qualified to drive transport vehicles.
- Machinery for construction and transportation (e.g., earth-moving equipment, trucks, personal vehicles) used in specific areas only to limit areas affected by potential spills.
- Waste generated from equipment removed by the construction contractor or stored at a central place on site for recycling and disposal.
- Chemicals used during construction (e.g., cleaners, adhesives, thinners, paint, lubricants, etc.) are contained at all times.
- Run-on to the site from the roadway and surrounding land directed and contained as per regulatory approval.

Construction Materials

- Excess and scrap building materials (e.g., steel, concrete, wood, adhesives, solvents,).
- Excavated material from grading cuts and foundation excavation (e.g., soil, rocks).
- Buried items and infrastructure excavated from the site (e.g., fuel pipelines, underground tanks).
- Minimizing construction waste destined for landfill disposal is a priority. This waste includes building materials such as insulation, steel, concrete, and wood as well as those listed above.

Saltwater Farms

As with the hatchery, MCE has a comprehensive Waste Management Plan for saltwater farms that covers construction activities. This plan is a component of the Environmental Management and Waste Management Plan (EMWMP) that is updated annually and provided to FFA for review to ensure all activities comply with the Environmental and Waste Management Plan Guidelines, all regulations, and government policies.

All the principles of waste management outlined previously in this section apply to saltwater farm construction with the following additions.

- As with all marine farming operations, nothing will be released into the environment during construction. Construction materials will be secured or confined in secure containers at all times to reduce the potential for being lost or discharged.
- Should equipment be lost, it will be retrieved immediately, weather permitting. If immediate retrieval of large floating debris, such as a boat drifting free, is not possible, the details and coordinates will be provided to Transport Canada.

Waste management must consider potential harmful effects on wild species and sensitive environments. Though every effort is made to keep waste out of the environment, as an extra measure, MCE saltwater farms are not located above sensitive habitat nor near areas where wild species, especially species at risk, are known to spawn, nest or congregate.

General

- Solid construction waste is categorized into hazardous and non-hazardous classes for more efficient disposal and is documented, maintained for re-use or recycled or disposed of as required.
- At all times the potential effect on the environment will be considered when collecting and disposing of waste.
- MCE waste material handling and disposal, including waste reduction procedures, are provided in MCE EMWMP. This plan and the SOPs and Health and Safety Program practices align with the Mowi Sustainability Strategy and support the targets to reduce opportunity for environmental interactions. MCE practices also comply with all regulatory requirements and BAP certification standards.
- No accumulation of construction waste or construction materials. All excess materials and debris used in construction is collected and disposed of offsite during construction and does not remain or accumulate on the farm.
- Construction waste materials removed from construction site either to the site collection area or the waste management agency listed in the next section.
- The purchasing program controls on-site construction supplies to reduce waste generated.
- Corporate sustainability reporting includes performance measures on various sustainability aspects and provides goals for improved performance.
- All waste will be securely contained in enclosed dedicated receptacles at designated locations on site.
- All waste materials generated at the sites will be stored prior to collection by a contracted service company.

Table 26 provides potential waste and impact to the environmental with mitigation measures used during construction of a saltwater farm and the associated regulation and MCE standard as indicated by the Management Plan.

Table 26 Measures to Reduce Waste Build-up and Limit Potential Environmental Effects

Potential Waste & Impact	Practices that Reduce Potential Waste Build-up and Environmental Effect	Regulation, Standard or Company Policy
Boating hazard and/or restriction Loss of construction equipment or gear to the environment	• All refuse is securely contained and regularly removed from the farm. • All equipment and gear securely attached.	Regulation 5/12 Occupational Health and Safety Regulations, 2012, Part XXII Diving and Other Marine Activities Environmental Management and Waste Management Plan
Unsafe infrastructure Navigation hazard due to loss of gear	• Infrastructure and site development to 3rd party engineering standards.	FFA AP 2 and Code of Containment Waste Management Plan, Environmental Management and Waste Management Plan
Loss of equipment and gear and/or excavation of sensitive habitat and species diversity	• Pre-farming site environmental assessment • Fuel accident/spill contingency and response planning	Baseline Assessment Report Waste Management Plan, Environmental Management and Waste Management Plan
Loss of equipment and gear creating degradation of area and loss of wild habitat	• Waste streams identified, collection and disposal methods pre-arranged. • Daily clean-up of construction materials, safe mooring of construction barges and equipment	Waste Management Plan, Environmental Management and Waste Management Plan
Loss of waste into the environment Habitat degradation	• Site access restrictions • Construction vessel, boat, and barge-securely moored during construction. • All wastes collected in secure containers.	Waste Management Plan, Environmental Management and Waste Management Plan

Non-hazardous Waste Management

- The site kept tidy at all times by establishing staging areas for waste collection, sorting and storage.
- Construction waste and sewage collected for proper disposal.

- Recyclable waste is separated from other waste materials, trash, and debris.
- Waste collected and stored in containers that are off ground and covered.
- Waste is removed regularly to an approved landfill or recycling facility.
- Salvaged waste removed from the site.

Hazardous Waste Management

- An inventory of controlled products, including hazardous waste, will be maintained on site and updated as needed. These products will be recorded in an on-site SDS documentation.
- Non-hazardous products used in place of hazardous products, if possible.
- All safety and WHMIS requirements followed, i.e., properly containerized, marked, etc.
- Each individual on the project is trained to recognize hazardous waste on the project, know the requirements for handling and deposition.
- Hazardous waste treated and disposed of at a facility permitted or licensed for this purpose. Transportation of hazardous waste per law, regulation and/or standard.
- Spill cleanup kits are maintained on site at the storage location.

Waste Management Agencies

Please refer to section 4.3i Waste Management Normal Operations for waste management service providers and their information.

4.2e Construction for Site Decommissioning and Restoration

Guidelines: Describe how the project would be constructed if there was a future requirement to decommission and rehabilitate the area.

This section describes the design criteria and construction methods that have taken into consideration the potential for decommissioning and rehabilitating the site.

Please refer to section 7.0 Decommissioning and Site Restoration for a full description of decommissioning and restoration processes.

Indian Head Hatchery

The Indian Head Hatchery is an integral component of MCE's business plan for next 20+ years and is not expected to be retired. However, should decommissioning be required, the following design and construction methods will assist the process of dismantling the culture systems.

Design

The facility has been designed as a series of independent culture units each with their own influent water source, fish culture and RAS technology, and effluent lines. If decommissioning was required, the hatchery could isolate sections to undertake a staged shut-down of the buildings and culture systems.

- Each of the five salmon production buildings – incubation/fry, smolt 1-2-3 and Modular RAS building – were constructed with their own freshwater lines, independent water treatment systems separate from other buildings, dedicated power and back-up power supply.
- Each culture system within these buildings is also designed to be autonomous and function independently. In the advent of having to decommission, the systems can be shut down and while doing so the remaining areas can continue to function.

The Hatchery Expansion Modular RAS Building was designed as four separate modules with the same independent attributes as described for the other hatchery units. The remaining construction includes modules 3 and 4 which will use similar construction processes as were used to construct Modules 1 and 2.

The Hatchery Expansion construction followed the directions from provincial and federal regulatory agencies and the Town of Stephenville that required minimum disturbance to the area. These requirements mean less remediation of the site is required should decommissioning be undertaken.

- New buildings were located to use the natural slope of the land that minimized the sub-surface drainage lines installed. This reduces the lines that would need to be removed in decommissioning.
- Soil and ground materials removed during excavation remain on the site to be used for back fill or restoration of the area.
- Routes of sub-surface lines avoid sensitive areas and are at a distance from the Port of Stephenville shoreline. Avoiding sensitive areas simplifies the removal of infrastructure if required.
- Wherever possible multiple sub-surface lines are laid in the same trench to minimize excavation and disturbance of the area. For decommissioning, this makes locating the lines easier and removal of the infrastructure more efficient.

Saltwater Farms

The saltwater farm infrastructure is designed and constructed to be easily accessed and taken apart to allow for regular inspection, cleaning, repair, and if necessary, replacement.

The following policies and processes ensure the farm is constructed in a way that allows for decommissioning should it be required. The procedures are included in the MCE Environmental Management and Waste Management Plan that is revised annually and approved by the provincial government.

- All farms are designed to have only the required infrastructure installed.
- Wherever possible, the infrastructure for sites in the same Bay Management Area (BMA) with one central feed and storage barge, office, docking infrastructure, waste collection etc. for all farms.
- During construction
    - No accumulation or storing of construction equipment or materials on site once construction is complete.
    - All equipment is removed from the site.
    - All construction materials are collected and disposed of offsite during construction and do not remain or accumulate on the farm.
- Fish culture nets are constructed and installed to be removed from the site regularly as mandated in AP 15 for net servicing and disinfecting which is completed on land prior to being re-installed on the farm.
- Farm surface structures and floating equipment and subsurface equipment and lines are constructed to be detached for cleaning and/or replacement.
- Infrastructure such as fish culture structures, accommodation facilities, feed and storage barges, lines, and site tools are installed to be removable for upgrades and cleaning of site. This equipment can also be easily removed for site decommissioning.

4.3 Operations and Maintenance

Guidelines: All aspects of the operation and maintenance of the proposed development should be presented including and in relation to the potential environmental effects of transporting and adding additional smolt to the sea farms, including illustrations where applicable.

This section provides information on the operations and maintenance of facilities and equipment required to rear salmon for all life stages – freshwater and saltwater.

The following sections also have information related to operations and maintenance.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery
- Section 4.1b Geographical Location and Physical Components, Transporting Smolt to Saltwater Farms
- Section 4.1c Geographical Location and Physical Components, Saltwater Farms
- Section 4.1d Geographical Location and Physical Components, New Saltwater Farms
- Section 4.2a Hatchery Expansion Construction
- Section 4.2b Fish Transport Construction
- Section 4.2c Saltwater Farm Construction
- Section 6d Farmed and Wild Salmon Interactions Management

This section is focused on rearing healthy robust salmon. Section 6 Potential Environmental Interactions and Operational Mitigations provides details on potential environmental interactions and operational measures that provide safeguards, see Table 27. Section 6 also includes Table 71 Summary of Potential Environmental Interactions and Operational Mitigations.

Table 27 Section 6 Potential Environmental Interactions and Mitigation Measures with Subsection Topics

Subsection	Potential Environmental Interactions and Operational Mitigations
6a	Capacity and Suitability of the Indian Head Aquifer
6b	Mitigation Strategies to Limit Pathogen Spread
6c	Elevated Mortality and Reportable Disease Event Management
6d	Farmed and Wild Salmon Interactions Management
6e	Protection of Wild Species and Benthic Habitat at Saltwater Farms
6f	Chemotherapeutants Management
6g	Species at Risk Management
6h	Aquatic Invasive Species Management
6i	Management of Extreme Environmental Conditions
6j	Avoiding Interference with Other Legitimate Marine Users

Introduction

The Indian Head Hatchery has been providing smolt for saltwater farms in the province since 2012. The salmon rearing practices and technology have continuously improved over this time to the current level of production management that provides the best culture situation for fish health and welfare and manages environmental interactions.

The Hatchery Expansion proposes to increase hatchery production by 2.2 million smolt annually. The additional fish will be cultured using the same practices and technology as the currently licensed 4.5 million salmon.

4.3a Salmon Rearing Operations

Guidelines: 4.3a) description of equipment and procedures associated with fish-rearing operations including acquisition of eggs, all hatchery growth stages, transport and transfer of fish to sea cages, grow-out within sea cages; and final harvest and transfer to a processing facility; including acquisition of eggs, equipment and procedures associated with fish-rearing operations.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide regulatory guidance for salmon rearing operations discussed in this section. Please note all APs pertain to fish rearing operations and are strictly adhered to. Those APs listed below have specific information for this section. Details of these policies as well as other regulatory requirements that control salmon farming in the Province of Newfoundland and Labrador are also provided within the section.

Table 28 Aquaculture Policies That Pertain to Section 4.3a

AP #	AP Title	Description
AP 12	Transfers and Transport Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the FFA Minister or designate. Health of all fish to be transported to be assessed by the FFA Aquatic Animal Health Division Chief Aquaculture Veterinarian prior to transporting.
AP 23	Fish Disposal	All farms will have a Fish Disposal Plan, outlined in a Waste Management Plan.
AP 29	Aquatic Animal Health Surveillance	All Licensees must have access to a Designated Veterinarian for the purposes of the Surveillance Plan.
AP 32	Aquatic Animal Health Reporting	Licensees must keep health records for the current stock at the aquaculture site/facility and must give the Chief Aquaculture Veterinarian access to these records upon request.
AP 33	Aquatic Animal Health Contingency Plan	Licensees will follow the FFA Aquatic Animal Health Division Contingency Plan during a provincial Reportable Disease event or outbreak.
AP 34	Aquatic Animal Health Surveillance Design	Licensees are required to have access to a licensed veterinarian. In accordance with the *Veterinary Medical Act,* only a licensed veterinarian can practice veterinary medicine, preventative medicine, perform surgery and diagnose with interpretation and treatment (prescriptions and mitigation).
AP 42	Animal Welfare	Licensee must have their designated veterinarian performing, overseeing, or instructing employees on the humane euthanasia of fish during fish handling, sampling events, depopulation, and normal operations.

This section provides the procedures associated with the culture of salmon for all life stages. Unless otherwise indicated, the information in this section pertains to all Mowi Canada East Inc. (MCE) salmon reared in the Province of Newfoundland and Labrador including the proposed Hatchery Expansion smolt.

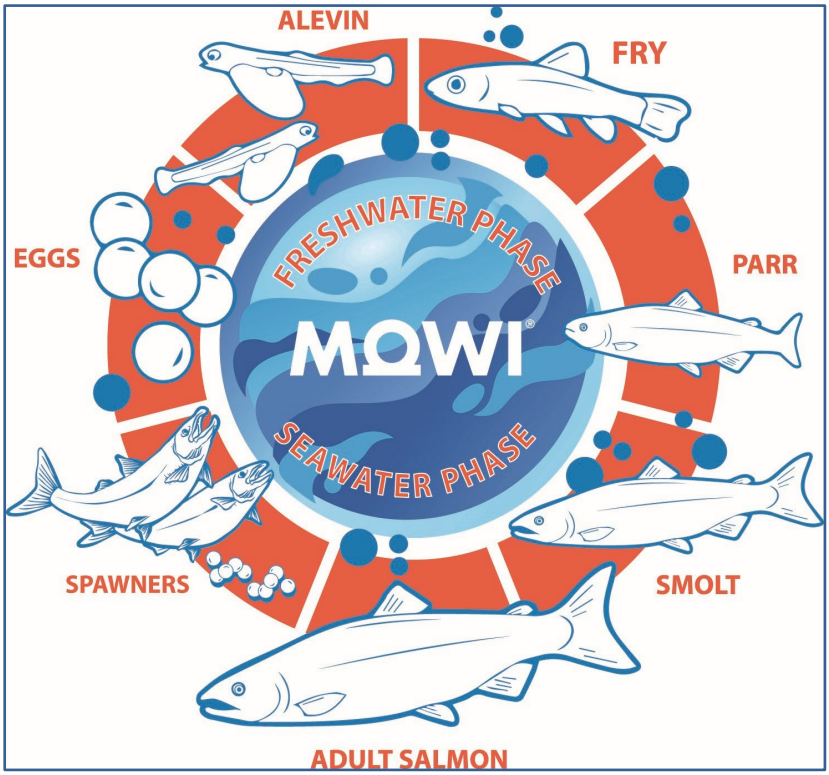
Please refer to the following sections for a general description of the components at each site used for freshwater rearing, fish transport, and saltwater production.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery
- Section 4.1b Geographical Location and Physical Components, Transporting Smolt to Saltwater Farms
- Section 4.1c Geographical Location and Physical Components, Saltwater Farms

Salmonid Culture Life Stages

As shown in Figure 32, fertilized eggs are incubated until hatching, and young fish are reared from alevin to fry to smolt (salmon ready to be in the ocean) at land-based hatcheries using freshwater. The remainder of the salmon culture cycle through to harvest is in the marine environment at saltwater farms.

Figure 32 Atlantic Salmon Life Cycle



In general, it takes 16-18 months to grow salmon from an eyed egg to smolt ready to go to sea and another 18-24 months in the ocean to harvest. Freshwater and saltwater culture are pre-planned in detail with activities collated into comprehensive production plans.

Individual salmon grow at different rates throughout their life and have different susceptibility to outside influences. Culture systems and schedules are developed to accommodate these differences. Table 29 provides an approximate schedule of culture stage and fish size, duration of each stage of culture and the time of year.

Table 29 Cultured Salmon Life Stages and Culture Schedule

Location	Stage[a]	Estimated Duration[b]	Months
Hatchery 16-18 months[c]	Egg Incubation	3-6 months	December/January – March/April
	Fry (0.5-15 g)	5-6 months	February/March – August/September
	Juvenile to Smolt (15-250 g)	8-10 months	August/September - May/June
	Smolt to Post-smolt[c] (250+ g)	2-5 months	June-September
Saltwater Farms 18-24 months	Smolt to Harvest (5 kg)	18-24 months[d]	August-January following year

[a] Smolt and post-smolt are physiological points in salmonid development not a specific weight. Salmon are transported to saltwater farms at 80+ g.
[b] Assumes 15°C water temperature.
[c] Post-smolt are not currently being reared at the hatchery. The technology for this additional stage of rearing is part of the Hatchery Expansion and is not currently complete, please refer to section 4.2a for status of Expansion Project Construction and estimated completion dates.
[d] Estimate based on smolt to harvest.

Hatchery Culture

The purpose of freshwater culture is to produce high quality smolt to meet the requirements of the saltwater farms - the number fish required for stocking, at the ideal size and age and when the farm is ready. The hatchery strives to produce high quality smolt using limited resources, such as facilities, water, and people, as efficiently as possible.

The hatchery rearing units are enclosed independent culture systems enabling a high level of control over culture requirements such as water quality, water flow, temperature, fish density, and effluent treatment. This control allows for enhanced biosecurity, fish health, and fish welfare.

Best Aquaculture Practices (BAP) Certification

The Best Aquaculture Practices provides standards for rearing practices. MCE BAP certification ensures salmonid culture is conducted to the following specifications.

- The appearance and behavior of all fish shall be observed at least daily for signs of distress or ill health and actions taken to correct distress or ill health shall be documented.
- Procedures are undertaken that minimize unnecessary stress or injury during crowding, capture, and handling of fish prior to and during transfer within the facility or transport to

saltwater farms. Records are kept of survival rates and used as an indicator of the adequacy of such procedures.

Recirculating Aquaculture Systems

The Indian Head Hatchery uses Recirculating Aquaculture System (RAS) technology for all life stages - egg incubation through smolt. Each RAS is a series of equipment that functions together to clean and treat used fish culture water bringing it to the standard required for re-use for fish culture.

A RAS allows for high efficiency use of water and precise management of the culture parameters that determine salmon survival, health, and growth.

RAS technology is complex, expensive, and requires specific expertise to effectively manage. However, MCE is committed to using RAS throughout the hatchery for environmental benefits, greater efficiency in water use, and ability to enhance fish health and welfare.

Environmental benefits to using RAS technology.

- Fish culture water is treated and re-used which significantly reduces the amount of new water required per fish and makes the best use of limited water resources.
- Closed systems enable enhanced biosecurity with fewer disease issues and no fish escapes nor issues with predators.
- Solid waste from fish culture water is screened and stored in a sump for disposal on land.
- With up to 97% of the fish culture water re-used, the reduced volume of wastewater can easily be treated to remove potentially harmful components.

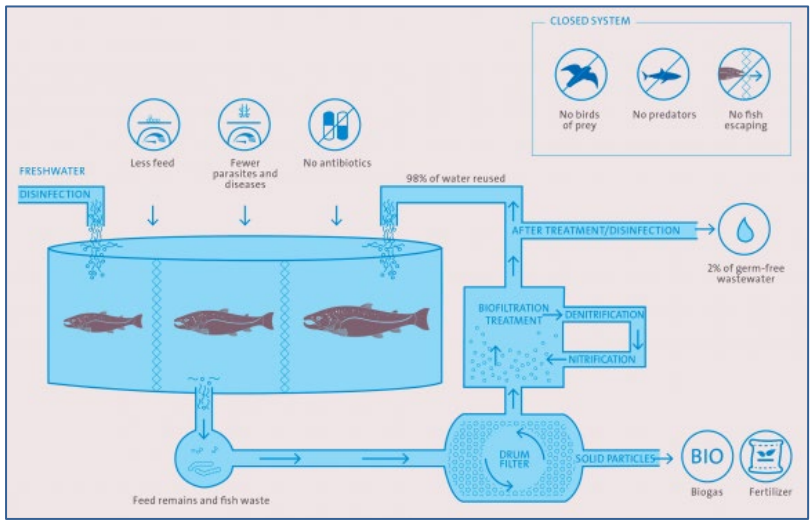
Fish culture benefits to using RAS technology.

- RAS units are independent from each other and from the other parts of the hatchery providing the ability to control a specific culture environment to the requirements of the size and age of.
- RAS units are sophisticated with sets of equipment for a specific life stage of fish rearing.
- Each RAS unit is capable of cleaning, treating, and reusing up to 97% of the culture water.
- RAS provides enhanced level of control over the rearing environment and the ability for the grower to produce fish according to their specific requirements.
- RAS allows for high-density culture of salmon reducing the environmental footprint where land area and water resources have limits.

Figure 33 shows a schematic of a RAS culture system technology. Culture water flows from the fish tanks through several levels of treatment before being returned to the fish.

- Mechanical removal of particles - waste solids, such as uneaten food and fish wastes, are removed by drum filters.
- Biological and mechanical removal of suspended matter and metabolites - dissolved toxic nitrogenous wastes are reduced and water pH is buffered using biofilters.
- Water polishing, where oxygen is added, CO_2 reduced, and if required water temperature is modified, is completed before returning to the fish culture tanks.

Figure 33 Representation of a RAS Culture System



Source: Swiss Alpine Fish

The hatchery culture systems are independent from each other and are housed in bio-secure areas of a building or in individual buildings: Incubation/Fry, Smolt 1-3, Modular RAS building. Please refer to section 4.1a Indian Head Hatchery Figure 4 for a layout of the hatchery buildings.

Each culture system and building are managed separately to provide the specific environment required by the fish at each stage of culture: egg incubation, fry rearing, smolt and post-smolt production.

Egg Incubation

Fertilized eggs from MCE's Saint John River broodstock are shipped to the Indian Head

Hatchery for incubation. The Incubation Room is a closed bio-secure area of the Incubation-Fry Building. Please refer to section 4.1a Indian Head Hatchery Figure 4 for the location of this building and the culture equipment.

The four incubation units are independent and are managed individually to provide the specific parameters required, see Figure 34. The following are the operational procedures that pertain to all units.

Culture Procedures

- Each culture unit can be run on either partial flow-through or chilled recirculation.
- Approximately 20,000 eggs are incubated in each tray, maximum 45,000 eggs per drawer (2 trays).
- Eggs are disinfected prior to being placed in incubation units. Please refer to section 4.3d Purpose and Use of Anti-microbials for chemotherapeutant procedures and application.
- Lighting is 24 hours a day on a low setting once eggs are eyed and increased during daily removal of dead eggs.
- Newly hatched alevins remain in the incubation system until their yolk sac is used up when they are transferred to the fry rearing units.
- Continual water flow 5 LPM for eggs, up to 8 LPM for alevin, total of 320 Lpm (5 Lpm per tray, 8 trays per rack, 8 racks per module) for a total recirculation flow of 1280 Lpm (four modules).
- Formalin treatments are conducted as required. Please refer to section 4.3d Purpose and Use of Anti-microbials for chemotherapeutant procedures and application.
- System effluent is processed through Effluent Treatment Building 1.

Culture Water Management

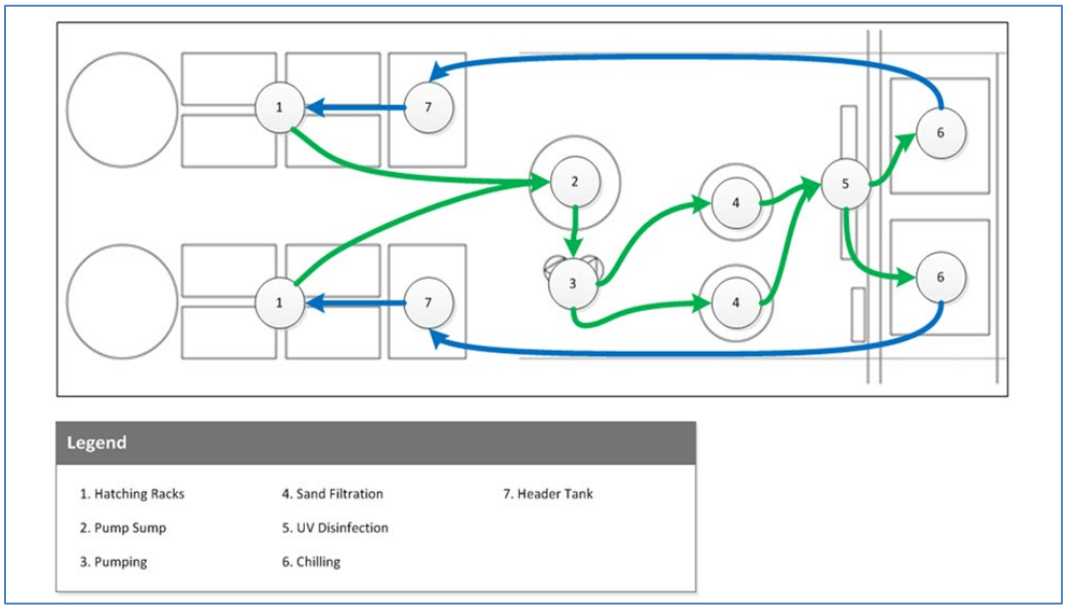
- RAS technology treats and re-uses up to 95% of the water by processing the water through two pressurized sand filters and a UV sterilizer.
    - Two sand filters run in parallel. Water enters through the top of the unit and is forced by pressure through the sand and solids are retained. Pressures are managed on the pressure gauges located on the top of the units.
    - As pumps are turned up, pressure through the sand filters increases. Pressures are checked daily and are backflushed when 35psi is reached (normal clean operation pressure is around 27psi) or at a minimum upon start-up, after hatch, during shut down.

  - Filters are backflushed daily for cleaning.
  - UV sterilizer provides minimum dose of 100mJ/cm^2 using three UV lamps. UV lamps can be changed while water is flowing through the unit unless a quartz sleeve is broken in which case the sterilizer must be bypassed and the unit serviced.

- Cleaned and treated water is chilled using two 7.5-ton chillers operating in parallel and managed using isolation valves located inside the building and bypass valves for when the chillers are not needed or down for servicing/repair.
- Cleaned and chilled water flows into a 3,685 L header tank, raised to distribute the fresh/cleaned water via gravity to the trays. A standpipe brings volume to full depth and overflow enters the sump via a return line.
- For disinfecting formalin treatments, chillers cool the system water to 4^o C. and store chilled water in a 2000-gal (7,570.8 L) sump used for flushing the trays following formalin treatment, so the formalin is not recirculated in the fish culture system.
- Water flow to individual trays is set using the flow meters on the front of the unit. Experience indicates a flow rate of 5 LPM through incubation to first feed is optimal.

Figure 34 shows the incubation system equipment and water flow through the incubation units and the RAS technology.

Figure 34 Incubation System Layout and Water Treatment



Fry Rearing

The two fry rearing units have 6 m tanks and 7 m tanks. The units are independent of each other with individual water management.

Production Procedures

- Stocking ratio for 1-5 g fish is 20-25 kg/m³ and 5-30 g fish 30 kg/m^3.
- Fish are fed automatically using Arvotec feeders.
- Feeding rate is 3-3.5% of body weight per day and is dependent on water temperature. On average, farmed fish only require 1.1 kg of feed to gain 1 kg of body mass making salmon the most efficient animal to produce. At the hatchery, the feed manufacturer's recommendation for freshwater growth is used to calculate feeding rate and pellet size.
- Mortalities are removed daily, with an expected mortality rate of 0.5% up to 12 g and less than 0.2% over 12 g.
- Influent water enters 18.4m^3 reservoir and is pumped to the low head oxygenator/degasser where oxygen is injected, and CO_2 gas removed.
- Water is gravity fed through a UV sterilizer and into the tanks in the fish rearing units.
- For additional water treatment a side stream bead filter pumps water from the reservoir through the bead filter and back into the reservoir.
- Dissolved oxygen level in fish culture tanks is monitored by equipment data output and if needed can be determined by hand-held Oxyguard probes in the tank.

- Each tank has four ceramic diffusers and one Pressurized Packed Column (PPC) inlet. The PPC is a highly efficient on-demand oxygenation system that generates oxygen-supersaturated water by contacting oxygen and a water side-stream in a media-packed pressure vessel.
- Hand-held probes are used to indicate oxygen levels in many situations such as moving fish from one tank to another, grading, testing efficacy of the other oxygen generating equipment etc.
- If the oxygen level drops, additional air stones with a pressurized oxygen tank are added and oxygen level monitored with the hand-held probes.

Water Quality Management

- Water from fish culture tanks flows through a 36-micron drum filter where solids are removed.
- Wastewater from the drum filter is discharged to Effluent Treatment Building 1 for processing.
- Filtered water flows from the drum filter through a moving bed biofilter (MBBR) with plastic beads where dissolved organics and products of fish metabolism are removed by surface bacteria. A MBBR prevents the accumulation of ammonia nitrogen, a toxic fish waste product by converting toxic ammonia-nitrogen to less toxic forms in a process called nitrification.
- Water is UV disinfected (minimum dose 100 mJ/cm^2) and temperature stabilized before being discharged back into the header tank for distribution to fish culture tanks.
- A Low Head Oxygenator (LHO) and CO_2 degasser ensure both oxygen and CO_2 levels are optimal for salmon culture. The oxygen units are manually controlled and adjusted as needed.

Smolt Production

As fish grow and mature, they are moved from the fry rearing units to the larger smolt culture tanks to allow for increase in fish size. Smolt Buildings 1, 2 and 3 each house four independent culture units each with dedicated oxygen and RAS technology. Each culture unit has four 280m^3 fish culture tanks, a rotating drum filter, bio-filter, bead filter, UV disinfection unit, and a water reservoir. The following procedures pertain to all units.

Production Procedures

- Stocking ratio for 5-30 g fish is 30 kg/m^3 and for larger fish stocking density can be up to 50 kg/m^3.
- Fish are fed automatically using Akva auger feeders.

- Feeding rate is 3-3.5% of body weight per day and this rate is dependent on water temperature. On average, farmed fish only require 1.1 kg of feed to gain 1 kg of body mass making salmon the most efficient animal to produce. At the hatchery, the Skretting FW Growth and Feeding Tables are used to calculate feeding rate.
- Mortalities are removed daily, with an expected mortality rate of 0.5% up to 12 g and less than 0.2% over 12 g.
- Solid wastes and liquid effluent are piped to Waste Treatment Building 1.
- Influent water enters 18.4m^3 reservoir and is pumped through four separate Low Head Oxygenator (LHO) – one for each culture unit - before entering the fish tanks.
- For additional water treatment, a side stream bead filter pumps water from the reservoir through the filter and back into the reservoir.
- Dissolved oxygen level in fish culture tanks is provided through equipment data output and can be determined as needed by hand-held Oxyguard probes in the tank.
    - Hand-held probes are used to indicate oxygen levels in many situations such as moving fish from one tank to another, grading, testing efficacy of the other oxygen generating equipment etc.
    - If the oxygen level drops, additional air stones with a pressurized oxygen tank are added and oxygen level monitored with the hand-held probes.
- The oxygen level is managed with the following equipment at each tank.
    - A Low Head Oxygenator (LHO) removes CO_2 and oxygenates the water to approximately 150% saturation.
    - Eight ceramic diffusers, which are manually controlled through 4 flow meters, are used to supplement oxygen during treatments, fish moves etc.
    - Individual packed columns, capable of delivering water between 900-1200% oxygen saturation through two dedicated inlets to the tank, are controlled by the Oxyguard® commander oxygen system. When the oxygen is out of range the computer controls the solenoid to ensure the tank volume is turned over every hour with high oxygenated water.

Water Quality Management

- Water from fish culture tanks goes through a 45-micron drum filter where solids are removed.
- Wastewater not returned to the fish culture tanks is discharged to Effluent Treatment Building 1 for treatment.

- Filtered water flows through a Pure Salmon Kaldnes moving bed biofilter (MBBR), with plastic beads, to remove dissolved organics and products of fish metabolism. A MBBR prevents the accumulation of ammonia nitrogen, a toxic fish waste product using cultured bacteria to convert toxic ammonia-nitrogen to less toxic forms using a process called nitrification.
- Water is UV disinfected (minimum dose 100 mJ/cm^2) and temperature stabilized before being discharged back into the header tank for distribution to the fish culture tanks.
- A Low Head Oxygenator (LHO) and CO_2 degasser ensure both oxygen and CO_2 levels are within the range for salmonid culture. The oxygen units are manually controlled and adjusted as needed.

Water treatment for each unit consists of the following.

- Influent water and treated fish culture water is held in a reservoir and distributed to each of the four tanks.
- Water leaving the fish culture tanks has particles removed by a rotating drum filter with 40-micron screens, one dedicated to each culture unit.
- Solids removed are collected and pumped to a sump in Effluent Treatment Building 1 for disposal.
- From the drum filter, water is processed by a moving bed biofilter to remove dissolved organics and products of fish metabolism.
- Water not returning to the fish culture tanks is processed through Waste Treatment Building 1.
- Low Head Oxygen (LHO) supply/CO_2 degasser is custom fabricated and installed on each culture tank to be used as required.
- All fish culture tanks have air stones and Smolt Buildings 1-3 have a Pressure Pac Column (PPC) installed on each tank. The PPC is a highly efficient on-demand oxygenation system with a media-packed pressure vessel that generates oxygen-supersaturated water.

MCE maintains a contingency of procedures in the event of deterioration of water quality. Procedures used vary depending on the cause of water quality decline, the stage of fish culture and the culture system. Please refer to section 4.3k Fish Culture Water Quality for detailed parameters and management practices.

These are examples of standard procedures.

- Cessation of feeding is immediate.
- Water quality monitoring is enhanced to determine the problem and to estimate how long the problem may persist.

- Plans are initiated to remedy the cause.
- Fish are monitored more closely for the duration of the event.
- Fish handling procedures are stopped until water quality is deemed acceptable.
- Events, actions, and outcomes are recorded in detail.

Post-smolt Production

Post-smolt production is a component of the Hatchery Expansion and uses the Modular RAS Building which is not complete. The following information is from the Modular RAS Building Theory of Operation.

Production Procedures

- Fish will be fed automatically using Akva auger feeders.
- Feeding rate is determined as a % of body weight per day and is dependent on water temperature. On average, farmed fish only require 1.1 kg of feed to gain 1 kg of body mass making salmon the most efficient animal to produce. At the hatchery, the Skretting FW Growth and Feeding Tables are used to calculate feeding rate and pellet size.
- Mortalities are removed daily, with an expected mortality rate of less than 0.2%.
- Oxygen is managed with a Pressure Pac Column (PPC) for each fish tank with air stones as back up, providing efficient on-demand oxygenation.
    - Dissolved oxygen is monitored continuously and provided to each tank individually as required.
    - In the event that dissolved oxygen level cannot be maintained in the tank, or if a power failure interrupts the supply of water to the culture tank, a solenoid will automatically open to supply back-up diffusers in the culture tanks.

Water Quality Management

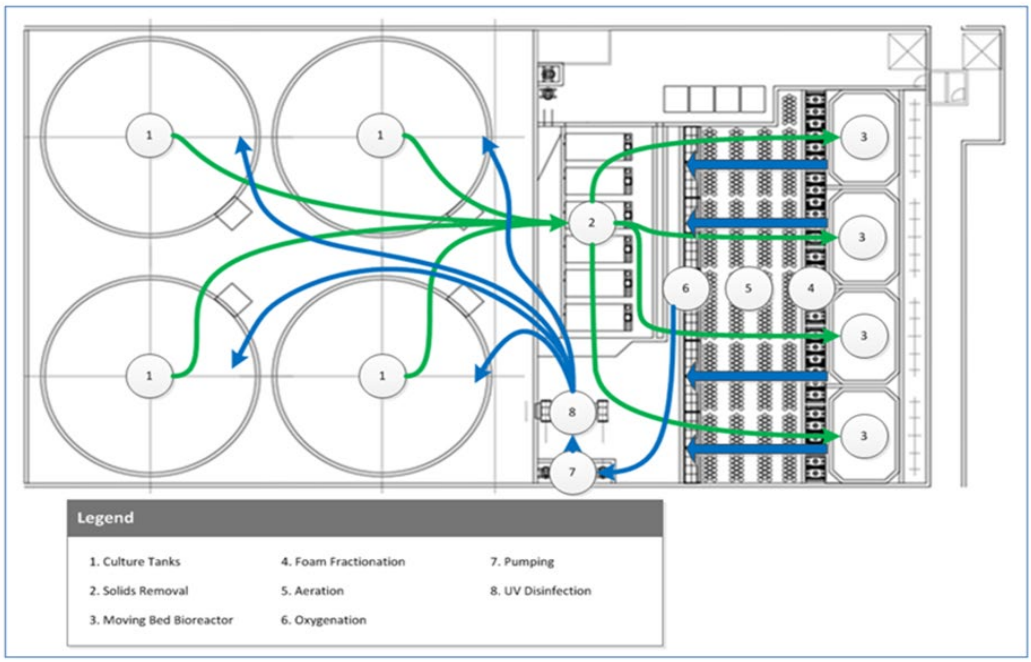
- Six 37-micron drum filters per module will be used to remove particles from the culture tank discharge water. The drum filters will be elevated to minimize system operating energy requirements and to maximize water depth through the treatment system. Each micro-screen drum filter will include a fully automated backwash and control system.
- A Moving Bed Bioreactor (MBBR) prevents the accumulation of ammonia nitrogen, a toxic waste product of fish metabolism, using cultured bacteria to convert toxic ammonia-nitrogen to less toxic forms using a process called nitrification. An MBBR is uniquely suited to aquaculture applications where there may be significant variance in feed load or flow rate. Air will be injected into upwelling tubes located

within the media bed providing oxygen to the bacteria and agitating and circulating the media. This aeration will also remove some carbon dioxide (CO_2).

- Treated water flows from the MBBR into an aeration basin used to balance the dissolved gases by bubbling air through the water. This will strip carbon dioxide and add oxygen until near saturation concentrations are reached. CO_2 stripping improves water clarity and helps to balance dissolved gases by removing CO_2 and adding oxygen.
- The treated aerated water will flow by gravity to Low Head Oxygenators (LHO) where oxygen is transferred into the water. The LHO, which operates at less than 0.9 m of hydraulic head, is a cost-effective method of reaching a baseline dissolved oxygen concentration for all culture tanks. The LHO has the added advantage of reducing the level of nitrogen dissolved in the water while it adds oxygen, providing protection against nitrogen supersaturation from the upstream aeration process. The LHO has been assumed to operate at up to 160% saturation dissolved oxygen (DO) at outlet to maximize the oxygen transfer efficiency.
- A full-flow UV unit will provide disinfection. The UV reactor is typically designed to provide a dosage of 60mJ/cm^2 EOLL with an assumed water transmissivity of 85%UVT.
- Solid and liquid effluent will be processed through Effluent Treatment Building 2.

Figure 35 shows the layout of one module with four fish culture tanks and the RAS technology: drum filter for solids removal; MBBR, foam fractionator; aeration plus oxygenation; and ultraviolet disinfection of the water prior to reuse in the fish culture tanks.

Figure 35 Modular RAS Building, Single Post-smolt Module



Vaccination/Grading

The centralized vaccination system can handle fish of 30 - 170 grams in size. The system anesthetizes, separates, and orients each fish for precise vaccination and improved fish welfare. The fish grader passively sorts fish by size using adjustable bars.

- Fish are pumped from the culture building through transfer pipes to the vaccination/grading building.
- The building does not have a water source. Water from the culture building is used to transfer the fish to the building, during vaccination and grading procedures, and to return the fish to their culture system. If fish are not returned to the same culture building, water from the new building is used for return transfer.
- Fish are graded prior to vaccination by gently lifting onto rollers where they slide through gaps with specific sizes.
- The vaccination system has double/twin line for efficiency. Fish are anesthetized and oriented gently for minimum stress and precise vaccination.
- Fish are held in a recovery tank and monitored until ready to be returned to the culture building.
- Oxygen levels in the recovery tank are monitored during recovery.

- The water supply and return flow rates were based on a peak flow of 405 GPM to/from the Modular RAS Building units and 190 GPM to/from the Fry Transfer Station.
- The layout was designed to minimize the distance from the grader and vaccination equipment to the smolt re-water boxes.
- Equipment is centralized in the building to facilitate access from all sides.
- Large equipment access is provided from the roll-up door on the north wall to the west side of the room.
- Water from the dewater box (on the Apollo grader) is captured in the dewater sump located under the grading platform. The sump is 1.8 m diameter x 1.5 m deep. Water returns from the dewatering sump is pumped via a 6" vertical inline pump located in the fish-in sump to the return point in the drum filter sumps at their respective smolt building modules.

Mortality Management

Mortalities are collected daily to limit pathogen exposure and disease risks to the healthy fish. All mortality plus suspected cause of death is recorded as part of daily observations. Sharp increases in mortality are reported promptly to the Fish Health department so that they can react quickly to any potential fish health problems, and to minimize mortality.

Operating Procedures

- Personnel wear gloves and use separate rain gear if available. If not available spray off raingear, boots, and hands with disinfectant before returning to site or another job.
- Cleaned and disinfected mortality buckets are stored in a dedicated area to provide minimal contact with ongoing fish rearing and other staff.
- Mortalities are removed with a dip net or other mort removal system (uplifts, etc.).
- Poor performers/moribund fish will be humanely euthanized in a solution of MS-222.
- All mortalities are counted and classified and recorded by tank.
    - If fish are less than 1 g and mortalities more than 300, 300 mortalities are counted and classified.
    - Calculate average weight per mortality.
    - Calculate approximate number per classification.
    - Mortality classification and numbers are recorded by tank daily.
- Mortality buckets are emptied daily into the on-site mortality holding tote. No material other than mortalities is placed in the on-site holding tub/tote. Lids are kept secured for predator control.

- No mortalities or moribund fish are released into the environment.
- All mortality collection equipment is cleaned with detergent, rinsed, disinfected with 1% Virkon solution before being returned to the production area that it belongs to.
- After mortality disposal, all on-site mort tubs/totes are thoroughly cleaned and disinfected before being returned to site.
- Any mortality tubs/totes that are damaged or cracked are taken out of rotation and disposed of. Only use fully intact tubs/totes for mortality collection.

Influent Water Management

Please refer to section 4.3g Influent Water Quality Management for parameters for all life stages and information on influent water management.

Effluent Management

Fish are only fed to satiation (point at which they are no longer consuming pellets) to not create large amounts of uneaten feed and faeces in the water. All water leaving the fish culture tanks is treated in the associated RAS to remove solids with up to 97% of the water further treated and returned to the fish culture tanks. The solids collected in the drum filter are pumped to a central sump for disposal on land. Less than 5% of the culture water becomes liquid effluent and is pumped to an Effluent Treatment Building for further treatment.

Effluent Treatment Building 1

Building 1 is the existing effluent treatment for the hatchery.

- Effluent from Incubation/Fry and Smolt 1-2-3 buildings is pumped to this building for treatment.
- Large solids are removed with a radial flow settler (RFS) which allows heavier solids to be settled out. RFS are passive, gravity fed, pre-filtration devices effective in removing up to 85% of settleable solids from aquaculture effluent.
- Resulting liquid effluent is passed through two 40-micron drum filters.
- Liquid effluent is pumped to Effluent Treatment Building 2.
- Solids are collected and disposed in land-based facility under contract with Gale's Septic Service.

Effluent Treatment Building 2

The Hatchery Expansion includes a new effluent treatment building – Building 2 – that has additional waste processing, UV sterilization, and triple screening. Construction is complete for

this infrastructure.

- Effluent from Modular RAS Building and Effluent Treatment Building 1 is pumped to Building 2.
- Large solids are settled out through a radial flow settler (RFS), see description above.
- Liquid from the RFS is passed through two 37-micron drum filters to remove finer suspended solids.
- Solids are collected and disposed of at a land-based facility under contract with local service supplier Gale's Septic Services.
- The effluent passes through triple screens sized to ensure the smallest fish on site cannot pass through nor can any fish enter the facility.
- Liquid effluent is disinfected with a minimum UV dose of 200 mJ/cm^2. Ultraviolet germicidal irradiation uses short-wavelength ultraviolet (UV-C) light to kill or inactivate microorganisms. Please refer to section 4.3b Biosecurity Protocols for common waterborne fish pathogens and UV dose required for deactivation of the organism. A benefit of using UV disinfection is that the process takes place only inside the UV vessel leaving no residue in the water to harm animals downstream.
- Effluent discharge is a deep-water ocean outfall designed in accordance with the Department of Environment and Climate Change (ECC) Guidelines.
- Effluent is monitored to ensure it meets the Newfoundland and Labrador Environmental Control Water and Sewage Regulations (2003) and the Global Aquaculture Alliance's (GAA) Best Aquaculture Practices (BAP) Hatchery Standard.

Please refer to the following sections for additional information.

- Section 4.1a Geographic Location and Physical Components, Indian Head Hatchery for Effluent Treatment Building equipment and specifications.
- Section 4.2a Hatchery Expansion Construction for status of construction and estimated dates to complete the project components.
- Section 4.3b Biosecurity Protocols for list of waterborne fish pathogens and UV dose required for inactivation.
- Section 4.3h Hatchery Fish Culture Effluent Management for effluent monitoring and treatment prior to discharge.

Transport Operations

Smolt (salmon ready to be grown in saltwater) are transported from the hatchery to the saltwater farms on the south coast of the province by vessel. This section covers operations associated with shipping smolt to the saltwater farms. These operational procedures apply to all

smolt grown at the hatchery including the proposed Hatchery Expansion smolt.

Please refer to the following sections for additional information that pertains to this topic.

- Section 4.1b Transport from Hatchery to Saltwater Farms
- Section 4.3p Regulatory, Incident Management, and Public Reporting Permits and Fish Health Certificate

Prior to moving fish, a pre-transport fish health assessment and a risk assessment by the provincial aquaculture veterinarian are required before a Department of Fisheries, Forestry and Agriculture (FFA) transfer permit and Department of Fisheries and Oceans (DFO) Introductions and Transfer Licence are issued. Transfer permits must accompany every group of fish and be available for inspection.

Best Aquaculture Practices (BAP) Certification

As with other fish rearing activities, BAP has standards for the transport of smolt that are required to be met for certification. Specifically, MCE must be able to demonstrate that transport has been completed in a manner that supports fish health and welfare. This is accomplished through continuous monitoring of water quality during transport and recording any mortality, evaluating mortality causes, and improving transport methods to reduce future losses.

Fish Transfer System

The Hatchery Expansion includes construction of a permanent enclosed Fish Transfer System that will convey smolt by gravity, or by pump if needed, from the Modular RAS Building to the transport vessel. This system has been designed for enhanced biosecurity and greater efficiency (moving larger number of fish more quickly) and improved fish health and welfare.

- Fish travel the 800 m line to the vessel in less than 4 minutes reducing the time required to fill the transport vessel.
- Above ground discharge line is sized to fill the vessel with a full load of 70-75 tons of fish (not including water) in approximately two hours.
- Centrifugal-type fish pumps, or gravity where appropriate, will keep the fish moving.
- Fish will be de-watered as they move through the Modular RAS Building module and move via an airgap into a hopper flooded with water from the receiving module. This airgap minimizes the potential risk of cross contamination from one production module to another and from the production area to the vessel.
- Remaining fish transfer water is returned to the hatchery via a separate line.

This system is not fully constructed and is not currently operational. Please refer to section 4.2a Hatchery Expansion Construction for status of construction and expected completion date. The following information pertains to the fish transfer system currently being used.

Hatchery to Vessel

The fish transfer line is not completed, and fish are currently transported from the hatchery to the vessel by truck. The route is less than 1 km on paved roads and is within the Port of Stephenville Industrial Park. Detailed management practices and standard operating procedures are developed for all transport steps, the following is a recap.

Prior to Shipping

- Fish are starved for 2-3 days depending on water temperatures.
- The Logistics Manager confirms the trucks and vessels will be available on schedule.
- Vehicles and equipment participating in the transfer of fish between the hatchery and vessel are cleaned and disinfected.
- Personnel participating in the transfer of fish between freshwater and wharf manage their personal gear (raingear, boots, and PFD) to ensure no cross contamination occurs.
- The weather is checked before transport. Weather concerns are communicated well before loading time.

Loading the Transport Trailers

- Truck driver pre-fills transport trailers to the required depth with water, oxygen stones are turned on at least 5 minutes prior to loading to ensure adequate O_2 levels.
- Prior to loading, the truck driver checks the operation of all equipment.
- The truck is positioned under the loading station and transport boxes filled.
- When a truck is full a final check ensures equipment on decks and or walkway and all personnel are clear before leaving the loading area.
- Trucks are thoroughly cleaned and disinfected prior to the transfer, and after all transfers are complete.

Transport to and Loading the Vessel

- During trucking all fish escape prevention measures are observed.
- Drivers will adhere to all standard safe operating practices.

- At the dock, fish are gravity fed from the truck to the vessel with the truck end of the line fastened with a coupling and the vessel end submerged in the vessel hold.
- To prevent escapes, a catch net is placed around the hose, and the vacuum hose ends are submerged at all times in both the truck tank and the vessel holding tank.
- Truck crew have a contingency plan in place and a seiner available on stand-by to initiate recapture protocols if required.
- All fish and water are transferred to the vessel, no effluent is discharged to the environment. Water remaining in the transport truck is returned to the hatchery.

Transport to Saltwater Farms

The vessel transports smolt from the Port of Stephenville to the saltwater farms on the south coast of the province from February through June each year. The vessel and crew are contracted, and transport is conducted using approved practices that meet predetermined standards.

The following information is for all smolt produced at the Indian Head Hatchery including the proposed additional 2.2 million Hatchery Expansion smolt.

Transport Vessel

- Fish are loaded on and off via a vacuum/pressure system.
- A 20” fish counting system ensures accurate inventory.
- Vessel has two separate tanks for holding fish, with capacity 1100 m^3 each.
- Continuous real-time monitoring of fish-holding tanks allows for immediate adjustments if needed.
- Ability to run using open, semi-closed, and closed circulation to the fish holding tanks.
- Circulation system capable of pumping 15,600 m^3/h and a filter with capacity of pumping 10,400 m^3/h and screening to 150 microns.
- Reverse osmosis plant for freshwater production with a capacity of 5,000 m^3/24h.
- No ballast water discharge during the transport.
- Standard protocol is for fish transport water to be contained during transport.

Preparation in Advance of Shipping

- Vessel manager to ensure docking facilities are appropriate for the vessel and a pilot boat arranged where needed (i.e., Port of Stephenville)

Vessel Conditions

- Coast Guard Canada inspected, licensed, and insured.
- All navigation and communication equipment must be in good working order.
- Skipper trained and ticketed for the vessel type.

- Compressed or liquid oxygen and air cylinders must be safely secured on the vessel.
- The vessel must carry a Fish Spill Kit with a seine net of appropriate mesh size to retain transported fish, a dip net, 50 m of 5 mm poly rope and bags or other containers in which to collect fish; a chain link barrier (prop guard) of appropriate size and weight for the vessel; and a catch net for loading and unloading.
- Fish pumps are maintained in good working order and operated in accordance with the manufacturer's recommendations. Six inches is the minimum hose size used for loading or off-loading smolt.
- The fish holds shall be configured and equipped to avoid mechanical damage to the fish; for example, inlets and outlets screened to contain the fish without mechanical damage and oxygen diffusers shall be fixed in place.
- Water temperature, presence of phytoplankton etc. at the saltwater farm is determined to ensure transports only undertaken when the environment in the culture pen supports salmon health and welfare.

Procedures During Transit

- A trained technician from Marine Services, Logistics or a qualified vessel crew member shall accompany all transport**.**
- Transport will be conducted in a manner intended to minimize stress or injury to fish.
    - Oxygen, CO_2, pH, ammonia, and temperature are monitored continuously to maintain optimum transport conditions and ensure rapid identification and remedy of problems.
    - Cameras within the hold of the vessel provide continuous visual monitoring of the fish.
- If transport vessel is delayed due to weather and has to deviate from the regular shipping route for shelter, transport personnel should be conscious of the biological history of any water used for flushing such as regions with high disease incidence and areas of low oxygen.
- The vessel operator shall promptly advise the Logistics Manager and Well Boat Manager of adverse events related to the security or health of the fish.

Vessel Fish Husbandry

- The crew understand the monitoring equipment data and are experienced in detecting stress in the fish.
- Water quality and fish welfare are monitored continuously during the trip using the vessel's water quality sensors for dissolved oxygen, carbon dioxide (CO_2) and temperature.
- Oxygen is provided at all times such that oxygen concentrations are maintained at or near 100% saturation, that is no less than 80 % saturation and no greater than 105% saturation.
- Transport standard protocol is to run closed with no water exchange with the natural environment except in the following situations.
    - The CO_2 level is above 17 ppm and needs to be reduced and the addition of oxygen did not completely bring it to an acceptable range.
    - The water temperature in the fish hold is not within the acceptable range.
    - Farm water temperature is more than 5^{o} C difference compared to the fish hold water temperature.
- Loading densities (on well boats delivering smolt) do not exceed 50 kg per m^3 as a rule. Regardless of trip length, and whether the boat will be traveling 'open' or 'closed,' the number and weight of fish transported is limited to conform with water quality limits described above and not to cause fish to be distressed. In general, larger fish may load at a higher density without compromising fish welfare.
- During harmful algal bloom season and when potential risk warrants it, the receiving farm manager will arrange for a trained staff member to conduct plankton monitoring onboard the well boat before taking on saltwater, or at any time during the transport.

Smolt are normally discharged by pressurizing the hold and moving bulkheads allowing the fish to go through the counter slowly to achieve accurate fish numbers delivered to the culture pens.

Off-Loading to Farm

- A vessel spotter is used when vessels > 32 ft are approaching and tying up to the system, thereby reducing the risk of anchor lines being damaged.
- The off-loading is continually monitored. If tanks are left to flush, the tank discharge is screened.
- A Fish Spill Kit is available in the immediate vicinity.
- Whenever loading or unloading from a vessel, the scuppers are screened or closed.

- Camlock fittings secure the fish transport lines which are submerged in the hold of the vessel and the culture pen.
- Catch nets are used at all times in the area between the boat and the destination pen.
    - Mesh size of ¼" and securely attached at four points.
    - When the hose is used all joints will be securely wrapped with netting and roped together.
- If attending site personnel judge there is a risk of propeller/net entanglement, chain link barriers will be used. All contractors must carry a chain link barrier of appropriate size and weight for their vessel at all times.

Cleaning and Disinfection

- Vessel is thoroughly cleaned and disinfected between trips. Please refer to section 4.3b Biosecurity Protocols for detailed cleaning procedures.
- Fully automated and efficient cleaning system enhances biosecurity and requires only a minimum of manual cleaning.

Mortalities During Transport

- Mortalities during transport are recorded and reported to FFA.
- High risk mortalities and/or elevated mortality event will follow procedures as provided in section 6c Elevated Mortality and Reportable Disease Event Management.

Saltwater Rearing

The salmon smolt from the Indian Head Hatchery are grown in the ocean for 18-24 months prior to harvest. The information in the section pertains to all MCE saltwater farms in the province.

This section provides information on saltwater rearing procedures. Please refer to the following sections for additional information relevant to this section.

- Section 4.1c Geographical Location and Physical Components, Saltwater Farms
- Section 4.3j Fish Culture Stocking Densities
- Section 4.3k Fish Culture Water Quality
- Section 4.3m Fish Containment Saltwater Farms
- Section 4.3n Recapture of Escaped Farmed Salmon

As for freshwater culture, Best Aquaculture Practices (BAP) certification requirements set the

following standards for saltwater culture with focus on fish health and welfare.

- Care must be taken at all times when handling and managing fish, specifically during high-risk activities such as grading and crowding for harvest or anytime the fish are out of water.
- Limit outside disturbances that have the potential to be stressful for the fish.
- When weather conditions allow, trained staff shall make at least daily inspections and reports on the culture facility, water quality, and behavior and condition of fish.

Fish Density

MCE saltwater farms are stocked at a density that promotes fish welfare and enables the growth of strong and healthy salmon. MCE maximum biomass is 15 kg/m^3 and many farms have lower density depending on the characteristics of the farm site. This is lower than the standard set by the province and assists in promoting fish health and welfare. The lower density also facilitates sea lice management and enhances water quality in the culture pens.

Feeding

Feeding fish is a tightly managed activity as proper feeding and feed handling is essential to minimizing potential environmental impact and supporting fish welfare. Uneaten pellets can be deposited on the bottom below the culture pens and wasted feed is an expense to be avoided.

Designated and trained technicians use underwater camera display on high-definition monitors to determine when fish are satiated (are no longer eating) and feeding is immediately stopped. *Orbit* underwater cameras provide 360-degree horizontal and 210-degree vertical views and have high light sensitivity for visual clarity. The cameras can be raised or lowered during feeding to get a full picture of the fish response.

Feeding Considerations

A proper feeding regime is essential for fish health and optimal growth.

- Once on the farm, salmon are fed slowly at first by hand using small scoops with wide dispersion within the pen, minimum of 5 times per day.
- Larger fish (1,100-3,500 g) are fed 3-5 times per day with all fish fed to satiation in the first 3-3.5 hours of the day, with the last feeding timed at dusk.
- Market size fish (3,500+ g) are fed to satiation using the feeding system as quickly as possible.

Environmental conditions are monitored before feeding as low temperature in winter and low oxygen in summer can substantially affect feed consumption rates and fish health.

Feed must be kept dry at all times until ready for use and kept away from birds or other predators and is therefore stored in a building or under cover. Storage areas are kept clean at all times.

Feeding System

Centralized feeding systems ensure consistent and efficient delivery from storage areas through feed pipes to each pen. MCE is in the process of replacing the existing feeding system with a newer Scale AQ fish feeding system (Feeding Systems – ScaleAQ*).* As farms are stocked, the new Scale AQ system will be installed.

Feeding Protocol

- Fish pens are fed in the same sequence each day and at the same times whenever possible.
- At the start of feeding, the camera is positioned between ½ and ¾ of the depth of the net and it is moved as required to see the full pen.
- Maximum spread of pellets over the water surface is the goal without wasting pellets through the side panels due to strong currents is the goal. The greater the spread over the pen the greater the opportunity for all fish to feed.
- Fish are fed at the highest possible rate and fish behavior is monitored to determine optimal feeding rate without pellet wastage.
- Feed discharge rate is matched with feed consumption rate, reducing discharge rates in small steps as fish become full.
- Fish behavior is observed with cameras and from the surface. Pellet loss is monitored.
- Any unusual, erratic, or diminished activity of the fish is reported to the Site Manager, noted in the log and on daily feed records, and if required, investigated to determine the cause.

Grading

Atlantic salmon grow at different rates, and it is important they are held with fish of a similar size so each fish can successfully compete for food and thrive. Also, large fish of harvest size need to be removed from the pens to be transported to the processing plant. To achieve both goals, fish are passively graded.

- Regular grading using a passive grading system *in situ* (gently pulling net through the pen with specific mesh size that allows small fish to swim through) allows for the separation of fish into size categories with minimal stress and handling.

- Once the fish are divided, the larger harvest-size salmon are loaded on to a well boat for transport to the processing plant.
- All saltwater farms have capacity for additional aeration during grading and other potentially stressful activities.

Water Quality Management

In the event of a plankton bloom or water temperature increase or other situation that causes the water quality to be less than ideal, deeper colder water can be moved up to near the surface. Aeration stones are lowered into the pens and the turbulence created by the bubbles circulates the water. Airlines are connected to the same pump as the feed system so the aeration system is always available.

Harvest

As described in grading, pens with fish of harvest size are passively graded allowing the smaller fish to swim out and the larger fish grouped.

- When the fish are grouped, a fish transfer line is lowered into the pen from the well boat.
- A catch net is used to prevent any escapes and a seiner is on call as contingency should there be an escape.
- Once the line is lowered into the pen, the net gently crowds the fish towards the line.
- A vacuum system moves the fish to the vessel from the pen.
- After the fish are fully transferred, the line stays in the water for a full five minutes to ensure there are no fish remaining in the transfer line.

Harvested fish are transported to the processing plant in a vessel with similar protocols and technology as for smolt transfer. Please refer to sections 4.3a Salmon Rearing Operations and 4.3b Biosecurity Protocols for details on transporting fish.

MCE is committed to handling farmed animals in the most humane way at all stages of their lives. “Stun and bleed” is currently the most humane way to process harvested fish.

- Once the transport vessel has arrived at the processing facility, the water is chilled to 4^{o} C to calm the fish.
- From the boat, the salmon are pumped into a half tank of water where they are stunned and bled into an ice water slurry.
- All blood water is disposed of according to regulations.

Equipment Maintenance and Repair

A regular inspection schedule identifies equipment that has reduced capacity and/or when repair and/or replacement is required. Table 30 provides MCE inspection and maintenance and repair schedule for saltwater farms.

All inspections and repairs are available for Department of Fisheries, Forestry and Agriculture (FFA) review.

In addition to the internal company inspection, the following salmon farming infrastructure is inspected annually with inspection report submitted to FFA.

- Surface lines, thimbles, shackles, compensators
- Submerged lines, thimbles, shackles
- Rope, chain mooring lines
- Bottom anchors

Table 30 Routine Salmon Farm Maintenance Procedures and Inspection Frequency

Equipment	Inspection Purpose	Inspection/Replacement Procedure*	Inspection Frequency
Outboards	Protect gears and prevent damage to equipment, reduce potential leakage to the environment.	Inspection every 100 hrs. (oil and leg oil; inspection etc.).	Daily
Generators	Protect equipment and prevent damage, ensure staff safety and comfort when on site.	Oil level inspection and filter inspection every 200 and 500 hrs.	Daily
Compressors	Efficient operation and prevent damage.	Oil level inspection and filter inspection every 200 and 500 hrs	Daily
Feed Equipment Servicing	Efficient operation and prevent damage to equipment and harm to fish	Monthly service call and refit after every generation (20-30 months)	Daily
Pen Inspection & Maintenance	Identify and replace worn or chaffing equipment, reduce potential for equipment breakage and loss, reduce potential for debris in the environment	Pen inspection and rebuilds after every generation (20-30 months)	Daily
Net Cleaning	Remove biofouling to maintain water exchange, promote fish health, reduce BOD, and benthic build-up.	HDPE nets – *In situ* net cleaning Nets kept clean at all times with ROV net cleaning equipment, cleaning schedule maintained even if net is clean Net cleaning schedule: Summer – every 10-14 days, Spring and Fall – every 2 weeks, Winter – no cleaning mid-December to May Existing nylon nets – Removed for cleaning at a land-based facility as frequently as needed to prevent heavy fouling	Seasonally adjusted
Net Inspection	Identify tears or weak areas from wear and replace before holes develop, reduce potential for escapes, reduce potential for debris in the environment.	Visual inspection of surface equipment Visual inspection of net condition from surface Underwater diver/ROV inspection Underwater diver/ROV inspection	Daily Monthly Monthly and after every treatment, storm event, or other events that might damage equipment

Equipment	Inspection Purpose	Inspection/Replacement Procedure*	Inspection Frequency
Net Servicing & Changes+	Evaluate net to ensure meets standards, reduce potential for escapes, reduce debris in the environment and BOD Determine strength and discard/recycle nets at end of life	All nylon nets will be inspected, break tested and repaired as needed and required by the NL Code of Containment. HDPE nets will be inspected, break tested and repaired at least once per generation*. Completed by third party contractor, off-site. Any nets that do not meet requirements will be disposed of.	Every (20-30 months) and as required by provincial regulations Nylon as frequently as needed based on net age and as required by provincial regulations. HDPE nets every generation
Camera Servicing	Ensure camera function to determine accurate feeding volume, to reduce uneaten feed and BOD, and to monitor fish behavior especially during stressful events or emergencies.	Inspect daily and clean weekly to maintain efficient functions and identify potential malfunctions before they happen.	Daily and weekly
Other production and site equipment	Keep all production equipment in good working order to ensure fish welfare and the best possible growing environment and to provide safe working environment.	Surface equipment inspected and cleaned daily to maintain efficient function and identify potential malfunctions and allow for maintenance and repair. Subsurface equipment, such as rearing systems, feeding systems, grow lights etc. inspected daily through underwater cameras and monthly by divers. Equipment prone to needing replacement or repair will have additional inspection and repair/maintenance replacement and/or supplies available at the site.	Daily and monthly
Uplifts (Mortality Retrieval Systems)	Maintain equipment in good order to remove mortalities efficiently daily, to improve fish health and biosecurity, and reduce attractants for nuisance animals	Inspection and serviced as required. Equipment removed after each generation for remote servicing.	Daily
Aeration Equipment	Ensure efficient aeration within the pens for normal operations and provide mitigation options for high temperatures, low oxygen levels, or other events and emergencies.	Inspection and servicing completed on-site. Equipment removed after each generation for remote servicing.	Daily when in use

Equipment	Inspection Purpose	Inspection/Replacement Procedure*	Inspection Frequency
Vessel Engine	Protect engine parts and prevent damage to ensure efficient operations, reduce potential for leakage of fuels and other oils, for staff and operator safety.	Each engine is serviced after 500hrs (oil, filter). Major inspection and service annually.	Daily and annually
Vessel Service and Refit	Protect vessel hull, ensure efficient movement through the water, ensure staff and operator safety.	Vessel dry-docked 2x per generation to replace zinc anodes, inspect, and clean the bottom, and replace bottom paint (if required).	Semi-annually
Moorings	Identify lines, anchors and other mooring structures that do not meet standard and may need to be replaced, to reduce potential for escapes, equipment loss and debris in the environment	All moorings will be inspected annually. Every generation, a spot testing of moorings will occur. All moorings inspected for replacement after three (3) generations unless inspection allows for one further generation* (maximum four (4) generations).	Annual

*"Generation" is synonymous with the term "production cycle"

+Generational HDPE nets are used to eliminate net changes during the grow-out cycle. HDPE nets are washed in-situ with special net wash units eliminating the need to change nets. Nylon nets are removed for cleaning at a land-based facility as frequently as needed, and as required by the NL Code of Containment. Existing nylon nets will be retired as the HDPE net inventory grows.

MCE is continuously improving farming practices and upgrading equipment. The fallow period at the end of the fish culture cycle provides the opportunity for design changes and equipment replacement prior to the next fish stocking.

4.3b Biosecurity Protocols

Guidelines: Description of biosecurity protocols associated with the hatchery operations and sea cage operations.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide comprehensive governance and direction when developing MCE's biosecurity plans and standard operating procedures related to fish health. Details of these policies as well as other regulatory requirements that control salmon farming in the Province of Newfoundland and Labrador are also provided within the section. MCE meets or exceeds all regulatory policies and procedures.

Table 31 Aquaculture Policies That Pertain to Section 4.3b

AP #	AP Title	Description
AP 12	Transfers and Transport Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the Minister or designate. Health of all fish to be transported to be assessed by the Aquatic Animal Health Division Chief Aquaculture Veterinarian prior to transporting.
AP 35	Biosecurity and Biosecurity Audits	Licensed sites are required to have a company-specific biosecurity plan approved by the Aquatic Animal Health Division (AAHD) at the time of licensing, enforced at all times, with responsibility designated to an employee of the licensed site.
AP 36	Aquaculture Motor Vehicle, Vessel, Boat, and Barge Biosecurity	All vessels, boats and barges must be cleaned and disinfected between fish handling events and will be subject to an audit by the Aquatic Animal Health Division, FFA, as per the Biosecurity Audit Plan.
AP 37	Aquaculture Equipment Biosecurity	All aquaculture equipment must undergo cleaning and disinfection prior to movement from one aquaculture site/facility to another.
AP 38	Inflow and Outflow Wharves	An inflow wharf (as defined by the Wharf Usage Agreement) will be associated with a Bay Management Area (BMA) or group of BMAs. All users must use an inflow wharf designated for that BMA.
AP 39	Blood Water and Offal	The management of all water and wastewater and disposal of all fish by-products from processing plant operations must adhere to aquaculture protections specified in the provincial *Fisheries Act*, Fish Inspection Operations Regulations.

This section provides information on the biosecurity protocols associated with the hatchery and saltwater farm operations. Unless otherwise indicated, this information pertains to all Indian Head hatchery production including the proposed Hatchery Expansion smolt and all MCE saltwater operations in the province.

Biosecurity is the ongoing process of identifying, evaluating, and addressing actions or events in order to reduce the risk of disease transmission, to or from the culture sites. Biosecurity practices are reviewed and assessed regularly as they may require modification as new information and technologies become available.

Biosecurity in salmon culture consists of practices that address the following.

1. Reducing the opportunity to introduce an infectious disease to the facility and spread it to the animals at a facility.
2. Minimizing the opportunity for diseased animals or infectious agents to leave the facility and spread to other sites or to other susceptible species.

Mowi Canada East Inc. (MCE) has developed rigorous protocols that are included in Salmonid Fish Health Management Plan (HMP) that is reviewed annually, revised as needed, and assessed by the provincial government to ensure all regulations and policies are addressed. This section provides an overview of the HMP and the standard operating procedures, developed from the HMP, in daily operations.

Best Aquaculture Practices (BAP) certification standards for biosecurity are also comprehensive and rigorous and include the following specifications that apply to activities for both freshwater and saltwater rearing of salmonids.

- Biosecurity and health management plans to include procedures for site fallowing, cleaning of farm equipment, visitor and vessel hygiene precautions, sanitary disposal of dead fish, increased vigilance if disease is suspected, sea lice management procedures and plans for disposal in the event of a mass fish kill and shall be able to demonstrate compliance with them.
- The facility has a training program for designated facility staff who implement the Health Management Plan (HMP) and documents to confirm that such training has been given. Their understanding of the HMP is verified by interview during the facility audit.
- Potential pathogens are listed in the HMP and federally reportable diseases can be found at : https://inspection.gc.ca/animal-health/aquatic-animals/diseases/reportable-diseases/eng/1322940971192/1322941111904.. The HMP shall include specific measures to address the presence of each of these diseases.
- Health status documents for all live aquatic products brought into the facility since the last audit are available at the next audit and demonstrate the products were free of diseases to the extent detection is possible.

- The HMP includes procedures and indicators to monitor and document the health of stocks including daily or more frequent observations of physical appearance, feeding response and mortality, or of larval development and/or growth rate at biologically relevant intervals.
- The HMP describes procedures for identifying diseases in hatchery stocks, diagnosis of pathogens, and, where necessary, determination of susceptibility to therapeutants and treatment with them. Surveillance records shall be available for inspection during audit.
- The HMP explains how fallowing or dry-out periods in different parts of the facility are planned and used to break infection cycles. Records are made available during audit.
- The health status of all animals or gametes shipped from the facility are recorded. Documents for all animals shipped since the last audit are available and shall show that products with diagnosed or suspected disease were not shipped, unless to a region of equal or lower health status, and that the transfer was approved by the customer and local regulator.
- Biosecurity provisions for feed brought into or produced at the facility are followed as described in the Health Management Plan. (See Section 14.) Records are made available during audit.
- All holding, transport, and culture systems are designed, operated, and maintained to minimize the unintended release of eggs, larval forms, juveniles, and adult animals.

The following sections provide additional information relevant to biosecurity.

- Section 4.3a Salmon Rearing Operations
- Section 4.3c Veterinary Services for All Life Stages
- Section 4.3d Purpose and Use of Anti-microbials
- Section 4.3i Waste Management Normal Operations

Hatchery

Disinfection and biosecurity procedures have been developed for the hatchery site and infrastructure, for staff and for the fish rearing equipment. These procedures are strictly followed to prevent pathogens from entering the hatchery, prevent pathogens within the hatchery from multiplying rapidly and transferring to other fish, and to prevent pathogens from spreading beyond the facility.

The following procedures have been developed to enhance biosecurity. Carrying out these procedures is the responsibility of all staff.

Influent Water

The fish culture water is managed carefully during all stages of culture and part of the management is continuously removing organisms that could be harmful to salmon.

Table 32 has a list of waterborne bacteria, protozoa, and viruses that can affect cultured fish and the UV dose required to inactive the organism. Table 33 has the UV treatment for fish culture water at various stages at the hatchery – influent water from the aquifer wells before being used for fish culture, incubation system culture water, smolt and post-smolt rearing culture water, and effluent treatment prior to discharge to an ocean outfall.

It is standard practice that the UV sterilization units run continuously and have redundancy to ensure fish culture water is always treated. The UV dose is calculated on maximum fish density or system loading and in all cases the treatment is in excess of the required dose to eradicate the organism.

Table 32 Waterborne Pathogens and UV Dose Required to Eradicate the Pathogen

BACTERIA	**UV Dose Required**
Aeromonas salmonicida	3.6 mJ/cm2 (log-3)
Pseudomonas fluorescens (fin rot)	11 mJ/cm2 (log-3)
Listeria monocytogenes	16 mJ/cm2 (log-5)
Streptococcus sp. (seawater)	20 mJ/cm2
Bacillus subtilis (spores)	22 mJ/cm2 (log-3)
Vibrio anguillarum	30 mJ/cm2
Yersinia ruckeri	30 mJ/cm2
BKD (Bacterial Kidney Disease)	60 mJ/cm2 (estimate)
PROTOZOA	**UV Dose Required**
Sarcina lutea (Micrococcus luteus)	26 mJ/cm2 (log-3)
Ceratomyxa shasta	30 mJ/cm2 (log-3)
Perkinsus marinus (dermo disease)	30 mJ/cm2
Trichodina sp.	35 mJ/cm2 (log-3)
Myxobolus cerebralis (TAMs, Whirling Disease)	40 mJ/cm2
VIRUS	**UV Dose Required**
ISA (Infectious Salmon Anemia)	8 mJ/cm2
CCV (Channel Catfish Virus)	20 mJ/cm2
IHNV (Infectious Hematopoietic Necrosis/CHAB)	20 mJ/cm2
IHNV (Infectious Hematopoietic Necrosis/RTTO)	30 mJ/cm2
VHS (Viral Hemorrhagic septicemia)	32 mJ/cm2

From https://pentairaes.com

Table 33 UV Treatment for Fish Culture Water from Influent to Effluent

Area of Operation	Supplier	Minimum Dose*
Influent Water	Atlantium	200mJ/cm2
Incubation	Pentair	100mJ/cm2
Rearing to Smolt	Sita	100mJ/cm2
Post Smolt	Atlantium	150mJ/cm2
Effluent	Atlantium	200mJ/cm2

*Operational minimum dose rate based on culture system flow rates of the systems at maximum stocking or loading

Site, Staff, and Equipment Disinfection

Year Class Separation

- Separate lab coats, raingear, and boots is maintained for all hatchery areas.
- Equipment and gear are specific to year class or fish culture units.
- Whenever possible, movement is restricted between culture sections or areas.

Footbaths

- Footbaths of 1% Virkon will be utilized between designated sections/areas.
- Footbaths will be visually monitored daily.
- Footbaths will be covered when in sunlight and changed as necessary.
- An additional footbath of water should be used to rinse mud off boots before using the Virkon footbath.
- Virkon will be disposed of by pouring to ground at land-based sites.

Hand Sanitizers

Hand sanitizers must be used both when entering and leaving sections/areas and also within sections after handling mortalities.

Effluent System

- A full rain suit or a long raincoat must be worn around the effluent system to prevent contact with clothing.
- Disposable gloves are to be worn and disposed of when leaving the effluent area or reusable gloves that will stay in the effluent area.

Hands will be cleaned with hand sanitizer upon leaving the effluent area.

- Separate boots are scrubbed and disinfected in a 1% Virkon footbath upon leaving the effluent area. A brush will be made available exclusively for this purpose.
- Raingear, gloves, and required equipment will be stored at or near the effluent areas and will not be used elsewhere on site.

Equipment and Equipment Movement

- There will be no direct transfer of work gear or fish handling equipment from the marine sites or freshwater facilities.
- Specific area equipment is clearly identified.
- Mortality collection equipment is marked as such and used only for that purpose, not for live fish handling.
- Individual brushes and nets are assigned to tanks or groups of tanks. This equipment is disinfected when moving from tank to tank within a group.
    - Virkon Aquatic is the preferred disinfectant for equipment coming into direct contact with fish.
    - Proper storage space is provided for this equipment.
- All equipment is scrubbed and disinfected after each use and before storage.
- Disinfectant is an approved product used at the concentration and exposure time recommended by the supplier.
    - Virkon at 1% or 10 g to 1 liter water
    - Bleach at 200 ppm for 30 minutes
    - Peracetic acid 2%
    - Ovadine at 100 ppm for 10 minutes
- Other equipment used occasionally on site such as smolt transport units and trucks will have a cleaning and disinfection performed.
- Transport tanks that have been flushed with saltwater or water from another freshwater facility must be disinfected completely before returning to the freshwater facility.
- If equipment must be shared between two freshwater sites, it must be:
    - Approved by each site manager prior to transfer.
    - Cleaned and disinfected using the Four Step Equipment Disinfection Procedure.
- Four Step Equipment Disinfection Procedure
    1. Cleaning and removal of all organic material by pressure washing or physically scrubbing and using a detergent (Dawn or Oxyfoam for equipment, and looping caustic soda pH=12 for 12-24 hours for RAS systems)

2. Application of a 1% Virkon and freshwater solution.
3. Rinse with potable fresh water after 10 minutes if corrosion is a concern.
4. Proper isolation to avoid re-contamination. Placing equipment in sunlight or heated areas and drying thoroughly, when possible, is an enhancement to the procedure.

Employees

- Rain gear, boots, and equipment must remain on site and are not for personal use. Street shoes are not to be worn on site or in production areas.
- Employees will respect the biosecurity policy and will not compromise it by bringing fish samples (live or dead), water samples, equipment or raingear that has been used on either ornamental fish or wild fish, or other aquaculture site location or watersheds to the hatchery.
- Footwear worn on site will remain on site and will be disinfected between production areas.
- Employees are not permitted to enter fish rearing facilities in which they are not currently employed. The only exception will be at the sole discretion of the Freshwater Director and in accordance with all relevant disinfection procedures.

Site

- Sites have routine cleaning plans covering defined areas and describing tasks to be completed within each area.
- Sites will have specific year class cleaning plans where all tanks and systems will be cleaned when emptied of stock and disinfected before change of generations.
    - The entire section will be disinfected between year classes using the Four Step Equipment Disinfection Procedure and site-specific SOPs.
    - Disinfection includes tanks, equipment, external surfaces, system components and inside pipes.
    - Once an area has been disinfected, restrict entry, and use clean, area-specific clothing or gear to avoid cross contamination before the area is restocked.

Egg Incubation

To initiate salmonid freshwater culture, fertilized eggs are brought into the hatchery from the broodstock site. Transport of eggs from outside the facility has the potential to transmit pathogens to fish within the hatchery. Specific biosecurity protocols have been developed to address this risk.

Egg Disinfection

- At the broodstock site, eggs are disinfected with Ovadine after fertilization.
- Eyed eggs are disinfected with Ovadine upon arriving at the hatchery following egg disinfection procedures.
- Subsequent disinfection with formalin, as per SOPs.

Worker Protocols

- All workers have to read relevant procedures before performing tasks.
- Required personal protection equipment (PPE)- respirator, gloves, steel-toed rain boots, (rain gear if handling barrel or dispensing formalin) – to be used at all times.

Potential Hazards and Preventative Measures

- Safety Data Sheet (SDS) for Formalin (Parasite-S) to be read and available during use.
- Exposure to Parasite-S fumes to be avoided, wear all required equipment listed above to prevent inhalation.
- Exposure to Parasite-S splashing when opening/closing valves to be avoided, wear all required equipment listed above to prevent skin/eye exposure.

Transporting Fish

Transport activities have the potential to create a biological hazard therefore comprehensive transport protocols, developed to safeguard the environment and the fish are used by truck and vessel crews.

Fish Health Prior to Transport

Only healthy vigorous fish are transported to the saltwater farms. Prior to being transported, the fish are assessed for diseases to ensure pathogens are not present. The fish health assessment uses standards in the Health Policy for the Transfer of Live Cultured Finfish in Atlantic Canada and may include additional pre and post transfer requirements as determined by the Provincial Aquaculture Veterinarian. The fish health assessment and associated disease risk evaluation are requirements for the mandatory federal Introductions and Transfers Licence and the provincial Transport Permit.

Vessel Transport

For vessels, contact with the environment is reduced by using closed transports (without

exchange of water between the fish hold and the marine environment), except in the situations where fish welfare is compromised.

Please refer to the following sections for additional information.

- Section 4.3a Salmon Rearing Operations
- Section 4.3c Veterinary Services for All Life Stages

Equipment and Vessel Cleaning

- Prior to disinfection, the transport tanks and/or vessel must be emptied of fish and any organic material or coating is to be removed.
- Full cleaning to be completed in the following situations.
    - Before each transport of fish.
    - After transports between two aquaculture facilities or to a processing facility, and before commencing transports from another aquaculture facility.
    - After fish are unloaded at a processing facility where the fish are kept in holding pens and where the holding pen facility contains fish from other aquaculture facilities.
    - After completed transport of fish from aquaculture facilities which are subject to restrictions as a result of listed contagious disease.
    - When the equipment and/or vessel has been used at aquaculture facilities for other assignments in relation to handling of live fish without the fish being transported.
- Cleaning and disinfecting include all areas inside the fish holding area, outer areas of the vessel as well as all equipment and personal gear that has been used on the transport.

Cleaning Protocols

Depending on the operational situation, various levels of cleaning and/or disinfection will be required for the vessel, as outlined in Table 34.

Table 34 Operational Situation and Cleaning Level Required

Operational Situation	Stage 1	Stage 2	Stage 3
Arrival and departure from Canadian waters	√	√	√
Within the BMA – Operating on a site / between fish culture pen	√		
Within the BMA – Moving between sites	√	√	
Between BMA's – Moving from one BMA to another	√	√	
Moving between provinces	√	√	√

Stage 1:

- Brush / clean solids from all surfaces.
- Use either a mild detergent solution (Greenworks or Dawn) or a hot-water pressure clean (greater than 2000 psi at a temperature greater than 60° C with detergent/degreaser) to remove organic material from the following areas: deck and railings, wells, pumps (if applicable), and other equipment.
- After cleaning, spray the items with a disinfectant (see approved list below) and either leave on permanently, or wait 10 minutes prior to rinsing off.
- Clean and disinfect personal gear.

Stage 2: Complete Stage 1 plus the following:

- Internally inspect, clean, and disinfect any fish pumps or fish lines, being sure to clean all organic material from it before carrying out the normal disinfection procedure.
- Disinfectant is recycled through pump for a contact time of 10 minutes.
- Steam clean and disinfect the deck, well and hull above the waterline.
- Deck lines are submerged in disinfectant for >10 minutes.
- Complete the checklist.
- Sign the checklist with copies to be retained/distributed as follows: retain in the vessel disinfection log and kept on board at all times and copies to site manager and Fish Health and Welfare Director for auditing.

Stage 3: Complete Stages 1 and 2 plus the following:

- Slip the vessel, clean, and disinfect the hull below the waterline.

- If a disease is detected on a site, the Fish Health and Welfare Director will provide instructions on how the vessel may or may not interact with that site. Any special biosecurity protocols will be given at that time.
- The Fish Health and Welfare Director must be given as much notice as possible when a Stage 3 cleaning is anticipated so that a biosecurity audit can be arranged.
- Approval must be granted from the Fish Health and Welfare Director prior to the vessel moving between provinces and/or countries.

Approved Disinfectants

- Iodophor (e.g., Wescodyne, Iodor) at minimum of 100ppm
- Peroxide/Peracetic Acid (e.g., Oxygerm) at a minimum of 0.5%
- Sodium hypochlorite (e.g., Javex) at a minimum of 100ppm (Note – cannot dispose of this disinfectant at sea; only use on land or if disinfectant can be contained and brought back to land)
- Potassium Peroxymonosulfate (Virkon Aquatic) at a minimum of 1% (Note – can only be mixed with freshwater. Cannot be mixed with saltwater.)

Cleaning Quality Control

- The vessel shall conduct ATP hygiene monitoring to ensure quality of cleaning. The effectiveness of the cleaning process can be determined by testing surfaces for adenosine triphosphate (ATP). ATP is a molecule found in all living cells and it is responsible for transferring and storing energy. ATP levels act as an indicator of whether the environment has been properly cleaned.
- Designated ATP checklist identifies MCE ATP limit. Weekly frequency of ATP test as minimum or as described in vessel specific procedures. Documentation maintained in vessels maintenance system.

Accidental Fish Escape

- During vessel transport, there is limited opportunity for fish to escape as the fish are held securely within the hold of the vessel at all times.
- During transfer to and from the vessel, a catch net is used, and the ends of the transport pipe are submerged in the hold of the vessel and in the net pen.
- All vessels have procedures and barriers to prevent fish from escaping during all

operations.

- Comprehensive instructions must be in place and adequate training provided before using equipment.
- Ensuring procedures are followed is the responsibility of the Officer on Watch with actions or barriers implemented based on a risk assessment.
    - Openings from deck are covered with grating or net.
    - Valves for loading hoses are closed.
    - Loading and unloading hoses are covered with small, meshed net.
    - Before using, loading and unloading hoses and pipes are checked for weaknesses or wear.
    - Hoses and pipes are checked for fish before and after use.
    - Barriers that prevent fish escape, e.g., opening of incorrect valves, are intact to prevent being opened at the wrong time.

Handling of Mortalities

- To avoid mortalities, fish and water quality are monitored continuously during transport.
- Should mortalities occur, it must be reported prior to off-loading at the farm site.
- Mortalities are stored onboard between different voyages.
- Any fish that have died during transport are delivered to the receiving facility.
- Mortalities are kept at a designated location onboard until delivered.
- In the event of mass death onboard, dead fish are delivered directly to a facility approved for the reception and handling of animal waste product. All protocols as provided in section 6c Elevated Mortality and Reportable Disease Event Management will be followed.

Saltwater Farms

MCE is committed to having clean and bio-secure workplaces and has developed standard operating practices that support this goal. The following practices are vital to ensuring the safe and responsible operations on saltwater farms.

Please refer to the following sections for additional relevant information.

- Section 4.3a Salmon Rearing Operations
- Section 4.3c Veterinary Services for All Life Stages
- Section 4.3d Purpose and Use of Anti-microbials

- Section 4.3i Waste Management Normal Operations

Training and Audits

All staff receive training in biosecurity procedures. Biosecurity audits will be conducted by MCE Fish Health Unit to ensure that protocols are being followed by all MCE staff members and to determine the efficacy of the protocols. Specific procedures and frequency of audits are outlined in the MCE Biosecurity Audit Plan.

For information on the roles and responsibilities of the MCE Fish Health Unit, please refer to section 4.3c Veterinary Services for All Life Stages.

General Daily Biosecurity Practices

- All feed boats and rafts are scrubbed topside with Greenworks or similar detergent and disinfected with Iodor or similar sanitizer at the start and at the end of every day.
- Disinfecting foot baths are located for easy access and are used when boarding site vessels or work barges.
    - Footbaths are refreshed daily.
    - Iodor is mixed at a concentration of 100 to 200 mg/L with a ten-minute contact time.
- As much as practicable, all site gear and personal gear should remain on site.
- Any site gear, equipment or personal gear that is moved between sites must be cleaned and disinfected before leaving one site and again upon arrival at another site.
- Inflow wharves (Pool's Cove, Hermitage, Harbour Breton, Milltown) are to be used for all 'clean' material being transported to farm sites.
    - Vessels using inflow wharves will be cleaned and disinfected prior to use at these wharves, according to operational agreement with Department of Fisheries, Forestry and Agriculture for use of those facilities.
- At mixed-use wharves or facilities, vessels and vehicles will be cleaned and disinfected to reduce transmission of pathogens.
- All site staff are required to clean and disinfect their personal gear at the end of every day prior to leaving the site.

Travel Between Different Areas

From a fish health perspective, different areas include the following and include the numerical designation.

1. Broodstock
2. Freshwater
3. Saltwater
4. Quarantined site for fish health reasons (Freshwater or Saltwater)
5. Processing Plant

If staff are required to travel from one area to another, the following procedures apply.

- Staff required to move from one area to another have a separate set of work gear for each area. Under no circumstances are any uncovered clothing or personal protection equipment (PPE) brought from one area to another.
- Staff can move from one area to an area with a higher number designation without any restrictions (e.g., no restriction to go from a freshwater site to a saltwater site).
- If staff need to move from one area to an area with a lower number designation (e.g., from a processing plant to a saltwater site), a site-free period of 72 hours must be observed prior to moving to the second area.
- Vehicles (personal or work-related) are used for salt water or freshwater; never both. If staff are required to travel between two different areas of production, rental cars should be utilized for one of the areas.
- In addition to the numerical areas set above, an off-site period of 72 hours is observed if staff are moving from a site in one province to a site in another (regardless of their numerical designations).
- If there are any questions as to whether a 72-hour off-site period must be observed, staff are instructed to consult with a member of the Fish Health Unit for advice.
- Exceptions to this rule will be on a case-by-case basis and MUST be approved by the Managing Director OR the Fish Health and Welfare Director AND either the Freshwater Production Director or the Saltwater Production Director.

Visitors

- Allow 72 hours between visiting a different aquaculture company and an MCE site.
- Ensure that the vessel is cleaned and disinfected according to MCE vessel protocols prior to entering site boundary.
- MCE specific personal gear is to be worn on any of the sites. Personal gear refers to personal flotation device, rubber boots, hard hat, and rain gear (if required). If items have been worn on a different company's site, they should not be brought onto site, even if

they are not worn.

- Furthermore, if staff are working directly with fish, BMA specific gear is to be worn.
- All personal gear is clean and free of debris before starting each day. If handle fish, then it is cleaned and disinfected at the end of the day (if unsure, please ask the site manager).

- MCE reserves the right to do a biosecurity audit of personal vessel or gear used. This may include taking swabs to verify cleanliness of the item prior to arriving on sites.
- All visitors must sign in and register details of any recent visits to aquaculture facilities. Farm Access

Vehicles, vessels, and visitors can be agents of contamination. The following protocols are designed to limit the opportunity for disease transmission from one farm to another.

- Access to farm sites is controlled to provide a break between outside influences, such as predators, non-essential personnel, and vehicular traffic.
- The most efficient layout of farm sites is used to facilitate the development and maintenance of controlled access zones.
- Exclusive ‘in-flow’ or ‘clean’ wharf facilities at Pool’s Cove and Harbour Breton will be used as per the Wharf User Agreements.
- No outside visitors will be allowed on site without prior approval from the Saltwater Production Director and/or the Fish Health and Welfare Director.

Large Equipment Cleaning and Disinfection

For maximum biosecurity, all equipment must be thoroughly cleaned and free of all organic material prior to disinfection, using either a detergent like Greenworks or a pressure washer.

- As operationally practicable, vessels and feed rafts will be used on one site only. If necessary to move between sites, they will be cleaned and disinfected between sites.
- Dirty nets being removed for cleaning will be transported in a manner to minimize loss or spillage of organic matter and will be moved to designated outflow wharves only.
    - Pickup of dirty nets will be done in a manner to reduce risk of contamination with clean areas, using contained transport vehicles and containers.
    - Vehicles or containers used to transport dirty nets will be cleaned and disinfected at the end of each day.
- Nets will be cleaned of all organic material before disinfecting. Disinfection will be done

on land, as per government policies.

- To move vessels or large equipment from one BMA to another, prior approval is required from the Fish Health and Welfare Director.
- Vessels or large equipment can be moved from one site to another within the same BMA without prior approval, provided that the vessel is thoroughly scrubbed clean with Greenworks prior to disinfection with Iodor (250ppm for 10-minute contact time). All cleaning to be conducted as stated in large vessel biosecurity protocols SOP.
- Transport trucks will be designated to haul dirty or clean loads – not both, unless they have had a thorough cleaning and disinfection which has been verified by MCE staff.
    - Examples of dirty loads include:
        - Used site equipment – nets, weight balls, compensatory buoys, etc.
        - Fish (harvest or processed)
        - Mortality or offal
        - Used pallets
        - Garbage
    - Examples of clean loads include:
        - Feed
        - Clean or new site equipment

Harvest Disinfection Protocols

Harvest is managed to ensure no negative impacts on the environment, to harvest in the most humane manner possible, and to actively manage all situations that may cause stress or other negative effects on the salmon.

Comprehensive disinfection before the harvest will reduce the opportunity for build-up of potentially harmful substances on equipment and infrastructure.

- Deck and equipment of all harvest vessels to be cleaned and disinfected prior to loading the harvest tubs. Top holes must be used when strapping full tubs.
- All harvest tubs will be disinfected and inspected for cracks or missing plugs prior to use.
- All harvest tubs will only be partially filled to prevent spillage during transport. Plastic wrap will be used to prevent spillage during transport to processing facilities.
- A disinfectant hose or sprayer will be kept on hand to treat any spillage.
- All operations will be carried out in a manner to avoid any spillage or leakage of blood, slime, or scales.
- After a harvest and prior to site departure, all harvest tubs, harvest equipment, rain gear,

gloves, boots, free deck, and side of boat under the dewatering box will be cleaned and disinfected.

- After offloading at the processing plant, the deck and other gear will again be disinfected, as well as the surface of the harvest wharf.
- Fresh water will be used to wash equipment where contact with saltwater should be minimized (vehicles, forklifts etc.).
- Blood water will normally be contained in tubs with the fish, transported & disposed of in an approved manner at Harbour Breton processing plants.
- If harvesting via vessel, the vessel will do a topside cleaning and disinfection after loading harvest fish, but before leaving site.
- If harvesting from a site with a known disease, the vessel will use moving bulkheads to dewater back into the holds so the water can be disinfected with ozone prior to releasing into the sea.

Mortality Management

Prompt and regular removal of mortalities is necessary to maintain site biosecurity and to keep the rearing environment in good condition. Mortalities that accumulate in the culture pens can cause distortion in the nets and reduction of rearing area and water quality issues. During decomposition, mortalities can create an environment for growth of pathogens and attract predators and other unwanted animals.

The following protocols have been developed to ensure mortality is removed from the culture pens and from the farm in a manner that safeguards the environment and the cultured salmon.

Collection – Mechanical

- Portable air lift system consisting of a hose, suction funnel and dewatering box, or the Foover ROV mortality recovery system can be used to mechanically remove mortalities.
- Mortality and debris are vacuum pumped into totes on the surface.
- As a diver is required to direct the hose in the net pen, all diver biosecurity protocols must be observed.
- All equipment is to be cleaned and disinfected prior to use and after use prior to being stored.

Collection – Divers

- Dives to determine the number of mortalities and to remove mortalities will be conducted at least once each week, provided weather, water temperature, and other environmental

conditions are suitable. Every effort will be made to dive all sites twice a week, logistics-depending.

- Divers to maintain separate dive suits and gear for each site or ensure thorough disinfection between sites where this is not possible. If dive gear is to be used on multiple sites, prior approval from the Fish Health and Welfare Director must be granted.
- Site crew to ensure the dive vessels, personal apparel, and equipment of the divers are properly cleaned and disinfected before and after the dive at their site.
- Any gear not necessary for the dive should be removed from the dive vessel. All drains and scuppers in boats should be plugged for the duration of the dive to contain any spillage unless the boat is equipped with flap-type scuppers. In this case, efforts will be made to contain any spillage and disinfect prior to discharge.
- Divers should be disinfected in between pens as soon as the diver exits the pen (to allow contact time between pens).
- The vessel and all gear and equipment onboard must be thoroughly cleaned and disinfected immediately after the mortalities have been removed from the vessel. If mortalities must be transported to a wharf, the vessel will be cleaned and disinfected after the dive (prior to leaving site) and then again after mortalities are removed.
- Mortality storage totes or tubs
    - Must be in good condition (no cracks or breaks).
    - Mortality totes should not be filled more than ¾ and not overfilled. Fish totes should be leak-proof, free from damage and if drain stoppers are present, they should be sealed. The totes should be covered and secured before movement from the dive boat to a barge or transport vessel.
    - Mortality totes should be clearly marked with company name.
- No mortalities or moribund fish are to be released to the sea.
- Divers' suits and all dive gear must be disinfected upon completion of the dive.
- Pens with elevated number of mortalities or known health issues will be inspected last.
- If more than one site is to be inspected per day, older sites or sites with known fish health issues will be dove last.

Disposal

All MCE mortalities are disposed of in a manner that does not negatively affect the marine environment nor the health and welfare of the remaining salmon. Detailed mortality disposal protocols and procedures are available in the Fish Health Management Plan that is assessed annually and revised as required and provided to the Department of Fisheries, Forestry and Agriculture for review.

- Tubs with mortalities will be taken to the wharf where they will be held for storage (a layer of clean sawdust may be added as a bulking and odour control agent if mortalities are destined for composting) or transferred to large, sealed containers for eventual transport to the designated mortalities disposal facility.
- No material other than mortalities (i.e., no kelp, plastic wrap, mussel or other shells) are to be mixed with mortalities destined to be ensiled.
- All mortality totes or boxes are thoroughly cleaned and disinfected before being returned to the site. In addition, any mortalities tubs that are damaged or cracked will be taken out of rotation and disposed of. Only undamaged, fully intact tubs will be used for mortality collection.
- Every effort should be made to avoid transporting mortalities from one BMA to another.
    - If mortalities must be transported, they should only move from a BMA with younger fish to one with older fish, not vice versa. Furthermore, mortalities should be stored in a separate area away from other wharf activities. Any mortalities that are being transported should be in leak-proof containers that have lids that can be secured. Every effort should be made to ensure that mortalities are contained during transport.
- Under no circumstance should mortalities from one site be taken to another. It is the responsibility of each site crew to bring their own mortalities back to the wharf for disposal.

4.3c Veterinary Services for All Life Stages

Guidelines: Provide a description of aquatic animal health veterinary services through all salmonid culture life stages identified in section 4.3a.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, outline regulatory guidance for all activities pertaining to salmon culture fish health and welfare which provide direction to veterinarians and other fish health professionals. MCE meets or exceed the requirements in all policies and procedures. Specific references to regulations, policies and other APs are included in the section where applicable.

Table 35 Aquaculture Policies That Pertain to Section 4.3c

AP #	AP Title	Description
AP 7	Annual Reporting	Licensees are required to provide the following information on an annual basis for each licensed site: Annual Aquatic Animal Health Report.
AP 12	Transfers and Transport Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the Minister or designate. Health of all fish to be transported to be assessed by the Aquatic Animal Health Division (AAHD) Chief Aquaculture Veterinarian prior to transporting.
AP 29	Aquatic Animal Health Surveillance	All Licensees must have access to a Designated Veterinarian for the purposes of the Surveillance Plan.
AP 32	Aquatic Animal Health Reporting	Licensees must keep health records for the current stock at the aquaculture site/facility and must give the Chief Aquaculture Veterinarian (CAV) access to these records upon request.
AP 33	Aquatic Animal Health Contingency Plan	Licensees will follow the AAHD Contingency Plan during a provincial Reportable Disease event or outbreak.
AP 35	Biosecurity and Biosecurity Audits	Biosecurity plans must be submitted to the department for review and approval at the time of licensing, when updates are made to the company's plan, or upon request by the CAV.
AP 41	Emergency Chemotherapeutant Release	Emergency chemotherapeutant releases are approved by the Federal Government The CAV must be notified of any Emergency Drug Release prior to their submission.
AP 42	Animal Welfare	A Licensee must have their designated veterinarian performing, overseeing, or instructing employees on the humane euthanasia of fish during fish handling, sampling events, depopulation, and normal operations.
AP 43	Provincial Criteria for Aquaculture Quarantine Facilities	All Licensees with a quarantine facility must grant access to the aquaculture facility by AAHD staff or designated representatives to conduct biosecurity audits as per the AAHD Biosecurity Audit Plan.

Aquatic Animal Health Management

At Mowi Canada East Inc. (MCE), veterinary services are provided within the framework of a comprehensive Fish Health Management Plan (HMP) designed to ensure a continuous focus on fish welfare through-out the life cycle of the salmon.

The HMP is reviewed annually, revised as needed, and provided to the Department of Fisheries, Forestry and Agriculture (FFA) for review. Approval of the plan ensures all company practices are compliant with conditions of licence, regulations, policies, and all other directives from regulatory agencies.

The Fish Health and Welfare Director, company veterinarian, fish health managers and technicians, and production staff all have roles and responsibilities in ensuring fish welfare.

The “Fish Health Unit” refers to persons, including the veterinarian, who are responsible as a group for making major fish health decisions including identifying and managing risks to maximize fish health. Table 36 provides a description of the roles and responsibilities by position.

Table 36 MCE Fish Health Positions with Roles and Responsibilities

Position	Roles and Responsibilities
Fish Health and Welfare Director[a]	• team leader for and provides direction to the Fish Health Unit • responsible for fish health policies and procedures • manages of fish health research and other projects • responsible for reporting as per conditions of licence and other requirements to FFA, DFO, ECC and other agencies • responsible for providing information relating to fish health to the Communications Director for public reporting
Veterinarian	• exercises good medical judgment in all matters of fish health • responsible in overseeing fish health management • responsible for disease diagnoses, interpretations, writing prescriptions • ensures MCE maintains regulatory health compliance and health certification through regular site surveillance • is part of and works collaboratively with others in the Fish Health Unit to achieve fish welfare • reports to the Fish Health and Welfare Director
Fish Health Technicians	• conducts site sampling visits, fish health assessments, treatments and other activities as directed by the veterinarian. • completes established fish health activities including reporting • works collaboratively with others in the Fish Health Unit to achieve fish welfare
Fish Health Unit: Farm Managers, Technicians, and Veterinarian	• responsible for major fish health decisions • responsible for identifying and managing risks to maximize fish health
All Facility Staff	As per conditions of licence all facility staff must • know and abide by the Fish Health Management Plan and relevant operational procedures • practice appropriate hygienic procedures supportive of fish health and welfare • carry out specific fish welfare duties as assigned from time to time

[a]Fish Health and Welfare Director position is currently vacant and expected to be filled in 2023. Until the position is filled, fish health management will temporarily be the responsibility of the attending veterinarian who will report directly to the Managing Director.

Veterinary Services

Best Aquaculture Practices (BAP) certification also sets standards for management of fish health.

- Written procedures for the diagnosis and treatment of disease in fish shall include monitoring for endemic parasitic, bacterial, and viral infections.
- If used, drug treatments shall be based on authorizations by the fish health professional, who shall be guided by the HMP and principles of best practice for the veterinary profession.
- The health professional shall prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations.

Veterinary services are provided at all life stages of salmon culture to ensure fish health and welfare, see Table 37.

- Broodstock health is evaluated prior to eggs being transferred from the brood site to the hatchery for incubation. If mortality rates increase at any life stage, the veterinarian investigates the situation and makes the appropriate health management decisions or suggestions.
- Health screening for smolt and post-smolt is conducted a minimum of three times per year.
- During saltwater rearing, the designated veterinarian, or designated fish health technician, will oversee a health surveillance visit at every active finfish site every 30-45 days (weather & logistics dependent).

Provincial surveillance visits and/or biosecurity audits are conducted quarterly by provincial Aquatic Animal Health Division. Table 37 provides information on veterinary services for each stage of salmonid culture from egg incubation through to harvest.

Table 37 Veterinary Services for Each Salmonid Life Stage

Location	Culture Stage[a]	Veterinary Services
Hatchery	Egg Incubation	· Pre-egg transfer screening of brood stock (3x/year - one visit conducted by PAV[d] and two visits by DAV[b]) · As needed, or if mortality rates increase
	Fry (0.5-15 g)	· As needed or once/year at hatchery, or if mortality rates increase
	Juvenile to Smolt (15-250 g)[a]	· As needed, or if mortality rates increase
	Smolt to Post-smolt[a] (250+ g)	· COHFT[c] sampling 3x/year (one visit conducted by PAV[d] and two visits by DAV[b]) · As needed, or if mortality rates increase
Saltwater Farms	Smolt to Harvest (5 kg)	· Marine surveillance sampling required every 30 days (to be completed by DAVa or a veterinary supervised fish health technician) · Quarterly site visits by NL AAHD[e] (DAV[b] surveillance and provincial AAHD sampling periods are not required to overlap) · As needed, or if mortality rates increase

[a]Smolt and post-smolt are physiological points in salmonid development not a specific weight. Salmon are transported to saltwater farms at 80+ g.
[b]Designated Aquaculture Veterinarian
[c]Certificate of Health for Transfer, Pan-Atlantic Finfish Policy
[d]Provincial Aquaculture Veterinarian
[e]Aquatic Animal Health Division of FFA Aquatic Animal Health Division - Fisheries, Forestry and Agriculture (gov.nl.ca)

Service Providers

Salmonid aquaculture veterinary services are provided by the designated aquaculture veterinarian and the provincial aquaculture veterinarian, supported by several analytical and research laboratories as indicated in Table 38.

Table 38 Veterinary Services Providers

Veterinary Service Providers	
Attending Veterinarian (currently on contract)	Best Fishes Ltd.
Provincial Aquaculture Veterinarian	FFA, Aquatic Animal Health Division
Laboratories	Atlantic Veterinary College RPC Science and Engineering Kennebec River Biosciences Center for Aquatic Technologies (CATC) Center for Aquatic Health Sciences BC

Provincial Veterinarian

The responsibilities of the provincial veterinarian, FFA Aquatic Animal Health Division, for the culture of salmonids include the following.

- Conduct frontline veterinary medicine by providing aquaculture health extension services, develop aquaculture health policies, create, and oversee management plans, conduct applied research, surveillance, and biosecurity programs.
- Laboratory diagnostic services for finfish clients, active and passive surveillance, and applied research programs for Newfoundland and Labrador.
- Aquaculture clients include finfish producers, Fisheries and Oceans Canada, Environment Canada, and Memorial University of Newfoundland.

Designated Aquaculture Veterinarian

The designated aquaculture veterinarian is employed by or is under contract to MCE. They have critical responsibilities in determining and managing fish health practices including the prescription and application of chemotherapeutants which are highly regulated in Canada. As such, the veterinarian must be licensed in Canada and have a lawful Veterinarian-Client-Patient-Relationship (VCPR) with MCE.

As with the Fish Health Director, the position of MCE veterinarian is currently vacant but expected to be filled late 2023. Contract veterinary services are currently provided by Dr. Katrina MacNeill, a registered Aquatic Animal Health Veterinarian in Canada.

Fish Transport

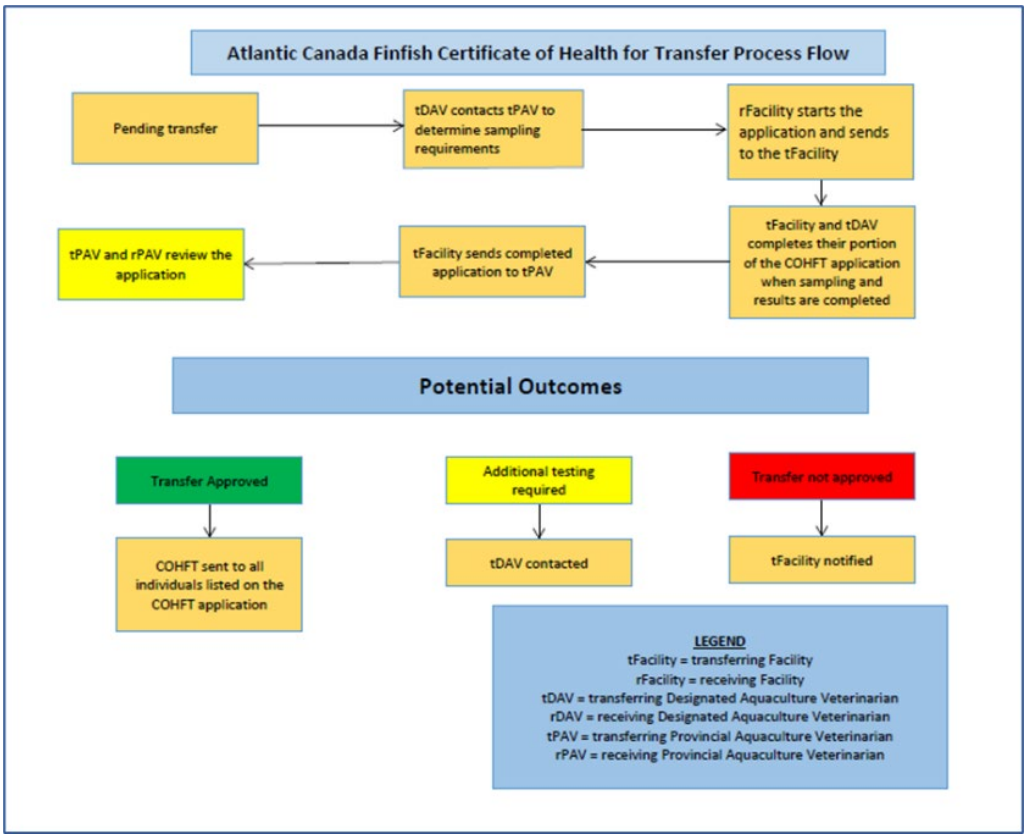
The hatchery is currently licensed to produce 4.5 million smolt and the Hatchery Expansion proposes production of an additional 2.2 million smolt annually. Moving fish from the hatchery to saltwater farms is an essential activity that requires proof the fish have met health standards prior to the required transport authorizations being granted. The fish health assessment is a key responsibility of the Designated Aquaculture Veterinarian working in collaboration with the Provincial Aquaculture Veterinarian.

The Health Policy for the Transfer of Live Cultured Finfish in Atlantic Canada (Policy) was developed to ensure aquaculture fish meet the health standards of the receiving province and healthy aquaculture production is supported. The Policy is implemented by each province through policy, regulation, or legislation according to specific jurisdictional authority and addresses fish health events, including pathogens of concern for aquaculture. The Policy outlines reporting obligations, roles and responsibilities of the producer/designated aquaculture veterinarian and the provincial aquaculture veterinarian, requirements for onsite health assessments, as well as recording and communication responsibilities, see Figure 36.

For fish transport within the province, the Policy provides the minimum requirements for the fish health assessment. The Provincial Aquaculture Veterinarian has the responsibility for determining if additional tests or assessments, pre or post transport, are required and if an Atlantic Canada Finfish Certificate of Health for Transfer (COHFT) is to be issued.

- For all fish transports, a federal Fisheries and Oceans Canada Introductions and Transfer Licence and a provincial Fisheries, Forestry and Agriculture Transport Permit are required. A condition of both authorizations is a health assessment that meets the Provincial Aquaculture Veterinarian's requirements.

Figure 36 Atlantic Canada Finfish Certificate of Health for Transfer - Process Flow with Veterinarian Responsibilities



4.3d Purpose and Use of Anti-microbials

Guidelines: Describe proposed use and purpose of antibiotics, anaesthetics, vaccines, pesticides, and disinfectants in all life stages identified in 4.3a.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide governance and management directions for the use of anti-microbials in salmon aquaculture. These APs and provincial regulations work in alignment with the federal regulations and controls on anti-microbial use. Specific references are also included with the information provided in this section.

Table 39 Aquaculture Policies That Pertain to Section 4.3d

AP #	AP Title	Description
AP 34	Aquatic Animal Health Disease Surveillance Designation	Licensees are required to have access to a licensed veterinarian. In accordance with the *Veterinary Medical Act*, only a licensed veterinarian can practice veterinary medicine, preventative medicine, perform surgery and diagnose with interpretation and treatment (prescriptions and mitigation).
AP 40	Integrated Pest Management Plan	Licensees must have a pest specific IPMP implemented and monitored by the company veterinarian. This will be updated as deemed appropriate by the veterinarian.
AP 41	Emergency Chemotherapeutant Release	Emergency chemotherapeutant releases are approved by the federal government. Chief Aquaculture Veterinarian must be notified of any Emergency Drug Release prior to their submission.

This section provides information on the purpose and proposed use of anti-microbial compounds such as antibiotics, anesthetics, vaccines, pesticides, and disinfectants, collectively known as anti-microbials. Anti-microbials are a broad category of substances used to kill microorganisms such as bacteria or mold or stop them from growing and causing disease and includes chemotherapeutants.

For this report, chemotherapeutants are defined as prescribed drugs used to treat pathogens that affect fish and are covered in Section 6f Chemotherapeutant Management.

The information in this section covers operations for all salmon culture stages at all MCE sites in the province including the production of the proposed Hatchery Expansion smolt.

Fish Health Management Plan

The purpose of salmonid aquaculture is to produce healthy robust fish. The management of fish pathogens, such as viruses, bacteria, fungi, and parasites, is key to fish health at all life stages. Pathogens can weaken fish causing suffering and if left untreated potentially cause death. The number one priority for fish farmers is fish welfare.

For fish culture, anti-microbials are used in the following ways.

- Disinfectants and vaccines are used to reduce likelihood of disease occurrence.
- Antibiotics, anti-fungal agents, and pesticides are used to treat specific conditions to reduce the cause and effects of disease and reduce the likelihood of disease occurrence.
- Anaesthetics are used to calm fish and improve fish welfare during health checks and to facilitate safe and thorough fish health evaluations.

The comprehensive MCE Fish Health Management Plan, Mowi ASA Policy on the Use of Anti-microbial Agents, and Best Aquaculture Practices certification provide standards, policies, and targets that direct the controlled use of anti-microbial agents.

MCE fish health management strategy has a multi-level approach and includes a comprehensive Fish Health Management Plan and Biosecurity Management Plan with protocols that proactively manage potential sources of diseases through prevention, surveillance, monitoring, diagnosis, and disinfection. Anti-microbial substances are used in all categories.

The Fish Health Management Plan (HMP) is reviewed annually, revised as required and submitted to the Department of Fisheries, Forestry and Agriculture (FFA) for approval to ensure compliance with all regulations and that culture practices align with provincial policies.

The HMP has the following objectives.

1. To outline good health conditions for rearing salmon.
2. To reflect the commitment by MCE to the principles, concepts, and elements of fish health management when culturing finfish or gametes in the marine environment or destined for, the marine environment, and the site-specific conditions of licence (i.e., culturing finfish in any open-water ecosystem).
3. To be used by MCE staff for training and for day-to-day interaction with the fish, and by other fish health staff who are responsible for maintaining and monitoring good health status of the fish, and by the Fish Health Unit, who makes decisions related to fish health.

All conditions of the aquaculture licence are followed during all stages of salmon aquaculture. Specifically for the use of chemotherapeutants, condition of licence #2 states “*All fish*

transferred from hatcheries must be vaccinated against known fish pathogens and in a manner approved by AAHD (Aquatic Animal Health Division of FFA)".

Mowi Policy on Use of Anti-microbial Agents

The Mowi ASA Policy on Use of Anti-microbial Agents guides the responsible use of licensed anti-microbials while minimizing the risks associated with anti-microbial resistant bacteria and ensuring compliance with respective laws and regulations. The policy ensures the use of anti-microbial agents is in line with World Health Organization (WHO) guidelines to mitigate the risk of human health consequences related to development of anti-microbial resistant bacteria.

The policy provides direction on the use of licensed anti-microbials, residue control, managing anti-microbial resistance, meeting established global standards, and fostering a culture of continual improvement within the company.

The following information pertains to this EPR, the full version of the policy is available at Mowi-Policy-on-use-of-anti-microbial-agents.pdf

Governance

- Strict practices and standards, dedicated fish health professionals, and trained staff, ensure fish are treated with licensed veterinary medicines only when needed.
- All prescriptions are signed by certified veterinarians/fish health professionals and are strictly controlled by the authorities.
- Withdrawal periods set by the respective authorities are observed and fish are tested for chemotherapeutant residues before harvesting.
- Managing Directors and Group Management Team have responsibility for anti-microbial use policy and implementation of best practices on responsible use.

Fish Health Management

- Fish health professionals continuously exercise their duty of care and attention to our fish.
- Good husbandry and management practices, biosecurity programs, and veterinary health plans, all under the supervision of fish health professionals, are used to control bacterial infections and reduce reliance on antibacterial substances.
- Fish health/veterinary health plans are designed with an emphasis on disease prevention, mitigation of stress, and limiting potential spread of infection if fish become sick.

- Staff regularly attend fish health courses which focus on disease prevention, management and medicine use.
- 100% of fish are vaccinated for the majority of salmonid bacterial and viral infections, reducing anti-microbial use.

Treatment with Licensed Anti-microbials

- Use of anti-microbials only when other measures are not sufficient or when fish welfare may be compromised. To not use anti-microbials under such circumstances would be unacceptable from a fish health and welfare perspective.
- Use of licensed anti-microbial medicines when specific bacterial infections are diagnosed and only with medicines that are approved and follow strict policies and regulations.
- All treatments are prescribed by certified veterinarians/fish health professionals and strictly controlled by the authorities. Whenever possible, a culture and sensitivity test is performed before any anti-microbial treatment, to avoid development of resistance.

Residue and Quality Control

- Pre-harvest withdrawal periods, set by the authorities, are strictly followed, and treated fish are analyzed before harvesting to ensure there are no residues.

Managing Anti-microbial Resistance

- Anti-microbials are never used prophylactically or to promote growth.
- Good husbandry and management practices, biosecurity programs, and veterinary health plans provide a sound basis for managing the risk of anti-microbial resistance. These indicate what measures should be used, when and which combination of measures to apply. This systematic approach ensures alternation of measures and sufficient fallowing periods, which minimize the risk of resistance development.
- Licensed anti-microbial medicines are only used when specific diseases are diagnosed and there is no alternative, or when fish welfare and health is compromised.
- Prudent and responsible use of licensed anti-microbial medicines is practiced at all times to optimize their use to preserve effectiveness.
- All treatments are prescribed by certified veterinarians / fish health professionals and are strictly controlled by the authorities.
- Pre-harvest withdrawal periods set by the authorities are observed and systematic analyses conducted to document residue levels are below legal limits. Residue controls

are additionally verified by the authorities on a regular basis.

- Recommendations and best practices as outlined in the “World Health Organization (WHO) guidelines on use of medically important anti-microbials in food producing animals” have been adopted.
- Restrict use of all anti-microbial classes, which according to the WHO appears to be more effective in reducing anti-microbial resistance compared to narrow restrictions of single anti-microbial classes.
- As per WHO recommendations, anti-microbials listed as critically important for human medicine are avoided and can only be used as exemptions under the judgement, prescription, and supervision of a veterinary professional, and if microbial sensitivity results demonstrate that the selected anti-microbial is the only treatment option.
- Licensed anti-microbials are replaced with evidence-based and sustainable solutions to prevent bacterial diseases and safeguard fish health and welfare, such as vaccination and improved husbandry and management practices.
- All anti-microbial use is monitored, controlled, and reported in the annual report.

Company and Global Standards

- Adopt standards that meet and exceed regulatory requirements and industry guidelines on use of anti-microbials and commitment to certify to Global Good Agricultural Practices (GAP), Aquaculture Stewardship Council (ASC) and Best Aquaculture Practices (BAP) standards that address aspects of anti-microbial use and reducing the risk of resistance development.

Continuous Improvement

- Focus on the development of better practices, and conduct R&D on new vaccines, to further reduce bacterial infections, anti-microbial use, and the risk of resistance development. Continuous advances in breeding programs and compliance with the ASC standard will further contribute to responsible use.

Best Aquaculture Practices

Best Aquaculture Practices (BAP) certification also has the following requirements for use and disposal of anti-microbials that MCE follows.

- Antibiotics shall only be used to treat diagnosed bacterial disease and shall not be used as growth promoters.

- The facility shall keep complete and accurate records for each culture unit and production cycle, including the culture unit identification number, unit area and volume, species stocked and, if applicable, species specifications such as triploid.
- An inventory shall be kept of all hazardous materials or wastes (chemotherapeutants and materials that are hazardous to people) stored on or disposed of by the facility.
- Documents shall be available from feed manufacturers that state antibiotics or other drugs are not present in non-medicated feed, that provide details of drugs or antibiotics in medicated feeds, and state that levels of heavy metals and PCBs/ dioxins in feed are below limits for those compounds set by the countries in which the plants operate.
- Where vaccines or anesthetics are used, records shall be available to show they were used in accordance with manufacturers' instructions and with the approval of a qualified veterinarian or Aquatic Animal Health Professional, or, if used outside manufacturers' instructions, with the express direction of a qualified veterinarian.
- Where effective vaccines are available, animals shipped from the facility shall be vaccinated according to the requirements of the importing region or country, or customer specification. Records must be available for inspection.
- Records shall be maintained for every application of drugs and other chemicals for therapeutic treatment that include the date, compound used, approving veterinarian or health professional (if applicable), dose and date on which the animals were transferred to another facility and the name of the facility. If the animals were harvested for human consumption, records of compliance with required withdrawal times shall also be maintained.
- A list of therapeutants used by the facility shall be available for inspection.
- Where vaccines or anesthetics are used, records shall be available to show they were used in accordance with manufacturers' instructions and with the approval of a qualified veterinarian or AAHP, or, if used outside manufacturers' instructions, then with the express direction of a qualified veterinarian.
- Where toxicant-based antifouling agents are used on pens or culture nets, documents shall be available to show that all necessary authorizations for their use were obtained. Net-cleaning procedures that allow the collection, treatment, and disposal of wash water in compliance with national regulations shall be used.

Chemotherapeutant Use in Aquaculture

The use of chemotherapeutants in salmonid culture is tightly regulated with several levels of compliance, oversight, and reporting.

- Approved Substances Available Only
    - Only substances approved by Health Canada and having a DIN number are approved for sale in Canada and approval is granted only after extensive testing. See tables below for a list of drugs approved for use in salmon aquaculture.
- Substance Use Approval
    - For pesticide use, provincial Department of Environment and Climate Change (ECC) must be notified 72 hours in advance and provide approval prior to use.
    - MCE Fish Health and Biosecurity Plans include policies and operating procedures for therapeutants that meet all FFA and company standards.
- Prescriptive and Controlled Use
    - Approved substances have comprehensive application and disposal conditions determined by Health Canada that must be followed exactly.
    - Veterinarian prescription and supervision during use is required for many therapeutants.
- Management and Reporting
    - Every application of chemotherapeutant must be documented with treatment records available and provided upon request.
    - Aquatic Animal Health Reports for each facility are prepared by the veterinarian to include all details of disease, status, and treatments, and submitted annually to FFA.
    - Annual Aquaculture Activities Reports submitted annually to DFO and Regional Aquaculture Management Offices

Canadian Regulations and Management of Therapeutants

The following information is provided from Therapeutant use in aquaculture - Questions and answers - Canadian Food Inspection Agency (canada.ca)

Therapeutants are chemical substances used in aquaculture to keep fish healthy and include the following.

- A drug is defined as any substance used in the diagnosis, treatment, mitigation, or prevention of disease or abnormal physical, to restore or correct organic functions, or disinfect premises where food is manufactured, prepared, or kept. Drugs in Aquaculture - Canada.ca

- Pesticide is a common term used to refer to many types of pest control products.
    - For aquaculture, if therapeutants are added to water to control only external parasites (i.e., topically applied to fish by submersion in a bath), they are deemed a pesticide and are regulated under the *Canadian Pest Control Products Act* and Regulations.
    - The Pest Management Regulatory Agency (PMRA) within Health Canada approves pesticides under the *Canadian Pest Control Products Act*. For more information refer to Health Canada's PMRA.
- Vaccines are substances used to stimulate immunity to a particular disease or pathogen and are usually administered prior to the fish being affected.

Health Canada (HC) is responsible for protecting human and animal health and the safety of Canada's food supply. Through the Veterinary Drugs Directorate (VDD), HC evaluates and monitors the safety, quality and effectiveness of substances used to keep fish healthy, sets standards, and promotes the prudent use of veterinary drugs.

VDD works both at a national and international level in collaboration with other jurisdictions and key stakeholder groups, including drug manufacturers, veterinarians, livestock producers and feed manufacturers. Each group plays a vital role in maintaining Canada's high standards for safe food and safe use of effective veterinary drugs.

In Canada, only specific drugs are authorized for use with aquatic animals for food. They are identified by the Drug Identification Number (DIN) on the label. It is illegal to sell and have in possession for sale and distribute any drug which does not have a DIN.

Therapeutants Approved for Use

In addition to testing for effectiveness and safety, HC also determines the conditions for the use of each drug and withdrawal periods to ensure food safety. Withdrawal period refers to the minimum period of time from administering the last dose of medication and the production of products for food. See tables below for a list of drugs for salmon aquaculture with their purpose and conditions of use. Note for more details on the conditions of use, please refer to the HC website via the link provided, see Table 40 and Table 41.

Table 40 Veterinary Drugs Authorized by Health Canada for Use in Food-Producing Salmonids

Name	Active Ingredient	DIN	Treatment/ Purpose	Conditions, Withdrawal*
Aquaflor	Florefenicol	0221742	Treatment of Furunculosis	12-day withdrawal
Syncaine	Tricaine Methanesulfonate	02168510	Anaesthesia, sedation	5-day withdrawal
Parasite-S	Formalin	02118114	Treatment of external parasites	
Pyceze	Bronopol	0298880	Treatment of fungal infection	Not foir adult fish
Romet 30	Sulfadimethoxine and Ormetoprim	02242954	Treatment of Furunculosis	42-day withdrawal, water temperature greater than 10°C
SLICE	Emamectin Benzoate	02328216	External parasites, sea lice	No more than 1 treatment in the 60 days prior to harvest
Terramycin-Aqua	Oxytetracycline Hydrochloride	0607657	Treatment of ulcer disease, furunculosis, columnaris disease, coldwater disease, enteric redmouth	40-day withdrawal at water temperatures 10°C or higher 80 days withdrawal when water temperatures below 10°C
Triberessen 40% Powder	Trimethoprim and Sulfadiazine Powder	02146037	Treatment of *Vibrio anguilliarum*	80-day withdrawal

Reproduced from: List of Veterinary Drugs that are Authorized for Sale by Health Canada for Use in Food-Producing Aquatic Animals - Health Canada - Canada.ca.

Table 41 Veterinary Drugs Authorized by Health Canada for Use in Hatchery Egg Rearing

Name	Active Ingredient	DIN	Treatment/ Purpose	Conditions, Withdrawal
Ovadine	Povidone-Iodine	02305712	Disinfectant, sanitizer	Not for use on fish eggs, do not contaminate food or food handling equipment
Perox-Aid	Hydrogen Peroxide	02238749	Treatment of freshwater fungus on eggs	
Pyceze	Bronopol	02298880	Treatment of fungus on eggs	

Reproduced from: List of Veterinary Drugs that are Authorized for Sale by Health Canada for use in Hatchery Eggs (Aquaculture)- Health Canada - Canada.ca

Anti-microbials Used by MCE - Application and Conditions of Use

For freshwater and saltwater culture, therapeutants are prescribed by the attending aquaculture veterinarian only after they have diagnosed a health condition that is best treated in this way.

Veterinarians are responsible for managing the treatment using the prescribed therapeutant, ensuring all conditions of use are followed, and the withdrawal conditions are met to ensure the treated fish are safe for human consumption. Please refer to section 4.3c Veterinary Services for All Life Stages for veterinarian roles and responsibilities.

There are a limited number of chemotherapeutants available for use in salmonid aquaculture as indicated previously. Regulatory requirements and MCE policies to protect the environment direct how and when available chemotherapeutants are used. In addition, the cautious prescription of chemotherapeutants by the designated veterinarian and oversight by independent agencies ensures chemotherapeutants are used only when other methods of addressing the fish health situation have been exhausted.

Table 42 provides a list of chemotherapeutants used in the past two years by MCE. The information is divided into each life stage for cultured salmonids and provides the purpose, the application, and the conditions of use for each chemotherapeutant.

Table 42 Chemotherapeutants Used by MCE in the Past Two Years by Culture Stage with Method of Application and Conditions of Use.

Life Stage	Chemotherapeutants Used in Past 2 Years or *Planned for 2023	Purpose	Method or Application	Conditions of Use
Egg Incubation	Virkon	Disinfectant, sanitizer	Surface cleaner	
	Ovadine (Povidone-Iodine)	Disinfectant, sanitizer	Surface cleaner	Not for use on fish eggs destined for human consumption, do not contaminate food or food handling equipment
	Parasite-S (formalin)	Treatment of external parasites	In tank, Bath Treatment	
Fry (0.5-15 g)	Virkon	Disinfectant, sanitizer	Surface cleaner	
	Syncaine (Tricaine Methanesulfonate)	Anaesthetic	Bath Treatment	5-day withdrawal at water temperatures of 10 °C or greater
	Parasite-S	Treatment of external parasites	In tank, Bath Treatment 1-5g fish	
Juvenile to Smolt[a] (15-250 g)	Virkon	Disinfectant, sanitizer	Surface cleaner	
	Syncaine (Tricaine Methanesulfonate)	Anaesthetic	Bath Treatment	5-day withdrawal at water temperatures of 10 °C or greater
Smolt to Post-smolt[a] (250+ g)	Elanco Renogen	Treatment of Renibacterium salmoninarum, Bacterial Kidney Disease	Vaccination	Do not vaccinate fish within 60 days of harvest
	Elanco Forte VII-Forte Micro	Treatment of furunculosis, vibriosis, and cold water vibriosis	Vaccination	Do not vaccinate fish within 60 days of harvest
	*Pharmaq Alpha Ject Micro 7 ISA	Treatment of coldwater vibriosis, furunculosis, Infectious pancreatic necrosis, Infectious salmon anaemia, vibriosis, winter sores	Vaccination	Do not vaccine fish within 60 days of harvest
	Virkon	Disinfectant, sanitizer	Bath Treatment	
	Syncaine (Tricaine Methanesulfonate)	Anaesthetic	Bath Treatment	5-day withdrawal at water temperatures of 10 °C or greater

Life Stage[a]	Chemotherapeutants Used in Past 2 Years	Purpose	Method or Application	Conditions of Use
Smolt /Post-smolt[a] to Harvest (5 kg)	Virkon	Disinfectant, sanitizer	Surface cleaner	
	Syncaine (Tricaine Methanesulfonate)	Anaesthetic	Bath Treatment	5-day withdrawal at water temperatures of 10 °C or greater
	Perox-Aid (Hydrogen Peroxide)	Treatment of External Parasites (sea lice)	Bath Treatment	
	Elanco Forte VII-Forte Micro	Furunculosis, vibriosis, and cold water vibriosis	Vaccination	Do not vaccinate fish within 60 days of harvest
	SLICE (Emamectin benzoate)	Treatment of external parasites	In-feed	No more than 1 treatment in the 60 days prior to harvest
	Salmosan Vet (Azamethiphos)	Treatment of external parasites	Bath Treatment or vessel	48-hour withdrawal
	Interox Paramov 50 Aquaperox 50 (Hydrogen Peroxide)	Treatment for external parasites.	Tarp or bath Treatment	No withdrawal

[a]Smolt and post-smolt are physiological points of salmonid development not specific weight. Salmon are transferred to saltwater farms at 80+ g.

4.3e Freshwater and Saltwater Use at Hatchery

Guidelines: 4.3e) Provide description of freshwater and saltwater use in the hatchery/hatchery expansion project, from source to discharge. Provide a full description of all components with a process flow diagram and indicate expansion project components.

This section provides information on freshwater and saltwater use at the hatchery, specifically the flow of freshwater and saltwater from source to discharge. The information in this section pertains to all production at the Indian Head Hatchery including the proposed Hatchery Expansion.

The following sections in other areas of this report provide additional information.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery
- Section 4.2a Indian Head Hatchery Expansion Construction
- Section 4.3a Equipment and Procedures for All for Culture of Life Stages
- Section 4.3f Hatchery Groundwater Source and Operational Volumes

Water Source

Freshwater for fish culture is 100% groundwater - sourced from the aquifer to the northeast of the hatchery. Saltwater for fish culture is 100% sourced from saltwater wells located on the Seaside Links Golf Course. No domestic water is used for fish culture.

Water from the freshwater aquifer wells and the saltwater wells is pumped to the Water Treatment Building where it is UV disinfected and held in reservoirs prior to being gravity-fed to the fish culture units. Saltwater and freshwater are processed and stored separately in the Water Treatment Building.

Water Flow Through the Hatchery

Freshwater is required for egg incubation, fry, and smolt rearing. Water from the influent Water Treatment Building is delivered separately to the Incubation/Fry Building and Smolt Buildings 1-2-3 to make up for the effluent removed by the RAS culture systems. Liquid effluent from these buildings is directed to Effluent Treatment Building 1 for processing and is pumped to Effluent

Treatment Building 2 for further treatment and discharge.

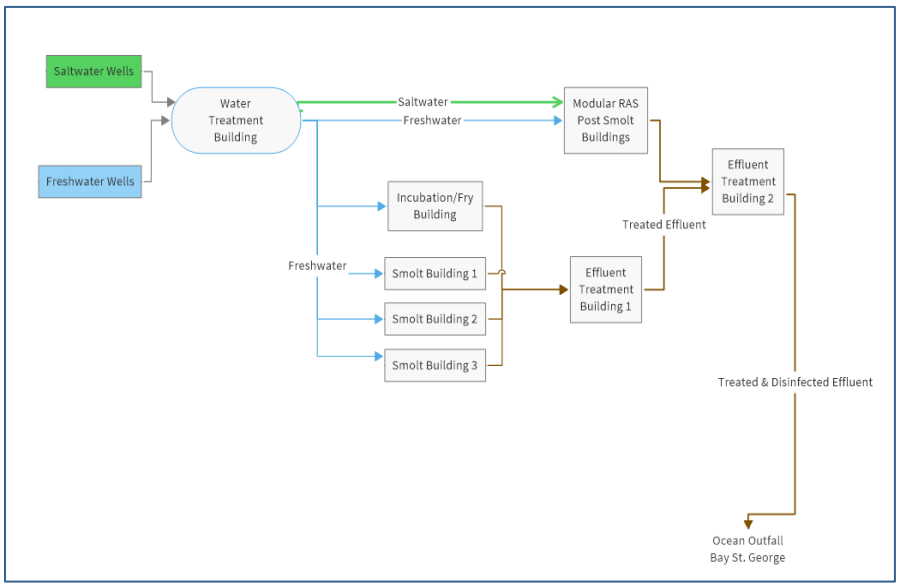
Saltwater is used for saltwater acclimation of smolt before being shipped to the saltwater farms. Saltwater from the Water Treatment Building will be used for post-smolt rearing in the Modular RAS Building. Neither the saltwater wells nor the Modular RAS Building are complete. Please refer to section 4.2a Hatchery Expansion Construction for details on the work to be completed and estimated schedule.

Effluent from the Modular RAS Building will flow to Effluent Treatment Building 2, where it is combined with the effluent from Building 1 and further treated before being pumped to a deep-water ocean outfall.

Fish culture water - fresh and saltwater – flows from the Water Treatment Building to the hatchery culture systems where it is stored in a local sump or reservoir before being used for fish culture. Water from the fish culture tanks is treated by RAS technology and up to 97% returned to the fish culture system. The water removed during RAS treatment becomes liquid effluent which is directed to an Effluent Treatment Building for processing prior to discharge in Bay St. George. Please refer to section 4.3h Hatchery Fish Culture Effluent Management for more information on effluent processing.

Figure 37 provides a schematic of the water flow from the wells through the hatchery to the effluent treatment and discharge outfall. Saltwater is indicated in green, freshwater in blue, fish culture liquid effluent in brown.

Figure 37 Hatchery Fresh and Saltwater Use



Water Use

The natural life cycle of Atlantic salmon starts in freshwater and this stage is replicated at the Indian Head Hatchery with the rearing of eggs to smolt using freshwater.

For both natural salmon and cultured salmon, the move to saltwater requires a complicated internal shift in metabolic processes that is best accomplished over time with slowly increasing levels of salinity.

The Hatchery Expansion includes saltwater supply to be used for this acclimatization. Experience in other jurisdictions has shown saltwater acclimatization can support better survival during transport and first weeks in saltwater, improved overall fish health, and enhanced growth to harvest.

Table 43 provides fresh and saltwater use at the hatchery, infrastructure, and the status of construction for saltwater as it is a component of the Hatchery Expansion.

Table 43 Water Use, Infrastructure, and Status of Construction for Hatchery Expansion Components

Existing or Expansion	Infrastructure	Freshwater Use unless Indicated	Status of Construction
Existing Hatchery	Incubation/Fry Building	Egg incubators, fry culture units and RAS water treatment	N/A
	Smolt Building 1	Juvenile culture units and RAS water treatment	N/A
	Smolt Building 2	Juvenile culture units and RAS water treatment	N/A
	Smolt Building 3	Juvenile culture units and RAS water treatment	N/A
	Effluent Treatment Building 1	Solids removal, effluent discharge	N/A
Hatchery Expansion	Modular RAS (Post-smolt) Building	Freshwater and Saltwater post-smolt culture units and RAS water treatment	Partially complete
	Effluent Treatment Building 2	Solids removal, disinfection, deep water ocean discharge	Complete
	Water Treatment Building	Disinfection and water reservoirs gravity fed to culture building reservoirs	Complete
	Freshwater wells	Production wells and line to Water Treatment Building	Complete
	Saltwater wells	**Saltwater** production wells, barrier wells, line to Water Treatment Building	Partially complete

4.3f Hatchery Groundwater Source and Operational Volumes

Guidelines: identification of the groundwater source and operational water withdrawal volumes required for the hatchery expansion project.

This section provides information on the groundwater source of fresh and saltwater used for the Indian Head Hatchery salmon rearing including the proposed Hatchery Expansion production.

Groundwater Source

All fish culture water is sourced from private wells developed specifically for the hatchery. No

fish culture water comes from the municipal system.

These wells are used according to the permit granted by the Department of Environment and Climate Change (ECC), Water Resources Management Division specifically for the hatchery. The wells described in this section are installed according to ECC Water Resources Management Division requirements and their use is monitored through real-time data and regular reports.

The well system was designed to fulfill all current production requirements plus the expected requirements of the Hatchery Expansion. No additional wells are planned.

The well fields that provide water to the hatchery are located in the following three areas.

1. Area one: Three freshwater wells in a previously developed well field.
2. Area two: Three or four freshwater wells at depths of 70 to 80 m below ground surface in a recently developed well field.
3. Area Three: Three saltwater wells in a recently developed well field located between the golf course and the ocean. Three barrier wells used to induce sea water intrusion are required at this location to ensure the production wells meet the salinity requirements. Saltwater will be used only in the Modular RAS Building.

The production wells in area two include a test well, constructed in February 2018, to survey the aquifer that was reconfigured to a production well and two additional wells installed between the test well and the previous well field. Water Use Licence, WUL 18-9929, issued by ECC Water Resources Management Division covers the construction and use of these wells.

Please refer to section 4.1a Geographic Location and Physical Components, Indian Head Hatchery for location of the wells and equipment description.

Operational Water Use

One of the benefits of using Recirculating Aquaculture Systems (RAS) technology is the reduction in the volume of water required to grow each fish. Once the treated groundwater has entered the culture units, up to 97% is cleaned and re-used with less than 5% discharged as effluent. In a stable fish culture system, the new water required is equal to the effluent discharged, therefore the more effective the RAS technology, the less new water is required.

The wells described in the previous section provide more than enough water for the current production at the hatchery and the proposed Hatchery Expansion. Table 44 provides the allowable volume of water as per the hatchery Water Use Licence (WUL 18-9929), the actual use since 2019, and the estimated water requirement for the Modular RAS Building once

operational.

The Hatchery Expansion Modular RAS Building and the saltwater influent system are not complete therefore actual volumes are currently unknown. The following is an estimate for future (2024) water withdrawal volumes once the Modular RAS Building is complete is included.

- The calculation uses the 2.2 million Hatchery Expansion fish as 33.8% of the total hatchery production of 6.7 million and the additional production would require 33.8% more operational water once the culture systems have been filled.
- The saltwater requirement is variable and dependent on the available supply and the requirement of the smolt; therefore, no estimate is provided.
- The Modular RAS Building design was based on a maximum 5000L/min fresh water and 4000L/min saltwater.

Table 44 Hatchery Freshwater and Saltwater Use

Use	Freshwater Volume m^3	Saltwater Volume m^3	Estimated Use for RAS Modular Building m^3
WUL*	4,493,880	2,102,400	
2019 Actual	1,734,067	0	
2020 Actual	1,971,296	0	
2021 Actual	2,359,450	0	
2022 Actual	2,673,302	0	
2024 Estimate	3,470,796	unknown	797,494+

*Water Use Licence 18-9929

+ Assumes ER 1975 is released from further environmental assessment September 2023

4.3g Hatchery Influent Water Quality Management

Guidelines: identification of the minimum water quality parameters required to support all hatchery operations as well as the industry or regulatory standards they meet or exceed. Describe all treatment, testing and monitoring of intake water to ensure sufficient quality for fish life support, including processes and technology involved with screening and filtration, UV radiation, oxygenation, aeration, nitrogen removal, or any other proposed treatment.

The culture of Atlantic salmon requires water with specific characteristics. In the wild, salmon can move to find the ideal environment but for culture it is the responsibility of the fish farmer to provide the ideal aquatic environment.

Hatchery operations manage water quality primarily in two areas: 1) before influent water enters the fish culture systems and 2) within the fish culture system recirculating aquaculture systems technology. This section provides information on the management of influent water quality including regulatory and industry standards and treatments to ensure the water meets standards. Section 4.3k provides information on the management of water quality within the fish culture systems.

Unless otherwise indicated the information provided in this section pertains to the culture of all salmon at the Indian Head Hatchery including the proposed Hatchery Expansion smolt.

The following sections provide additional information on the management of fish culture water quality at the hatchery.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery
- Section 4.3e Fresh and Saltwater Use at the Hatchery
- Section 4.3f Hatchery Groundwater Source and Operational Volumes
- Section 4.3k Fish Culture Water Quality
- Section 6a Capacity and Suitability of the Indian Head Aquifer

Salmonid Culture Water Quality Parameters

In the table below, the water chemistry requirements for salmonid culture are provided and compared to the analyses of the hatchery groundwater sourced from wells developed in the nearby aquifer area.

The general chemistry, total metals, and dissolved metals data indicate the water from the freshwater aquifer is suitable for salmonid culture and showed no evidence of hydrocarbon impacts in the immediate area of the test well. Table 45 provides the water chemistry requirements for salmonid culture and the levels of these components in the water sourced from aquifer wells.

Table 45 Water Chemistry Requirements for Salmonid Health Compared to Influent Water Analysis

Parameter	Units	Application	Recommended Minimum	Recommended Maximum	Chronic Toxic Limit	Acute Toxic Limit	Pump 1	Pump 2
Ammonia	mg/LTAN			1[1]	1			
Cadmium	mg/LCd	Hard Alk>100 mg/L		0.003[4]		0.08 to 0.42[2]	<.000017	<.000017
Chlorine	mg/LCl			0.003 to 0.005[3]	0.05[3]	0.1 to 0.3[3]		
Chromium	mg/LCr			0.03[4]		2 to 20[2]	0.001	0.001
Copper	mg/LCu	Alk>100 mg/L		0.01[3]	0.03[3]	0.1[3]	<0.001	<0.001
Hydrogen Cyanide	mg/LHCN			0.005[1]				
Iron	mg/LFe			0.1[3]			<0.05	<0.05
Lead	mg/LPb			0.02[1]		1 to 40[2]	<0.0005	<0.0005
Mercury	mg/LHg			0.0002[3]		0.01 to 0.04[2]		
Nickel	mg/LNi			0.1[1]			<0.002	<0.002
Nitrate	mg/LNO_3		0[1]	400+[1]	1000+[1]	1310[2]	0.21	0.38
Oxygen, Dissolved	mg/LDO		6[2]					
pH			6.5[2]	8[2]				
Phosphorus	mg/LPb		0.01[1]	3[1]			0.02	0.02
Selenium	mg/LSe			0.01[1]				
Silver	mg/LAg			0.003[1]			<0.0001	<0.0001
Total Dissolved Solids	mg/LTDS			200[3]			190	179
Total Suspended Solids	mg/LTSS			80[1]				
Turbidity	NTU over ambient			20[3]			0.6	0.8
Uranium	mg/LU			0.1[1]			0.0003	0.0003
Vanadium	mg/LV			0.1[1]			<0.002	<0.002
Zinc	mg/LZn			0.005[1]		1 to 10[2]	<0.005	<0.005

Regulatory Standards

The Department of Environment and Climate Change (ECC), Water Resources Management Division is responsible for freshwater resources management under the *Environmental Protection Act* and the *Water Resources Act* and has the mandate to protect, enhance, conserve, develop, control, and effectively utilize the water resources in the province.

For hatchery use of the local freshwater aquifer, the Water Resources Management Division has provided instructions and criteria for the assessment of the aquifer and for the continuous monitoring. They have approved the well locations, development criteria, and issued a Water Use Licence for the extraction of the water for fish culture.

Water Quality Testing

Extensive testing and modeling of the freshwater aquifer was completed prior to submission of the Hatchery Expansion for environmental assessment in 2018 and demonstrated the aquifer has the capacity to meet the fish culture requirements.

A test well was sited and drilled in February 2018 to evaluate the aquifer potential and water chemistry as a source water for the proposed Hatchery Expansion. Figure 38 shows the location of test well MHPW1.

Figure 38 Freshwater Test Well MHPW1

Aquifer assessments consisting of a step-drawdown test, a 72-hour constant discharge test followed by monitoring of the recovery of the water level in the Test Well and monitoring wells, were completed between March 19 and 22, 2018.

- Five potable water samples, three fish health samples, (tested for bacteria, viruses, parasites, and fungi that could adversely affect the fish) and additional water samples for low-level BTEX/TPH hydrocarbon analysis, were collected during the 72-hour aquifer test. Water chemistry requirements for culture of salmonid are compared to the water analyses. The safe yield is controlled in part by the size of the well screen and with a specific capacity of approximately 400 litres per metre of drawdown.
- The estimated safe yield of the wells is 2,300 Lpm. Please refer to Table 45 for assessment results.
- The general chemistry, total metals and dissolved metals laboratory data indicate that the water tested is suitable for salmon aquaculture.
- The low-level BTEX/TPH laboratory data show no evidence of hydrocarbon impacts in the immediate area of the test well.

Saltwater Supply

Saltwater is used to acclimatize salmon to the marine environment prior to culture at saltwater farms. To determine the potential for obtaining saltwater, monitoring wells were constructed, and the resulting data was used to determine the preferred well location, potential water volume, and well construction requirements.

Two monitoring wells (FHS1 and FHS2) were drilled between the paved highway and the southern edge of the Seaside Links Golf Course to determine if water chemistry was suitable.

From the data collected, a saltwater well system was designed that included three production wells drilled in close proximity to the ocean on the Seaside Links Golf Course each constructed using a 250 mm (10 inch) diameter well screen with a straight well assembly and each well design was adapted to the aquifer materials encountered during the borehole drilling.

Water Source Monitoring

The three well fields described in the previous section are controlled by a common wireless three node system with real-time monitoring of the water level and flowrate/pump discharge from a control center in the hatchery.

Each production well has an individual flow meter and an individual water level sensor. The sensors are hardwired into the wireless node for each well field. The data is recorded in real-time on a set schedule.

To ensure accurate data is reported, the flow meters are calibrated against a calibrated turbine flow meter on an annual basis. The water level sensors in each well are calibrated by direct measurement of water levels using a standard water level meter.

The water supply pumps in each well are equipped with variable frequency drives also controlled from the hatchery control room.

The pump discharge pipe at each well head is designed to allow the collection of water samples under pressure for water quality monitoring on a periodic basis - quarterly for the first year and currently every six months after the first year of operation. The existing production wells will be sampled individually at the well field pump house.

- Laboratory analysis on the collected water samples from each production well will include the standard potable water analysis as provided by the Water Resources Management Division guidelines, including both total metals and dissolved metals as well as low-level BTEX/TPH.

Real-time monitoring of water chemistry from each production well is not feasible due to the need to frequently calibrate the sensors and the limited range of parameters that the available sensors can measure accurately. However, water quality for the combined freshwater supply is monitored on a real-time basis.

- Aquifer wide water level and water quality monitoring will be completed using both single level and multi-level piezometers. Two piezometers are in place for areas one and two.
- Two additional piezometers have been constructed, one up gradient and one trans-gradient of the test well/production well.
- The capture areas and the travel times for the area two well field were computed using the 3D flow and transport model and confirmed they are well located to monitor changes in water levels and water quality within the recharge area and within the aquifer.
- As an added precaution, a multi-level, deep, piezometer has been constructed in area one between the Ministry of Transport property and the existing production wells.
- A second multi-level deep piezometer is installed close to the area two test/production well.
- A third aquifer monitoring well is installed along the existing road between the Town of Stephenville sludge disposal pits on the edge of the airport and the area one well field. Real-time monitoring of water quality and water levels in those piezometers is not feasible and is not warranted based on the 3D model simulations and the difficulty in maintaining water quality sensors.

Data loggers (Leveloggers) provide water level and temperature data every 30 minutes and each sensor is equipped with a direct reading cable to allow for regular downloading of the recorded data. The piezometers provide a clear indication of any changes over the long term.

Quarterly sampling was conducted during the first year of well field operation and currently it is every six months. The periodic water sampling, with the same analytical program for the water supply wells plus the near-continuous recording of water levels provides the data needed to achieve real-time monitoring of the aquifer performance and water quality. This has indicated the quality of the water remains high and the volume of water used by the hatchery has not diminished the aquifer capacity.

ECC Water Resources Management Division Monitoring

In addition to the water source monitoring by the hatchery, ECC Water Resources Division requires three levels of data collection as part of the Hatchery Expansion release conditions in 2019.

- Extensive hydrological assessments of the aquifer with future modelling.
- Groundwater assessment and monitoring assessing water levels and water quality.
- A real-time groundwater monitoring program with data going directly to Water Resources Management Division. This program was a Condition of Release of ER 1975 2018 release from further environmental review.

Though the release of the Hatchery Expansion was rescinded in 2021, the three stations identified as the Northern Harvest real-time groundwater monitoring stations are established and monitoring is being conducted. The monitoring system will remain and continue to be operated as per the Water Use Licence (WUL 18-9929) with the data provided to Water Resources Management Division to evaluate the use of the aquifer and be alerted to any potential negative impacts.

Table 46 provides the conditions of release for groundwater use and the status of compliance with the conditions. Appendix C: Indian Head Hatchery Expansion ER 1975 Conditions of Release has the letter releasing the project from further assessment.

Table 46 ER 1975 Conditions of Release for Groundwater Use and Status of the Conditions as of June 2023

Release Conditions	Status
The proponent shall complete a **hydrogeologic assessment of the proposed groundwater source**. This assessment shall be carried out by a qualified hydrogeologic professional and submitted to the Minister of Municipal Affairs and Environment for approval. **Reports on the progress of this assessment are required to be submitted to the Water Resource Management Division every two months** until the assessment is complete and accepted by the Minister of Municipal Affairs and Environment.	Assessment and reporting complete
The proponent shall implement a **groundwater monitoring program to monitor water levels and water quality**. The program must be developed with and meet the approval of the Minister of Municipal Affairs and Environment **within two months from the release date**. **Continuous ongoing monitoring:** Water level data shall be collected continuously using a recording data logger, and selected water quality parameters will be monitored Annual reports submitted to this department for review for a period of at least two years. Extension of the monitoring and reporting beyond two years will be at the discretion of the Minister of Municipal Affairs and Environment.	Groundwater monitoring program and equipment installation complete Annual reporting ongoing
The proponent will be required to enter into a **Memorandum of Understanding** with the Department of Municipal Affairs and Environment for the installation of a **real-time water quality and quantity monitoring network** to monitor water levels and selected water quality parameters within two months from this release date. The type, number and location of the stations required will depend on site conditions and final operation plans. The proponent is to bear all costs associated with the groundwater monitoring network and installation, operation, and maintenance.	Real-time monitoring network installation complete Data sent in real-time to ECC

The groundwater system is designed to allow ready access by the regulator to the full monitoring system and its real-time database to confirm that the groundwater monitoring program is being executed as outlined. On-going bi-annual reports will be compiled and submitted to ECC Water Resources Management Division for review on an approved schedule as determined by ECC.

Influent Water Treatment

Currently only freshwater is being used to culture salmon at the hatchery. According to the ongoing monitoring and water analyses, the groundwater meets salmonid culture requirements and there are no contaminants leeching into the fresh water source.

The aquifer has been the source of fish culture water for the hatchery since 2011 and has

consistently proven to be of excellent quality for salmonid culture and sufficient volume during this time. However, as a precautionary measure, freshwater is UV disinfected prior to being used in the fish culture systems.

Freshwater Disinfection

The freshwater disinfection system in the Water Treatment Building is comprised of two independent ultraviolet reactors operating in parallel. Flow from the freshwater wells passes through one of the reactors.

A flow meter is used to identify the freshwater flow through each individual reactor and valves direct the flow evenly through the reactors. The minimum disinfection dose applied is 200 mJ/cm^2 which is in excess of dosage required to eliminate waterborne fish pathogens. Please refer to section 4.3b Biosecurity Protocols for a list of waterborne fish pathogens and the minimum UV dose required to inactivate them and a table of water disinfection stations and dose administered.

Data outputs to the central management system include the following.

- Flow through that individual reactor
- UVT of water passing through that specific reactor
- Intensity (dose) water passing through the reactor has received.

Each reactor has two alarm conditions to alert staff if UV treatment is interrupted.

- Shutdown warning
    - This system is designed to identify conditions such as elevated temperatures or loss of flow that could result in equipment failure if unaddressed. This should generate an alarm but not require an automated change in pump operations.
- General alarm
    - This alarm identifies conditions such as lamp or ballast failure that will result in a failure. The well pumps should immediately stop operating.

In the event that any condition limits the minimum dosage, the central management system will automatically reduce or interrupt the system flow (into all of the reactors) to ensure that the minimum dose is being delivered to all water passing through all of the reactors.

Should an individual reactor experience a general failure, all flow through all reactors will be automatically halted. This allows operators to take any reactor out of service while maintaining operation of the second reactor and manage the flow during the time only one reactor is functional.

Saltwater Disinfection

The saltwater system is currently not complete and is not being used. The saltwater inflow disinfection system has similar equipment and processes to freshwater disinfection.

Reservoir Water Level Controls

Both the saltwater reservoir and the freshwater reservoir are controlled with a level sensor.

- Assuming the UV reactors are operational, the saltwater supply pumps will automatically adjust speed to maintain a target water depth in the reservoir.
- The fresh water supply pumps will also automatically adjust speed to maintain a target water depth in the reservoir. However, control of the freshwater well pumps speed is not conditional on perfect operation of the freshwater UV reactors.
- Both reservoirs have been supplied with reservoir recirculation pumps which draw water out of the reservoir discharge and return it to the head of the reservoir. If the reservoir water level is low, the associated reservoir recirculation pump will automatically shut down.

4.3h Hatchery Fish Culture Effluent Management

Guidelines: a description of all treatment, testing and monitoring of hatchery effluent and identify industry/regulatory standards for the treatment of hatchery effluent prior to discharge

Fish culture produces wastes that include fish feces, uneaten food, fish scales, and products of fish metabolism. In the hatchery, the waste is carried in the fish culture water and removed by the RAS technology that is part of each culture systems. The removed wastes, or effluent, includes the solid and dissolved products plus the water that carries them. This section provides a description of the hatchery effluent management procedures and the standards that apply to fish culture waste management.

Unless otherwise indicated, the information provided in this section pertains to all fish culture effluent produced at the Indian Head Hatchery including the proposed Hatchery Expansion. Please refer to the following sections for additional information.

- Section 4.1a Geographical Location and Physical Components, Indian Head Hatchery Subsection Fish Culture Waste Management for the following information

    - Effluent Treatment Buildings 1 and 2 locations, equipment, and descriptions
    - Effluent discharge line route and specifications
    - Deep-water ocean outfall location, description, and permit information
    - Disposal of effluent solids
- Section 4.3f Hatchery Groundwater Source and Operational Volumes
- Section 4.3k Fish Culture Water Quality Management

Waste Volume

All hatchery fish culture effluent is processed through Effluent Treatment Building 2 prior to discharge. This building and the waste management equipment has been designed to accommodate the maximum volume of waste from the currently licensed production plus the maximum estimated waste from the Hatchery Expansion production, as provided below.

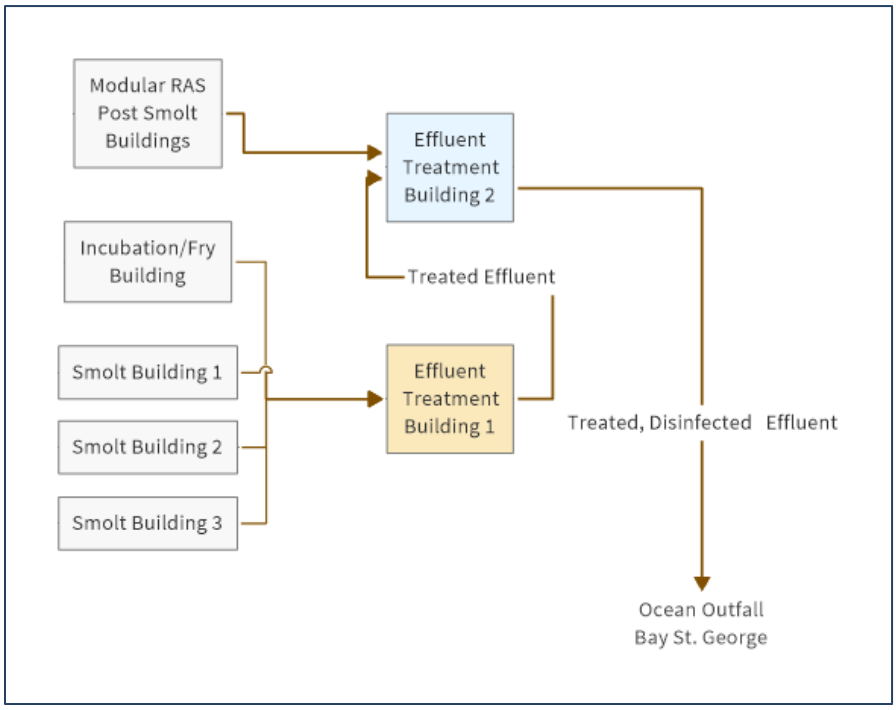
- 35MT (640m^3 of sludge @ 5% solids) of solids in wastewater (9,750 gallons @ 3.75 Kg/gallon)
- 1,735,067MT of culture water (1,735,067 m^3 @1,000 kg/m3)

Effluent Processing

The Indian Head Hatchery has two effluent treatment buildings that together remove particles down to 37 microns, disinfect with UV to remove pathogens, and triple screen to eliminate potential for fish to escape. The treated effluent is discharged to a deep-water outfall and the solids are disposed at land-based facility under contract.

Fish culture effluent from the Incubation/Fry and Smolt 1-3 buildings is pumped to Effluent Treatment Building 1 for processing and from there is pumped to Effluent Treatment Building 2 for additional processing. Fish culture effluent from the Modular RAS Building goes directly to Effluent Treatment Building 2. After treatment and disinfection, the combined effluent is pumped to a deep-water outfall in Bay St. George, see Figure 39.

Figure 39 Effluent Processing



Ecological Improvements

The purpose of the Hatchery Expansion is to improve and increase hatchery salmon production and reduce the potential for negative environmental impacts. The effluent management system in Effluent Treatment Building 2 and deep-water ocean outfall are examples of environmental improvement.

- Treatment Building 2 houses equipment to provide enhanced effluent treatment that removes very small particles (to 37 microns), kills all pathogens with UV disinfection, and triple screens to eliminate potential for escapes.
- The ocean outfall discharges treated effluent at a deep-water location in Bay St. George.

Effluent Disinfection

Ultraviolet germicidal irradiation or UV is uses short wavelength ultraviolet light to eradicate microorganisms. The system in Effluent Treatment Building 2 provides a continuous minimum dose of 200 mJ/cm^2 which has been proven effective against waterborne pathogens commonly associated with aquatic recirculating systems.

Please refer to section 4.3b Biosecurity Protocols for a list of water borne pathogens and UV doses required to eradicate the pathogen. This section also includes a list of hatchery locations where UV disinfection is applied and the minimum dosage.

One of the benefits of using UV disinfection is that it takes place only inside the UV vessel (exposure chamber) and leaves no residue in the water. Therefore, it is harmless to organisms downstream. In contrast, chlorine/bromine treatment leaves a residual in the water that can irritate the skin and eye tissue of mammals, reptiles, and birds. Ozone, if not measured and controlled properly, can cause severe tissue damage even death in fish and invertebrates.

Effluent Testing

Table 47 provides the fish culture effluent parameters that are evaluated monthly at the hatchery.

Table 47 Parameters for Monthly Effluent Evaluation

Effluent Parameters	
Oxygen Demand, Biochemical (BOD5)	Chloride
Solids, Total Suspended (TSS)	Chromium, Hexavalent
Solids, Total Dissolved (TDS)	E. coli
Ammonia (NH_3 as N)	Oil & Grease (Total) in Water
Nitrate (NO_3 as N)	Trace Metals and Mercury (Water)
Nitrite (NO_2 as N)	Digestion for Metals in Water
Nitrate + Nitrite (NO_2+NO_3 as N)	Cyanide (Subcontracted)
Ortho Phosphate (O-PO_4 as P)	Phenolic Compounds (Subcontracted)
Phosphorus, Total (Water)	Sulphide
pH	

Effluent Deep-water Discharge

Treated, disinfected, and screened liquid effluent will be pumped via an underground 500mm HDPE effluent line around the Port of Stephenville and across the golf course before discharging to a deep-water ocean outfall. The line is installed in the same trench as the saltwater line to minimize disruption to the environment during construction and for ease of locating the line for inspection.

Solids Disposal

“Solid” effluent is a slurry of the larger particles removed by settling, the RAS drum filters, and the Effluent Building drum filters with a small amount of liquid effluent. Solid waste is consolidated in sumps at the hatchery. The waste is pumped out and trucked to licensed on-land facilities under contract with Gale’s Septic Services.

Regulations and Standards

The following are standards for fish culture effluent management.

- NLR 65/03 Environmental Control Water and Sewage Regulations, 2003
- Best Aquaculture Practices Certification Standards, Guidelines: Finfish, Crustacean and Mollusk Hatcheries and Nurseries, Appendix A.

The Province of Newfoundland and Labrador Environmental Control Water and Sewage Regulations, 2003, under the *Water Resources Act* provides the regulations for discharge to a body of water. All conditions in the *Act* must be followed and discharge prohibitions include the following.

> 6. A person shall not discharge into a body of water sewage or effluent
>
> > (a) containing a constituent specified in Column 1 of Schedule A having a content in milligrams per litre in excess of the maximum specified in Column 2 of that Schedule.
> >
> > (b) having a temperature in excess of 32° celsius;
> >
> > (c) having a pH value less than 5.5 or greater than 9.0; or
> >
> > (d) a radio-active substance having a gross beta activity before discharge of more than 37 Bq per litre except for
> >
> > > (i) radium 226 which shall not exceed 0.37 Bq per litre, and
> > >
> > > (ii) strontium 90 which shall not exceed 0.37 Bq per litre.

The table below summarizes the standards in NLR 65/03 Environmental Control Water and Sewage Regulations (NLR), Best Aquaculture Practices (BAP), and the average results of monthly effluent monitoring at the hatchery for 2022.

Typical effluent parameters from a blended saltwater/freshwater culture are also provided.
In all cases, the criteria used to design Effluent Treatment Building 2 was the most stringent of the three sources.

Table 48 NLR and Best Aquaculture Practices (BAP) Effluent Standards and 2022 Averages from Monthly Effluent Testing at the Hatchery

Parameter	Units	NLR 65/03	BAP[1] (<5 yrs in operation)	BAP[1] (+5 yrs in operation)	Hatchery 2022 Average
Temperature AM	^{0}C	32			11.57
Temperature PM	^{0}C	32			11.77
E. coli		5000/100ml			<1.0
Aluminum	mg/L Al				1.00
Ammonia	mg/LTAN	2.0	5	3	0.45
Antimony	mg/L Sb				< 0.0001
Arsenic	mg/L As	0.5			< 0.001
Barium	mg/L Ba	5.00			0.03758
Beryllium	mg/L Be				< 0.0001
Bismuth	mg/L Bi				< 0.001
BOD	mg/L	300[2]	50 or less	30 or less	32.3333
Boron	mg/L B	5.0			0.01
Cadmium	mg/LCd	0.05			0.00
Calcium	mg/L Ca				47.4167
Chlorine	mg/L Cl	1.0	< 800 mg/L[3]	<550 mg/L[3]	124.39
Chromium	mg/L Cr	0.05			0.002
Cobalt	mg/L Co				0.00
Copper	mg/L Cu	0.3			0.00
Hydrogen cyanide	mg/L HCN	0.0025			< 0.01
Iron	mg/L Fe	10			0.03
Lead	mg/L Pb	0.2			< 0.0001
Lithium	mg/L Li				0.00
Magnesium	mg/L Mg				7.8583
Manganese	mg/L Mn				0.01
Mercury	mg/L Hg	0.005			< 0.000025
Molybdenum	mg/L Ni				0.00
Nickel	mg/L Ni	0.5			< 0.001
Nitrate	mg/L NO_3	10	5 or less	3 or less	4.5417
Oil and Grease		15			< 10
Oxygen, dissolved	mg/L DO		4 or more	5 or more	8.9500
Oxygen, dissolved	mg/L DO		4 or more	5 or more	8.5917
pH	mg/L	5.5-9.0	6.0 - 9.5	6.0 - 9.0	7.8750
Phenols		0.5			0.00
Phosphorous	mg/L P				1.3317
Phosphorous	mg/L P	1	0.5 or less	0.3 or less	0.4100
Potassium	mg/L K				1.3483
Rubidium	mg/L Rb				0.0006
Selenium	mg/L Se	0.01			< 0.001
Silver	mg/L Ag	0.05			< 0.0001

Parameter	Units	NLR 65/03	BAP1 (<5 yrs in operation)	BAP1 (+5 yrs in operation)	Hatchery 2022 Average
Sodium	mg/L Na				91.5458
Strontium	mg/L St				0.08808
Sulphide	mg/L S				< 0.05
Tellurium	mg/L S				< 0.0001
Thallium	mg/L Te				< 0.0001
Tin	mg/L Sn				< 0.0001
Total Dissolved	mg/L TDS	1000			374.66667
Total Suspended	mg/L TSS	30	50 or less	25 or less	38.25000
Uranium	mg/L Ur				0.00
Vanadium	mg/L V				0.00
Zinc	mg/L Zn	0.5			0.014

[1]Best Aquaculture Practices, [2]5-day BOD, [3] Discharged into freshwater (less than 1 ppt salinity, specific conductance below 1,500 mmhos/cm or chloride less than 550 mg/L is considered fresh)

4.3i Waste Management Normal Operations

Guidelines: provide a description of the anticipated volume of waste to be generated and waste management methods during normal operations

This section provides information on management of the anticipated types and volumes of waste generated during normal operations. Unless otherwise indicated, the information provided pertains to all fish rearing activities at MCE sites in the Province of Newfoundland and Labrador including the proposed Hatchery Expansion production.

Please refer to the following sections for waste management in specific situations.

- Section 4.2d Waste Management During Construction
- Section 4.3h Hatchery Fish Culture Effluent Management
- Sections 4.3l Integrated Pest Management Plan
- Section 6c Elevated Mortality and Reportable Disease Event Management
- Section 6f Chemotherapeutant Management

MCE is dedicated to the principles of environmental sustainability and that includes safe materials handling and management of waste materials in a manner that reduces the potential for negative environmental impact.

Since 2008, MOWI ASA has worked with the World Wildlife Fund to strengthen the sustainability of aquaculture and to improve the industry's environmental standards.

The MOWI Sustainability Strategy guiding principles of "Planet and People" sets the framework for social and environmental performance. These commitments are aligned with the United Nations Sustainable Development Goals (SDGs). Annual reporting across all business units, including Mowi Canada East Inc. (MCE), on all aspects of the strategy encourages environmental accountability and the development of new approaches to reduce waste.

The Sustainability Strategy includes measures for handling all materials in a responsible manner to minimize potential risk to the environment and is achieved by applying the following priorities.

1. Reduction of the volume and non-recyclable wastes through efforts such as identifying and reducing single use plastic containers.
2. Recycling and re-purposing of waste materials over landfill dumping whenever possible.
3. Treatment and monitoring of the effluent released from the hatchery into the marine environment and mitigation and/or clean-up as required.

The MCE Environmental Waste Management Plan and the Materials Storage, Handling and Waste Disposal Plan (MSHWDP) are developed according to the conditions of the aquaculture licence and requirements of the Department of Fisheries, Forestry and Agriculture (FFA) Environmental and Waste Management Plan Guidelines 2022 and to align with the Mowi Sustainability Strategy. The plans are reviewed annually to include innovative developments in waste management and are submitted to FFA for approval.

Standard operating practices are developed to ensure all materials are handled in a responsible manner that prioritizes recycling over landfill dumping and that non-biological and non-organic materials are not discharged into marine or freshwater environments.

Of special concern is hazardous waste and the first step in controlling hazardous substances is reduction of use and recognition of their presence on site.

- The Hazardous Materials Inventory Form is used to track location of items on site and is a reference for ensuring that Safety Data Sheets (SDS) are available for all substances.
- The form includes all substances that may be commonly found on site and for which SDS are required, other hazardous materials that may not be normally found on site and waste hazardous materials that may be stored on site prior to disposal.

For aquaculture facilities, a clean bio-secure production environment supports healthy fish and fish welfare is a key principle of fish culture that guides the development of best practices and

hazardous materials use and management.

All staff have training in the management of waste materials to ensure they are aware of the company practices and can complete their duties appropriately.

Materials purchase and storage, and waste handling and disposal practices have been developed to meet the priorities listed above.

- MCE purchasing policies are developed to ensure that as materials are requisitioned thought is given to ***Reduce*** the potential for over purchasing.
- Once materials have been used, ***Recovery*** and/or ***Reuse*** of materials are prioritized.
- The majority of the waste materials are collected and sorted for ***Recycle***.
- The remaining waste is disposed of according to ECC waste management policies.

Indian Head Hatchery

Table 49 lists the common waste materials generated during salmon culture at the hatchery. The annual volumes have been estimated and appropriate waste management practices, that minimize potential environmental interactions, are provided.

Table 49 Waste Materials, Volume and Management Practices at the Indian Head Hatchery

Waste Materials	Approximate Volume* (MT annually)	Waste Management Practices
Household Recycling: paper, plastic, tin cans, glass Household garbage	Negligible n.d.	**Reduce/Recycle**: Household recyclables (plastic and cans) centrally collected on site, sorted as required and delivered to a recycling depot. **Residual Disposal:** All efforts will be made to reduce the amount of garbage that cannot be recycled. Garbage will be collected in a central location on the site and delivered to the disposal depot by Containerized Sanitation Ltd.
Oil, Fuel	1.5 MT	**Recycle:** Used oils and waste fuel are collected on site and recycled. **Reduce:** Use captured in global sustainability reports.
Therapeutants	negligible	**Reduce:** Excess medicated feed disposed of under direction of company veterinarian. **Residual Disposal:** Outdated medicated feed is returned to feed manufacturer for disposal.
Cleaners and Disinfectants	negligible	**Residual Disposal**: Expired biosecurity chemicals are collected at site and shipped to an appropriate lab facility for disposal via an appropriate contractor. Arrangements will be made with the Fish Health and Welfare Director.
Paint	negligible	**Residual Disposal:** Old paint will be collected onsite in a secure container and transported to a depot to be disposed of. **Residual Disposal:** Arrangement may be made with a service provider.
Facility Maintenance – metal, wood & PVC	2.5MT	**Reduce:** Regular maintenance schedule will include all aspects of the facility **Reduce/Residual** Disposal: Repairs undertaken so no debris or materials are discarded in the water and all repair materials will be collected and disposed of as appropriate on land.

Waste Materials	Approximate Volume* (MT annually)	Waste Management Practices
Fish Feces/Fish Culture Water	29MT (555m^3 of sludge @ 5% solids) of solids in wastewater 7,730 gallons @ 3.75 Kg/gallon) 2,672,302MT (2,672,302 m^3 @ 1,000 kg/m^3)	**Reduce:** fish are fed to satiation only and feedidng is stopped once this point has been reached. Systems are designed with an expected amount of feces generated. **Reduce/Residual Disposal:** Feces will be transported via the fish culture water from the fish tanks to effluent treatment system using closed pipes. <u>Effluent Use</u> Effluent from fish culture is rich in nutrients and discussions are underway to provide the liquid and potentially the solids for use in other applications. <u>Effluent Treatment</u> Large solids settled out. Smaller solids captured with 80-micron drum filtration in Effluent Treatment Building 1 and finer solids captured with 37-micron drum filtration in Effluent Treatment Building 2. Ultra Violet sterilization and removal of pathogens. Discharged to the deep-water outlet in marine environment in the St. George's Bay. Monthly assessment of effluent discharge. Sludge from settling and filtration stored in tanks onsite and removed periodically by a contractor (Gales Septic Services Ltd.) and disposed of at a licensed site (South Branch, NL).
Fish Discards, Mortalities	35MT mortality 30MT culls	**Disposal:** Mortalities collected daily, stored in 1 cubic meter insulated fish totes. All mortalities and discards are recorded in Mercatus AquaFarmer. **Disposal:** Contracted to New World Dairy and sent as needed depending on the number. NWD can accommodate this level of material weekly and accepts silage and whole fish. For mortality in excess of this amount, the Burgeo rendering plant owned by the Barry Group is also available.
Feed Waste	negligible	**Reduce:** Feed is rotated in feed storage area to ensure that it doesn't go out of date prior to use.
Empty Feed Bags	2MT	**Disposal:** Feed packaging collected in a central area and sent to the local land fill.
Empty Salt Bags	6.5MT	**Disposal:** Salt packaging collected in a central area and sent to the local land fill.

Waste Materials	Approximate Volume* (MT annually)	Waste Management Practices
Household Greywater - Human Waste, Septic	1MT solids in septic system	**Disposal:** Centrally collected on site, removed by Gales Septic Services Ltd. and disposed of in their licensed septic lagoon (South Branch, NL) in a responsible manner consistent with CFIA regulations, and provincial regulations.
Printer Cartridges	negligible	**Recycle**: Where available, arrangements made to drop off at the recycling depot.
Retired Technology (computers etc.)	negligible	**Recycle:** Return to company IT Department for recycling.
Damaged Production Equipment or Parts	negligible	**Reuse, Recycle:** Where appropriate, parts/materials recycled, donated or sold, **Residual Disposal:** otherwise disposed of according to provincial regulations at Western Regional Waste Management, Bay St. George Waste Disposal Site at the discretion of the Hatchery Manager.
Out-of-service Production Equipment	negligible	**Reuse, Recycle**: Where appropriate, equipment will be recycled, donated or sold Residual Disposal: disposed of according to provincial regulations at Western Regional Waste Management, Bay St. George Waste Disposal Site.

*negligible = <1MT annually, n.d. = unable to determine

Vessel Transport

Vessels are used to transport smolt from the hatchery to the saltwater farms and from the saltwater farms to the processing plant. Vessel waste disposal in Canadian waters is regulated through the *Canadian Environmental Protection Act, 1999* *Disposal at sea legislation and regulations - Canada.ca*. In addition, Canada is a signatory to the International Convention for the Prevention of Pollution from Ships (MARPOL), International Convention for the Prevention of Pollution from Ships (MARPOL) (imo.org) that covers management of on-board generated sewage, greywater, ballast water, wash water, and other forms of garbage.

MARPOL 73/78, Annex V, regulation 10 (2,3) states the requirement for and details of a Garbage Management Plan.

> "*Every ship of 100 gross tonnage and above, and every ship which is certified to carry 15 or more persons, and fixed or floating platforms shall carry a garbage management plan which the crew shall follow. This plan shall provide written procedures for minimizing, collecting, storing, processing and disposing of garbage, including the use of the equipment on board. It shall also designate the person or persons in charge of carrying out the plan. Such a plan shall be based on the guidelines developed by the Organization and written in the working language of the crew"*

Transport vessels manage waste generated from on-board activities according to a Garbage Management Plan. This plan is developed to protect the environment and comply with Canadian and international regulations.

The Garbage Management Plan provides the following directions for waste management.

- All waste discharge or incineration must be recorded, and the recording verified.
- When ordering supplies, spare parts etc., packing material is to be reduced to a minimum or use, whenever possible, reusable packing. If practicable, packing material in which stores, provisions, and spare parts are delivered to the vessel, should be collected upon delivery, and given back to the supplier.
- To minimize the generation of waste materials, provisioning practices are to include ensuring the least packaging required for the products.
- Waste materials are collected and separated according to the different kind and stored in different receptacles in order to care for proper disposal ashore and various methods of processing of waste material.
- Although discharge at sea under specific conditions for a wide range of ship-generated garbage is permitted, it is recommended that whenever practicable port reception facilities are used as a primary means of disposal.
- Waste materials are to be separated into the following recommended types: plastics,

steel, timber, glass, paper, chemicals, textiles, and galley waste.

- In case of waste delivering a shore to a reception or disposal facility, a receipt voucher, or form FCM-01-10 A10 waste delivery receipt, is to be obtained and entered into to the Garbage Record Book.

Saltwater Farms

MCE Environmental Management and Waste Management Plan (EWMP) and procedures have been developed to manage waste generated from saltwater farming activities and align the management practices with the Applicant Guidance Document – Environmental Information Reviews, revised September 2019 and the Department of Fisheries, Forestry and Agriculture (FFA) Environmental and Waste Management Guide, 2022. The EWMP is revised annually and submitted to FFA for review and approval.

In general, no farm materials will be discharged to the environment and all efforts will be made to ensure no accidents occur that release materials to the environment. MCE has a policy of reducing refuse through recycling and not using feed bags and pallets to reduce the potential waste on saltwater farms.

All farm staff have the responsibility of ensuring materials are confined in secure containers in designated locations on the farm. Any gear lost to the environment will be retrieved immediately weather permitting. If immediate retrieval of large floating debris, such as a boat drifting free, is not possible, the details and coordinates will be provided to Transport Canada to release a Notice to Mariners.

Table 50 provides the potential waste materials generated by saltwater culture of salmon divided into organic, inorganic, and chemical categories. For each waste material the estimated volume is provided as MT. Established practices to reduce, reuse, recycle, and dispose of waste are listed.

Table 50 Waste Components, Volume, and Management Practices for Saltwater Farms

Organic Waste	Approximate Volume* (MT annually)	Waste Management Practices
Biofouling from net cleaning and maintenance	50	**Reduce deposition:** Pens are oriented for maximum current flow to disperse particles.
		Reduce net changes: Generational HDPE nets are used which eliminates net changes during the grow-out cycle. HDPE nets are washed *in situ* with special net wash units eliminating the need to change nets. Nylon nets are removed for cleaning at a land-based facility as frequently as needed, and as required by the NL Code of Containment. Existing nylon nets will be retired as the HDPE net inventory grows.
		Reduce biofouling: Regular schedule of *in situ* net cleaning of HDPE nets will avoid biofouling growth and accumulation (every 10-14 days in summer, as needed for rest of year). Cleaning will be scheduled on an ongoing basis as needed to ensure fouling is negligible. By ensuring fouling levels remain low, the volume of debris produced that settles in the benthos or water column is minimized. Nylon nets are removed for cleaning at a land-based facility prior to heavy fouling occurring.
		Reduce debris: Repairs are undertaken so no debris or materials will be discarded in the water and all repair materials will be collected and disposed of as appropriate on land.
		Residual: Regular surveys of the seafloor will monitor the benthic habitat, ensuring aerobic conditions within the lease. and reporting

Organic Waste	Approximate Volume* (MT annually)	Waste Management Practices
BOD (fish faeces, uneaten fish feed)	82[1]	**Reduce deposition:** The farm is oriented towards the current for optimal flushing (which also provides an optimal level of oxygen for the salmon) and is positioned in deep water to optimize dispersal of faeces.
		Reduce deposition: Fish are fed only to satiation only and are observed at all times during feeding with the use of submerged feed cameras, that minimizes both fecal output and deposition of uneaten feed. Feed volume is calculated daily and compared to biomass requirements to check volume fed is appropriate. **Reduce deposition**: Full survey, analyzes and reporting as required by AAR conducted annually.
		Reduce feed waste: Feed is rotated in the shed to ensure that it doesn't go out of date prior to use.
		Residual: Regular surveys will monitor the benthos for potential environmental impact due to organic input with data compared to baseline data for early identification of potential issues and development of mitigation methods.
Excess medicated feed	negligible	**Reduce:** Only enough feed for a specific treatment will be ordered and delivered to the site.
		Residual disposal: For excess medicated feed, MCE's veterinarian shall be contacted for disposal method. Outdated medicated feed is returned to feed manufacturer for disposal.
Fish discards and mortalities (See Fish Disposal Plan in the Fish Health Management Plan)	120[2]	**Reduce:** Mortalities will be kept to a minimum through rearing practices supporting healthy fish, site specific farm design and infrastructure, as well as Biosecurity and Fish Health Management measurers.
		Recovery: Fish discards and mortalities will be collected after dives at least 1 per week, except in winter when dives may be less frequent due to weather.
		MCE will send mortalities to New World Dairy (NWD). NWD has indicated that they can take whatever mortalities are produced from MCE operations. Should NWD not be able to accept mortalities, Barry Group Inc. Burgeo Rendering facility in NL and Cardwell Farms in New Brunswick will also accept mortalities and waste products including fish waste and fish silage.

Organic Waste	Approximate Volume* (MT annually)	Waste Management Practices
Bloodwater	0	**Reduce: All contained on the harvest boat, treated, and disposed of at the processing plant according to regulations.**
Septic and grey water	n.d.	**Recovery:** Human waste (septic) and grey water will be collected onsite in secure approved tanks.
		Residual disposal: Disposal in a manner consistent with Transport Canada regulations, aquaculture licence conditions and provincial regulations at municipal facilities by contractors.
Inorganic Waste	**Approximate Volume* (MT annually)**	**Waste Management Practices**
Feed bags, wooden pallets	0	NAIA is currently pursuing waste management research and development initiatives, and MCE plans to participate.
Expired HDPE buoys, piping	n.d.	**Residual disposal:** Waste to be collected on site, transported, and disposed of according to provincial regulations at the Central Newfoundland Waste Management Authority, Norris Arm.
Expired netting	6-7	**Reduce:** Adoption of durable HDPE nets with 8-10year life expectancy. No HDPE net changes during culture cycle, nets developed specifically to be used for full culture cycle (3 years). Existing nylon nets will be retired as the HDPE net inventory grows.
		Reuse: Nets tested at end of culture cycle for strength and durability, nets that meet standards are re-used for salmon culture. Nets that do not meet the standards for salmon culture are re-purposed or recycled for other purposes if possible.
		Residual disposal: Nets that cannot be reused are recycled if available or sent to landfill at Central Newfoundland Waste Management facility in Norris Arm if recycling is not an option. Since 2023, Mowi has chosen to not dispose of large plastics in the landfill and is supporting efforts to develop options for recycling.

Inorganic Waste	Approximate Volume* (MT annually)	Waste Management Practices
Refuse	negligible (7kg/week, 4-4 bags, 0.36 MT annually)	**Reduce:** Single use plastic containers will be avoided wherever possible. All efforts will be taken to reduce the amount of refuse that cannot be recycled.
		Recycle: Household refuse will be separated into two waste streams (recycling and garbage) and stored at dedicated locations on the site with collected refuse held in a secure container that is animal proof and does not emit odour or provide visual appeal so as not to attract animals or birds. Garbage will be collected in a central location on the site and from the sea sites delivered to the disposal depot. Recyclables will be collected in a central place on the sea sites and delivered to a recycling depot.
		Recycle cardboard, plastics, paper, tin, glass: Recycling and compost collected regularly and transported to recycling and composting facilities on land once regional waste management authorities put infrastructure in place to enable this.
		Residual disposal: Garbage disposed of at landfill.
Shipping containers	0	**Reduce:** not used
Operational waste - polypropylene ropes, lines	n.d.	**Reduce:** Ropes, lines etc. will be purchased as needed only.
		Reuse: Where appropriate, parts and materials will be recycled, repurposed, donated or sold.
		Residual disposal: Waste will be collected and managed by internal staff or a third-party contractor. Disposal to rural landfill is available in the province. As of 2023, MCE stockpiles all large plastics and does not send to the landfill. MCE is supporting efforts to develop options for recycling.
Operational waste - production equipment or parts	n.d.	**Reuse:** Where appropriate, parts/materials will be recycled, donated or sold.
		Residual disposal: Disposal according to provincial regulations at the Central Newfoundland Waste Management Authority, Norris Arm. Disposal at the discretion of the Regional Saltwater Manager.

Chemicals	Approximate Volume* (MT annually)	Waste Management Practices
Antifoulants	0	**Reduce:** None used. All new nets will be free of cuprous oxide antifoulant.
Cleaners, disinfectants	negligible	**Reduce:** Only chemicals that are approved for use around the marine environment will be used for footbaths and cleaners to limit potential negative effects**.**
		Recovery: Expired chemicals (i.e., TMS) are collected at a designed location on site and shipped to lab for disposal via appropriate contractor.
		Residual: Disposed of as per manufacturer's instructions with hazardous waste disposed of at approved facilities.
Hydrocarbons, paint	negligible	**Reduce:** No paint is used
		Recovery oils, fuel, chemicals: Used oils and fuel waste are collected on site and recycled with use captured in global sustainability reports. Old paint will be collected onsite in a secure container and transported to a depot to be disposed of.
		Recovery: Waste will be collected at a dedicated location on the site and transported to the area central site. Waste collected and held for disposal in enclosed containers that do not tip and have tight fitting lids to reduce opportunity for the compounds to be spilled into the environment.
		Residual disposal: Arrangement may be made with a service provider and disposed of as per manufacturer's instructions with hazardous waste disposed of at approved facilities. As applicable, staff will avail of local Harbour Authority Waste Oil Collection points.
Printer Cartridges	negligible	**Recycle:** Where available arrangements will be made to drop off at a depot for recycling.
Retired technology	negligible	**Reuse/Recycle:** Return to MCE IT Department for recycling.

*negligible = <1MT annually, n.d. = unable to determine

** Household/production garbage – If additional information is required, the size of dumpster and the number of times emptied annually could be provided.

[1]Volumes of faeces and uneaten feed as calculated by DFO recommended default values for DEPOMOD of 3% feed waste and 90% digestibility equates to 492 MT. These input values are grossly exaggerated. BC uses much lower percentages as they have been verified for that area. MCE expects feed wastage to be no more than 0.5 %. Volume of feed and feces has been adjusted to 1/6th of the DEPOMOD calculated value. This calculation applies to a 1 million fish site.
[2] Total for a 1 million fish site, lower stocking numbers will be lower amount of mortalities. In general, mortalities will be 10-15% of fish stocked.

Waste Management Agencies and Companies

The following agencies and companies have confirmed their ability to manage the volumes and types of waste listed in Table 50 within their Certificate of Approval

Town of Stephenville

- Regional land fill and garbage pickup, municipal sewage disposal.
- http://www.townofstephenville.com/

Western Regional Waste Management

- Disposal services for construction and demolition waste, household hazardous waste, scrap metal and bulk waste, electronic waste and large production equipment that cannot be recycled will be sent to the Bay St. George Waste Disposal.
- http://www.wrwm.ca/services/waste-disposal-sites/bay-st-george-waste-disposal-site/

Regeneration Paint Recycling

- Product Care Association operates Regeneration, a province-wide industry-led and government-approved paint recycling program that provides residents and businesses with province-wide drop-off locations and collection events.
- Phone: 1-888-772-9772 Website: www.regeneration.ca

Envirosystems Inc.

- Envirosystems Inc. (formerly Crosbie Industrial Services Ltd.) provides province- wide a commercial collection service for hazardous waste as well as proper disposal of oil tanks and filters.
- Phone: 709-722-8212 (St. John's) / 709- 686-5665 (Pasadena), www.envirosystemsglobal.com

Containerized Sanitation Ltd

- Containerized Sanitation Ltd. provides waste removal and dumpster rentals to residential, commercial and industrial customers at Bay St. George and the surrounding area.
- Phone: (709) 643-3279 7 Bayview Hts, Kippens, NL A2N 3N1
- https://www.containerizedsanitation.com/

Pardy's Waste Management and Industrial Services Ltd.

- Province-wide commercial collection service for hazardous waste including disposal of oil tanks and filters.
- Phone: 709-368-4350 (St. John's) / 709-686-2043 (Pasadena) / 709-896-0489 (Goose Bay): www.pardyswaste.com

Gale's Septic Services Ltd.

- Province-wide collection of liquid and semi liquid waste including the solids and sludge produced from filtering the production effluent.
- Phone: 709-955-2642 Email: galesseptic@gmail.com
- Location: Trans-Canada Hwy, South Branch, NL A0N 2B0
- www.galesseptic.com

Greenfield Enterprises

- Province wide collection of finfish aquaculture mortalities.
- Ryan Hines, Phone: 902-940-3445

New World Dairy

- Disposal of fish mortalities and silage.
- Brent Chaffey, Phone: 709-645-2793
- Location: 7488 Maidstone Road, PO Box 475, St. David's, NL A0N 1X0

Barry Group Rendering Plant

- Disposal of fish mortalities and waste
- Location: Burgeo, NL Phone: 709-785-7387
- https://barrygroupinc.com/contact/

Scotia Recycling Ltd

- Collection, processing, sales, and brokerage of recyclable materials
- Phone: 800-961-000
- https://scotiarecyclinggroup.com/

4.3j Fish Culture Stocking Densities

Guidelines: planned stocking densities for the hatchery and sea cages, including maximum densities at peak production

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide the legal requirements for salmon stocking at saltwater farms within the province and provide the framework upon which stocking operational practices are developed. For Mowi Canada East Inc. (MCE), the company policy meets or exceeds regulatory requirements. It is standard policy that all MCE farms have a maximum stocking density of 15 kg/m^3 which is lower than the provincial requirement.

Table 51 Aquaculture Policies That Pertain to Section 4.3j

AP #	AP Title	Description
AP 24	Single Year Class	Licensees must comply with the stocking schedule outlined in the Bay Management Areas Agreement for Atlantic salmon. This agreement is reviewed by the Bay Management Committee on a regular basis.
AP 28	Fish Size at Sea Cage Entry	Atlantic salmon must be a minimum of 50 grams for all smolt stocked on a licensed site.

MCE uses fish culture stocking densities, developed through years of growing Atlantic salmon, that are known to support strong healthy fast-growing fish. Culture densities are managed through regular assessment of biomass, mortalities, and average fish sizes.

Unless otherwise indicated, the information in this section pertains to all fish production at MCE facilities in the Province of Newfoundland and Labrador.

Table 52 provides the planned and maximum stocking densities for each Atlantic salmon culture life stage.

- Reaching a maximum stocking density at the hatchery indicates a situation where the culture conditions may not be ideal and the number of fish in a culture unit may need to be reduced.
- For saltwater farms, the number of smolt stocked initially to each pen is calculated so the maximum stocking density is not reached at any time during culture to harvest.
- Atlantic salmon grow at different rates. At saltwater farms the early fish to reach 5 kg harvest size are passively removed by pulling a net through the culture pen that allows

the smaller fish to swim through. The larger fish are grouped and harvested which reduces density in the pen and provides opportunity for the smaller salmon to grow.

Table 52 Planned and Maximum Stocking Density by Culture Life Stage

Culture Location	Culture Life Stage	Planned Stocking Density	Maximum Stocking Density at Peak Production
Hatchery	Egg Incubation	20,000 eggs per tray	45,000 eggs per drawer (2 trays)
	Fry	1-5 g fish – 20 kg/m^3 5-30 g fish - 30 kg/m^3 40+ g fish - 50 kg/m^3	1-5 g fish - 25 kg/m^3 5-30 g fish - 30 kg/m^3 40+ g fish - 50 kg/m^3
	Juvenile to Smolt	50 kg/m^3	60 kg/m^3
	Smolt to Post-smolt	50 kg/m^3	75 kg/m^3
Saltwater Farms	Smolt or Post-smolt to Harvest		15 kg/m^3

4.3k Fish Culture Water Quality Management

Guidelines: measures that will be undertaken to monitor water conditions and quality in the hatchery and sea cages, including water temperature and dissolved oxygen.

Salmon thrive in clean, cold, highly oxygenated water, therefore the purpose of managing water quality in culture is to provide these ideal growing conditions which support fish health and welfare, reduces disease and mortalities, and minimizes injury and/or stress to the fish.

Every effort is made at the hatchery and the saltwater farms to ensure the culture environment is exactly what the salmon require. As a result of these efforts, in 2022, Mowi received the prestigious Special Recognition Award from Compassion in World Farming that demonstrates outstanding innovation, commitment, or achievement in farm animal welfare. Mowi | Compassion in Food Business.

This section provides the measures that are taken at the hatchery and saltwater farms to manage water conditions to provide the best culture environment for the fish. Unless otherwise indicated, these practices pertain to all fish grown at the hatchery and saltwater farms including

those produced by the Hatchery Expansion.

Hatchery

Due to the importance of water quality throughout the complete salmonid culture life cycle, ensuring fish culture parameters are met is the responsibility of the Hatchery Manager and significant resources are employed daily in monitoring and managing these parameters.

All hatchery culture units include Recirculating Aquaculture Systems (RAS) technology. The role of the RAS is to remove waste and harmful components from the fish culture water before re-using it. Each fish culture unit is independent with individual monitoring, controls, and alarms allowing for water management specific to the requirements of fish in that culture unit.

Please refer to section 4.3g Hatchery Influent Water Quality Parameters for water chemistry requirements for salmonid health.

Fish culture freshwater is 100% sourced from the local aquifer and is pumped from wells to the Water Treatment Building reservoir for storage prior to being used in the salmon culture systems.

Water volume used is monitored continuously and reported annually.

- Water volume available in the aquifer has been assessed (as recharge time and volume) by independent experts and deemed adequate for all current users and future development with reports provided to Department of Environment and Climate Change (ECC) Water Resources Management Division.
- Water volume used by the hatchery is managed through the Water Use Licence (WUL) 18-9929 conditions and reported to ECC Water Resources Management Division.

Water quality is monitored regularly and reported annually or as directed by ECC.

- The groundwater source meets the requirements for salmonid culture and has been stable for over a decade.
- Influent Water: Quarterly water quality testing for temperature, hardness, alkalinity, and pH is undertaken prior to the influent water being added to the culture systems.
- Fish Culture Systems: Water quality parameters in Table 53 are monitored twice weekly in the egg incubation systems and daily or weekly in the fry and smolt culture units with oxygen, carbon dioxide, temperature and nitrate compounds monitored daily. If any parameters are outside the acceptable fish culture range, corrective measures as indicated are taken.

Table 53 Water Quality Parameters with Monitoring Frequency and Corrective Measures If Required

Water Quality Parameter	Life Stage	Acceptable	Preferred	Monitoring Frequency	Corrective Measures if Required
pH	Eggs		6.8-7.2	Daily	Adjust with NaOH, Na_2CO_3, $NaHCO_3$, CaOH; control CO_2, adjust production, do not expose to sudden changes in temperature >2°C, additional monitoring, reduce stress
	Alevin		6.8-7.2	Daily	
	Fry-Smolt		6.8-7.2	Daily	
Temperature	Eggs		4-8°C	Daily	Adjust at generator and flow meters, reduce feeding, monitor daily and after adjustment
	Alevin		4-8°C	Daily	
	Fry-Smolt		5-15°C	Daily	
Salinity (ppt)					Consult manager
	Fry-Smolt		<3	Weekly	
	Smolt				
Oxygen (% sat)	Eggs		90-100	Daily	Adjust O_2 with LHO, air stones, PPC, oxygen cones, water flow, see [1] below
	Alevin		90-100	Daily	
	Fry-Smolt		90-100	Daily	
CO2	Eggs	<5	0	Daily	Improve stripping, increase make-up water, monitor O_2 ensure not too high, adjust fish density, reduce activity and feeding rate, control pH, see [2] below
	Alevin	<15	<12	Daily	
	Fry-Smolt	<15	<12	Daily	
Alkalinity (ppm)	Eggs	<5	<5	Weekly	Adjust as consumed by biofilter using carbonate source, higher than 250 not a threat
	Alevin	50-25	80	Weekly	
	Fry-Smolt	50-250	120	Weekly	
Hardness (ppm)	Eggs		> 100	Weekly	Adjust with calcium source, higher than 250 not a threat
	Alevin	50-250	80	Weekly	
	Fry-Smolt	50-250	120	Weekly	
Nitrite NO_2 (ppm)	Eggs	<2.0	0.6-0.8	Daily	check chloride level, add more salt check NO_3 for biofilter performance, see [3] below
	Alevin	<2.0	0.6-0.8	Daily	
	Fry-Smolt	<2.0	0.6-0.8	Daily	

Water Quality Parameter	Life Stage	Acceptable	Preferred	Monitoring Frequency	Corrective Measures if Required
Nitrate NO_3 (ppm)	Eggs			Daily	Maintain biofilter functionality, additional testing, flush with fresh water, see [3] below
	Alevin	<350	<25	Daily	
	Fry-Smolt	<350	<25	Daily	
TAN NH_4 (ppm)	Eggs	<3	<2	Daily	Ensure biofilter functioning, additional testing NO_2 and NO_3, calculate ammonia levels, add ammonium chloride to feed biofilter, see [3] below
	Alevin	<3	<2	Daily	
	Fry-Smolt	<3	<2	Daily	
Ammonia NH_3 (ppm)	Eggs	0	0	Daily	Reduce pH additives, reduce temperature, reduce feed, see [3] below
	Alevin	0	0	Daily	
	Fry-Smolt	<0.02	<0.002	Daily	
Chlorides (ppm)	Eggs	<250	20 x NO_2	Weekly	Add salts to increase chlorides, reading will be higher during salt treatments
	Alevin	<250	20 x NO_2	Weekly	
	Fry	<250	20 x NO2	Weekly	
Nitrogen N_2 (% sat)	Eggs	<102%	<100	Daily	Increase degassing, increase oxygen % sat, keep TGP < 10%
	Alevin	<102%	<100	Daily	
	Fry-Smolt	<102%	<100	Daily	
Flow	Eggs	5 LPM	5 LPM	Daily	Manage influent flow
	Alevin	5 LPM	5 LPM	Daily	Manage influent flow
	Fry	6000LPM		Daily	Manage influent flow

[1]**Oxygen is a key culture parameter and needs management specific to the situation,** e.g., more oxygen is used during feeding or times of stress. For these reasons, oxygen input to the culture tanks is managed at several levels.

- Influent water has oxygen added by passing through the Low Head Oxygenator (LHO) within the culture systems. Oxygen levels can be adjusted manually for a variety of situations such as when fish are fed or stressed. However, a maximum concentration of 160% of saturation is the level for most efficient transfer to the fish.
- Either each system or each fish culture tank has a dedicated Pressurized Packed Column (PPC) and a dedicated in-tank diffuser system to provide supplementary oxygen and backup oxygen. The PPC generates oxygen-supersaturated water for injection into the fish culture

tanks to increase the level of dissolved oxygen available to the fish. The % of saturation for each tank is set for the PPC to achieve. It is expected that this set point will be 90% of the saturation concentration. When the DO level drops, the PPC pump speed increases and more oxygen is supplied.

- Each fish tank also has a dedicated dissolved oxygen and temperature sensor. The output from this sensor is used to automatically regulate the supply of supplementary oxygen to the tank. If the LHO and PPC are unable to supply enough oxygen, backup oxygen diffusers are used to add additional oxygen. Operators will also set the concentration or % of saturation at which the oxygen supply to the backup diffusers will be opened, and the concentration or % of saturation when the supply will be closed. It is expected that this set point will be 80% of the saturation concentration.

Dissolved oxygen level data in fish culture tanks is provided continuously through equipment data output and can be determined by hand-held Oxyguard probes in the tank. Hand-held probes can be used to indicate oxygen levels in many situations including in the fish culture tanks but are essential when there is no effective alternative method of monitoring oxygen levels such as when moving fish from one tank to another, grading, testing efficacy of the other oxygen generating equipment etc.

If the oxygen level drops, additional air stones connected to a pressurized oxygen tank can be added and the oxygen level monitored with hand-held probes.

- Oxygen is added to fish culture water through the Low Head Oxygenation unit (LHO) in-tank air stones or through the influent water oxygenated is managed either on demand (automatically) or manually.
- All fish culture tanks have air stones installed. Fry culture systems have two PPC per system. Smolt Buildings 1-3 and the Modular RAS Post-smolt Building have a PPC installed for each tank. The PPC is a highly efficient on-demand oxygenation system that generates oxygen-supersaturated water in a media-packed pressure vessel.

[2] Carbon dioxide is measured daily for each culture unit using a carbon dioxide meter.

MCE maintains a contingency of procedures in the event of deterioration of water quality and procedures vary depending on cause.

- Cessation of feeding is immediate.
- Water quality monitoring is enhanced to determine the problem and to estimate how long the problem may persist.
- Fish are monitored more closely for the duration of the event.
- Fish are not handled until water quality is deemed acceptable.
- Events, findings, and actions are recorded.
- Additional mitigation measures to address adverse environmental conditions are listed in Table 2 and Appendix A (Operational Environmental Mitigation Plan) of the MCE Environmental Management and Waste Management Plan (EWMP).

If levels are above the range provided in the table above, the Low Head Oxygenators (LHO) and degassers will bring CO^2 out of solution (off-gassing) to be discharged outside of the building. The agitation in the bio-filter also results in CO_2 being brought out of solution and the vacuum fans above the bio-filters exhaust the CO_2 out of the building.

[3] Total Ammonia Nitrogen (TAN), Nitrite and Nitrate levels are recorded daily for each culture unit.

Palintest Photometer is used to determine Total Ammonia Nitrogen (TAN), Nitrite and Nitrate concentrations. If levels are outside of the range indicated above, corrective action includes increasing influent water (new water from reservoir) to dilute the culture water and/or reduction or cessation of feeding to reduce fish metabolites in the water.

Modular RAS Building

The Modular RAS Building construction is not complete and currently no fish are grown in this building. However, the culture modules have been designed to meet or exceed the fish culture parameters in Table 54.

Table 54 Culture Parameters and RAS Module Design

Parameter	Units	RAS Module Design
Bio-plan Criteria		
Species	-	Atlantic Salmon
Maximum rearing density	kg/m^3	75
Maximum biomass	kg	240,000
System culture volume	m^3	3,200
Unit culture tank volume	m^3	800
Rearing tanks	m	Ø18 x 3.5
Water Quality Criteria		
Minimum temperature	ºC	10
Maximum temperature	ºC	15
Salinity	g/L	0-15
Minimum allowable DO concentration	% saturation	80%
Maximum allowable CO2 concentration	mg/L	15
Max allowable NH_3-N concentration	mg/L	0.0125
Max allowable NO3-N concentration	mg/L	100
Design Values/Assumptions		
Oxygen demand rate wrt feed (average)	g O_2 / kg feed	400
Culture tank CO2 to O2 ratio	gCO2/gO2	0.9
Max protein content of feed	%	50%
TAN conversion rate	g TAN / kg feed	46
TAN production rate	g TAN / hr	5750
Nitrate production rate	mg/min	95833
System Flow Rates		
Culture Tank turnover (maximum)	1/h	1.7
Culture Tank HRT (maximum)	min	35.3
Culture flow rate (max, total of all tanks)	lpm	90,667
Influent Flow Rate	lpm	958
Recirculation Rate (by flow)	%	98.94%
Daily water exchange (of culture volume)	%	43.13%
Influent Flow Rate wrt Feed	L/kg feed	460

Equipment

The following equipment is used to manage water quality in the fish culture systems. All equipment is calibrated to ensure accuracy and is serviced and replaced routinely as per manufacturers' instructions.

Oxyguard® Commander System

All water quality parameters are monitored on a daily basis using either use of colorimeter or photometer. The probes are controlled through the Oxyguard® Commander system and continuously measure oxygen saturation and temperature in each tank, and pH values and salinity are recorded per system.

The system enables staff to monitor the system and set alarms for upper and lower limits on parameters. This system controls the oxygen packed columns in the smolt buildings which, based on the set point, determines oxygen dosage per tank.

In the fry culture units, the system controls oxygen diffusers in each tank, similar to the oxygen pack columns in the smolt buildings. Once a minimum level is reached, additional oxygen is added to the affected tank.

Colorimetric Water Quality Analysis

Palintests are used to determine Total Ammonia Nitrogen (TAN), Nitrite and Nitrate concentrations of the water being treated in the RAS technology. All samples are obtained observing the strictest biosecurity protocols and analysis is conducted by trained personnel in the on-site laboratory. A Palin Photometer analyzes and visually displays the readings directly in concentration units on an LCD screen. Interpretation of the results is conducted by management and mitigation measures taken if required. Often this will result in an increase of top-up water to the system and a reduction/cessation of feeding to the affected system.

Follow up analysis will be conducted to ensure levels stay within normal culture range. Fish behaviour during this period will be rigorously monitored to determine if there are any adverse effects.

Carbon Dioxide Monitoring

Carbon dioxide level is monitored using a hand-held meter and La Motte Test Kit and in the smolt culture units, a Palin meter. Excess CO_2 is off gassed through water agitation in the biofilter or through Low Head Oxygenators (LHO).

Ultraviolet Disinfection

A full-flow ultraviolet (UV) unit provides disinfection. The UV reactor is designed to provide a minimum dosage of 100mJ/cm^2 in the incubation fry and smolt culture systems and 150

mJ/cm^2 for post-smolt. Please refer to section 4.3b Biosecurity Protocols for a list of waterborne fish pathogens and the UV dose required to eradicate the organism as well as a list of areas in the hatchery where UV disinfection is used and the minimum continuous doses.

Oxygen Recording

Dissolved oxygen levels in fish culture tanks are monitored through the management center and can be determined as needed by hand-held Oxyguard probes. In the fry culture units, additional oxygen can be provided if needed from air stones in the culture tanks. Pressurized Packed Columns (PPC) are attached to individual smolt culture tanks and automatically keep optimal oxygen saturation. Oxygen can also be added manually to the smolt tanks using air stones.

Saltwater Farms

Salmon require cold, clean, highly oxygenated water in the marine environment to thrive. However, the marine environment does not allow for the same level of control that can be achieved with closed recirculating systems at the hatchery. In the ocean, ensuring the best water quality includes ensuring a farm is located where the environment is naturally conducive to salmon farming, developing the site and growing fish to make the best use of the site attributes, and during culture continuous surveillance for potential for adverse conditions for early warning and to initiate mitigation procedures.

Unless otherwise indicated, the information in this section pertains to the rearing of salmon at all MCE saltwater farms in the Province of Newfoundland and Labrador.

Farm Location and Development

Making the best of the marine environment starts with locating salmon farms in areas that naturally have the requirements for salmon aquaculture - satisfactory depth below culture pens, high dissolved oxygen levels, ice free, and consistent suitable water flow.

Prior to obtaining an aquaculture license, the proponent must demonstrate the proposed site has the appropriate conditions for salmon farming and the water quality, so essential for salmon survival, will not be diminished with salmon farming activities. The data collected for the aquaculture licence application provides a baseline of environmental conditions for the site for comparison to the monitoring during salmonid culture.

The salmon farm is designed and constructed to take best advantage of these attributes, the fish pens are located over areas with depth and the culture pens are oriented to the current for best water flow to the fish.

Fish Culture Practices

Fish culture practices, including biomass density, feeding and mortality management, and use of technology, are employed to manage water quality.

- Fish culture density at all MCE farms is less than 15 kg/m^3 which is lower than the provincial standard. Fish cultured at this density or lower have an optimal rearing environment supporting fish health and growth. More effective sea lice management and water quality management is possible at lower densities. When biomass density approaches this level, larger fish are passively graded for harvest, leaving room for the smaller fish to grow.
- Feed frequency and volume is tightly aligned to the requirements of the fish. The fish are continuously observed during feeding to reduce uneaten feed pellets which can be deposited below the net pens. Please refer to section 6e Protection of Wild Species and Benthic Habitat for a full description of deposition management.
- Mortalities are removed daily with uplifts or FOOVERs to remove dead fish from the culture environment.
- Nets are cleaned every 10 days *in situ* to remove growth that may inhibit water flow into the culture pens. Nets are inspected regularly to ensure all biofouling has been removed.
- Air stones in the pens can circulate deeper colder water within the culture pen to the surface if needed, physical barriers can also be deployed between the culture pen and outside environment.
- Remote Operated Vehicles (ROV) inspection of the bottom under culture pens to ensure no accumulation of organic matter that may affect water quality.

Monitoring for Adverse Conditions

Specific water quality conditions are detrimental to salmon, such as high-water temperatures and low dissolved oxygen levels. These and other parameters are monitored daily to provide early warning of potentially harmful events and when to initiate management measures.

Table 55 provides environmental factors that affect water quality, the data collected and frequency of collection. Data is collected using various technologies such as handheld instruments or real-time monitoring systems where installed or in the case of benthic deposition, ROVs. Over time the site data is used to improve management techniques.

Table 55 General Environmental Factors, Data Collected, and Collection Frequency

Environmental Factor	Data Collected	Frequency of Data Collection
Water quality	Temperatures at surface, 1, 5, 10, 15, 20 and 30 m depths (as net allows)	Continuous monitoring
Water chemistry	Dissolved oxygen and salinity at surface, 1, 5, 10, 15, 20, 30 m (as net allows)	Continuous monitoring
Plankton	Plankton density and species identification at 5, 10 and 20 m depths	Daily as per the Harmful Plankton Monitoring and Response Plan
Atmospheric conditions	Wind direction, weather, air temperature, precipitation, storms	Daily
Benthic deposition	ROV or grab benthos sampling and analysis	Annual and as required by AAR

General Water Quality Management Measures

MCE maintains a contingency of procedures, including the following, to be used in the event of water quality deterioration. These procedures are detailed in the MCE Salmonid Fish Health Management Plan that is reviewed annually, revised as needed and submitted to the provincial Department of Fisheries, Forestry and Agriculture (FFA) for approval during the annual aquaculture licence validation.

- Cessation of feeding is immediate.
- Water quality monitoring is enhanced to clarify the problem and estimate how long the problem may persist.
- Fish are monitored more closely for the duration of the event and are not handled until water quality is acceptable.
- All fish culture nets are minimum of 20 m depth to allow for fish to move out of warmer surface water to the cooler water at depth.
- Fish stocking densities will not exceed 15 kg/m^3 to allow for fish movement, space for water circulation, and to prevent crowding which can lower oxygen levels which can be already depressed during high temperature.
- All culture pens have aeration systems to assist in moving cooler water from depth and to circulate the higher oxygenated water within the pen.
- Handheld sensors for extra monitoring of temperature, oxygen and salinity will be calibrated weekly to ensure accuracy.

- Staff training for the following ensures early warnings and accurate evaluations.
    - Signs of low oxygen distress (hypoxia) and any unusual fish behavior. Signs could include crowding at the surface, aligning into the current, gasping, loss of equilibrium and darkening.
    - Methods for feeding, aeration, and processes to assess whether to feed or handle fish during high water temperatures.
    - Use of water quality equipment including calibration and data reading.
- Events, findings, data, and actions are recorded in detail.
- Additional mitigation measures in the Operational Environmental Mitigation Plan, Environmental Management and Waste Management Plan, are used to address specific adverse environmental conditions.

Water Temperature Management

As stated previously, salmon are highly sensitive to water temperatures changes and dissolved oxygen levels. Historic data from the south coast of the province indicates water temperatures are within the range for salmon aquaculture, however, as seen in recent years, the potential exists for temperature extremes.

- High water temperatures can reduce oxygen levels which negatively affects fish health.
- High water temperatures can cause acute mortality when above the thermal limit for salmon.
- Prolonged temperature stress can affect fish welfare and make them more susceptible to disease or to additional stressors.
- Extreme cold-water temperatures can slow growth and negatively affect fish health.

Historically, winter water temperatures vary along the south coast. Government of Newfoundland and Labrador data show winter temperatures are generally at their coldest from February to the end of March and can range on average from 0 to 4 degrees, depending on the year and location, with periodic dips below zero degrees and occasional super chill conditions.

On-farm monitoring includes year-round daily collection of water temperature at 6 depths to 30 m via hand-held instruments or Real-time monitoring systems which are in the process of being installed on all sites.

- Hand-held sensors will be calibrated weekly or self-calibrating to ensure accuracy.
- During times of very cold water, temperature readings will be taken before approaching the site.

Management of water temperature starts with locating saltwater farms in ice free areas.

- Super chill occurs when the water temperature drops to -0.7°C or lower.

- Impacts of cold-water temperatures can be minimized through specific monitoring and husbandry practices.
    - Nets will be a minimum of 20 m deep to the bottom of the net to allow for fish to move lower in the water column where water temperatures may be warmer.
    - Remote feeding high-definition cameras for observing fish behavior without approaching pens will be installed as cell/remote sensing technology allows.
    - Fish are not fed at water temperatures below 1°C.

Table 56 provides information on management of high-water temperatures.

Table 56 High Water Temperature Management Measures

Frequency/Duration	Impact(s)	Mitigation Measures
Frequency: seasonal in the summer Duration: variable	High temperatures can reduce oxygen levels and negatively affect fish health and appetite	Farms located at a site with significant temperature stratification with colder water at depth, can bring deeper colder water to the surface to mitigate high water temperature nearer to the surface. An aeration system, installed in each pen, can move cooler water from depth and circulate the water within the pen. Site design includes pens oriented for maximum water flow through the pens. Routine monitoring and recording of water quality parameters will provide early warning for high temperature events and a history of when and how the events occur for better management. Water quality data collected is compared to optimal fish requirements including dissolved oxygen and temperature to increase knowledge of potential issues at the site. Infrastructure mitigation includes pens that are a minimum 20 m deep with low stocking levels of 2.0 smolt/m^3 and a maximum density of 15 kg/m^3, to allow the entire population to occupy more optimal depths to respond to different environmental conditions. At higher temperatures, feeding and other site activities may be reduced or suspended to improve fish health and welfare. Due to thermal stratification within the water column, fish may inhabit the lower levels of the pen.

Algal/Plankton Mitigation

Algal and plankton blooms have not caused mortality at saltwater farms in the province but as a risk management measure, MCE has a detailed Harmful Plankton Monitoring and Response Plan included in the Salmonid Fish Health Management Plan that is reviewed annually, revised

as needed, and submitted to FFA for approval.

Not all harmful algae blooms (HABs) are directly harmful to salmon but some release toxins, others can cause damage to fish gills via physical abrasion, and all species if numerous enough can deplete oxygen from the water, reducing the oxygen available to the salmon.

At minimum, the presence of harmful algae blooms (HABs) is monitored weekly during the spring; with increased frequency occurring during high-risk periods (August through September), see Table 57.

Farm staff are trained in obtaining plankton samples using a plankton tow and discrete water samplers to take samples from depths of 1.5 m and 10 m, preparing slides for identification, determining plankton density, and photographic recording on the microscope. Staff collect water samples with a plankton tow and microscopically identify algal species and determine densities according to the schedule below.

Table 57 Plankton Sampling Schedule

WINTER (October-April)	SPRING (May-June)	SUMMER (August-September
Equipment Maintenance	Weekly Samples	Daily Monitoring*

*Monitoring is via plankton tow, discrete samplers, and satellite with sample frequency upon recommendation of the consultants,

Management measures include having aeration equipment on all farms. Aeration technology placed in the pen is used to break up algae and plankton, lift clean water from depth and move harmful algae from the pen, and provide increased level of oxygen to mitigate low oxygen levels, see Table 58.

Table 58 Low Dissolved Oxygen Information and Management Measures

Frequency/Duration	Impact(s)	Mitigation Measures
Frequency: seasonal in summer and/or variable if specific events Duration: variable Dissolved oxygen levels can vary as a result of a number of environmental factors such as seasonally when water temperature rises, or with reduction of water flow due to fouling of nets, or specific environmental conditions such as algal blooms.	Low oxygen levels cause stress to fish, can negatively affect fish health and in extreme situations cause die offs.	Routine monitoring and recording of water quality parameters will ensure optimal fish health including dissolved oxygen, water clarity, and temperature. HDPE nets will be cleaned regularly to reduce fouling and allow water flow. Nylon nets will be removed and cleaned at a land-based facility prior to heavy fouling occurring. Water samples will be taken on site and at designated stations to assess the presence of plankton and to predict potential incoming events. The nets will be a minimum 20 m deep, with low stocking levels of 2.0 smolt/m^3. This will allow the entire population to occupy optimal depths within the pen to respond to different environmental conditions. During seasonal periods of low dissolved oxygen, feeding and other site activities may be reduced or suspended to improve fish health and welfare. An aeration system will be installed in each pen to move cooler, more oxygenated water from depths and circulate the water within the pen, improving dissolved oxygen levels. Feeding technology may be available to feed fish at lower depths, reducing exposure to higher surface temperatures.

Vessel Transports or Treatments

- The vessel Captain, or Officer on watch in his absence, has the responsibility to ensure water quality in the vessel hold is within fish culture parameters for the full duration that live fish are held within the vessel. This includes transport of smolt from the hatchery to the saltwater farms, transport of harvested live fish from the saltwater farms to the processing plant and any treatments that are conducted using the well boat. The following procedures ensure water quality is optimal prior to loading fish and during the procedures. Prior to loading fish, gas supersaturation generated by air in pipes and pumps and from the filling of well is removed by aeration.
- During transports of more than 2 hours in duration, O_2, pH, salinity, and temperature are monitored continuously.
- When holding fish over a long period of time in a closed system such as the vessel hold, the water quality issues related to elevated levels ammonium/ammonia must be monitored and appropriate mitigating measurements in place.
- If there are significant fluctuations in temperature and salinity as a result of the transport route being in areas that cross the estuaries or areas that are peripheral to strong currents, fish behaviour will be given extra attention.
- All transport vessels have equipment for oxygen supplementation if required and can adjust the level of water exchange to ensure adequate water flow.
- If it is discovered that the fish are stressed as a result of the changes in water quality, it should be considered to deviate from the planned route to an area of "normal water", allow time for the water quality to normalize before closing the water exchange and continuing with the transport route.
- Changes in salinity can also cause major fluctuations in oxygen levels and supplementary oxygen is available on vessels at all times.

Table 59 provides a list of parameters to be monitored during the use of a vessel for transport of salmon or for treatments and management considerations.

Table 59 Water Quality Parameters for Use of a Vessel and Management Measures

Parameter	Management Measures
Oxygen	O_2 level to be closely monitored during all operations. O_2 saturation on the outlet side (minimum level) to be kept above 80%. O_2 level on the inlet side to be monitored to confirm that O_2 is injected into the system. It is also important to monitor the purity of the produced O_2.
Temperature	Temperature to be monitored during all operations. Change of +/- 5 ppt for salinity in conjunction with water higher than 4° C is of concern. If chilling, don`t chill the water lower than 4° C. Water temperatures over 10° C should not be lowered more than 50%. Special attention to be paid during freshwater treatments when there can be big differences between saltwater and freshwater temperatures. RSW cooling to be considered.
Salinity	Salinity to be monitored. Change of +/- 5 ppt for salinity in conjunction with water higher than 4° C is of concern. Special attention to be paid to this during freshwater treatments in case of unintentional mixing with saltwater. Salinity should also be closely monitored during open transports where brackish water can be expected.
pH	pH to be monitored. While in saltwater the pH before taking onboard fish should be in the range 7,8 – 8,2. pH will drop if fish is kept onboard on closed system. Depending on the nature of the transport, different limit values must be considered. pH in FW varies from 6,3 – 7,2 depending on the source. The pH should be buffered with Sodium Bicarbonate to bring the pH up to approximately 8,0 prior to start-up of a freshwater treatment. Dosage and procedure to be decided by personnel in charge at the facility.
CO2	CO_2 is calculated from the pH probe. Calculation made by consideration of the following values: temperature, alkalinity, salinity, pH. It is highly important to get good pH readings to get reliable CO_2 calculations.
Ammonium	The ammonium/ammonia level is to be monitored during closed transports. Limit values will be determined together with statutory governments.

4.3l Integrated Pest Management Plan

Guidelines: describe the use of integrated pest management for sea lice control and monitoring, including provision of designated veterinary services.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide direction for development of MCE's Integrated Pest Management Plan and reporting requirements to ensure regulatory agencies and the public are aware of sea lice management activities and abundance on cultured salmon. All policies and procedures are strictly adhered to. Details of these policies

as well as other regulatory requirements that control the management of sea lice are also provided within the section.

Table 60 Aquaculture Policies That Pertain to Section 4.3l

AP #	AP Title	Description
AP 2	Application Requirements	Fish Health Management Plan to include a Biosecurity Plan, Integrated Pest Management Plan, Fish Disposal Plan Sea lice abundance numbers reported monthly and posted on the industry association or corporate website
AP 4		Licence applications to include plans related to aquatic animal health including a Fish Health Management, Plan, Biosecurity Plan, Integrated Pest Management Plan, Fish Disposal Plan and Designated Veterinarian.
AP 6	Aquaculture Licence Renewal	As of January 1, 2021, Licensees must report sea lice abundance monthly and post monthly publicly on an industry association or corporate website. Additional requirements for sea lice reporting to be determined through stakeholder engagement.
AP 17	Public Reporting	Sea lice abundance numbers are reported monthly and posted publicly on the industry association or corporate website. Further details as to sea lice reporting parameters will be determined through stakeholder engagement
AP 25	Integrated Pest Management Plans	Species separation promotes biosecurity and sustainable management of aquaculture operations. Cleaner fish and Atlantic salmon may be co-stocked as part of an Integrated Pest Management Plan (IPMP). Licensees are permitted to stock only one species at a time on a licensed aquaculture site. Sites that are licensed to produce more than one species are permitted to have only one species on site at a time.
AP 40	Integrated Pest Management Plan	Each Licensee must have a pest specific IPMP implemented and monitored by the company veterinarian. This will be updated as deemed appropriate by the veterinarian.

Sea lice are naturally occurring in the ocean ecosystem living on many species of wild fish including salmon. They do not pose a human health risk.

As sea lice can cause health issues for cultured salmon, all MCE farms in the province have a comprehensive Integrated Pest Management Plan (IPMP) which outlines the management methods undertaken to keep salmon healthy. The IPMP includes mechanical and other therapies, medicinal treatment options, and research for continual improvement to reduce the need to use chemical treatments.

The IPMP is a component of the government approved MCE Fish Health Management Plan, which outlines a multi-level approach to managing fish health and controlling sea lice on farmed

fish. The IPMP combines preventative farming practices such as fish husbandry, fallowing, and low stocking densities, with approved treatments when necessary.

Minimizing the use of chemical treatments is a priority. Mowi ASA and MCE invest millions of dollars annually into the research and development of alternative sea lice management strategies such as extended treatments, sea lice traps, and cleaner fish.

This section provides information on Mowi global integrated pest management policy, MCE Integrated Pest Management Plan as well as innovations being researched.

Unless otherwise indicated, the information in this section pertains to the rearing of salmon at all MCE saltwater farms in the Province of Newfoundland and Labrador.

Please note the following information is included in other sections of this report.

- Section 4.3a Salmon Rearing Operations
- Section 4.3b Biosecurity Protocols
- Section 4.3c Veterinary Services for All Life Stages
- Section 4.3d Purpose and Use of Anti-microbials
- Section 6f Chemotherapeutant Management

Mowi Policy on Integrated Pest Management for Sea Lice Control

Mowi's Policy on Integrated Pest Management (IPM) for Sea Lice Control is based upon proven techniques and approaches developed for terrestrial parasite management in agriculture systems. It provides multiple avenues for managing the number of lice on salmon and considers available preventive and intervention options first and allows for informed decisions aimed at achieving optimal results. The IPM strategy addresses mitigating and managing lice infections, reducing the opportunity for resistance development by limiting medicinal use, and ensuring salmon health and welfare as the first priority. The following are key elements of Mowi's IPM approach.

Lice Levels on Cultured Salmon

- Adhere to national limits on sea lice levels and other required actions.
- Keep lice level as low as possible throughout the production cycle.
- Lice counting and reporting by trained staff, at a minimum frequency as defined by local regulations.
- Weekly and precise counting, and reporting, of sea lice levels on all seawater sites.
- Monitor lice development on all seawater sites.

Husbandry

- Fallow the saltwater farm between production cycles.
- Follow health management and veterinary health plans during operation.
- Maintain clean nets to increase water flow.
- Routine removal of moribund fish.
- Monitor fish health status, behaviour, and disease.

Prevention

- Use cleanerfish where past experiences have shown a benefit and cleanerfish are available as preventive tool.
- Re-stock with additional cleanerfish as required.
- Use preventive tools (skirts, deep-feeding, deep-lights etc.) where conditions permit, and such tools are available.
- Apply functional feeds to achieve proven effect.
- Coordinate lice management plans within the provincial Bay Management Area (BMA) strategy.

Intervention

- Only use licensed medicines prescribed by a veterinarian/fish health professional and according to clinical needs.
- Minimize internal infection pressure and handling by treating on pen level (single pen treatment strategy) when appropriate and possible.
- Use the appropriate intervention tools for the lice stages being targeted.
- Ensure sufficient capacity on intervention tools.
- For each production cycle, and where available, evaluate and use non-medicinal treatment tools.
- Practice intervention rotation, where possible and permitted.
- Maintain treatment records and monitor treatment efficacy.
- Coordinate treatments within the BMA, where possible.
- Have knowledge of the resistance status in the BMA.

MCE Integrated Pest Management Plan

The goal of an Integrated Pest Management Plan (IPMP) is to control sea lice by providing a

management strategy that is science based and utilizes all available means (prevention, research, monitoring) to control the pest populations.

MCE IPMP includes continuous monitoring of fish in the marine environment, methods of lice infection prevention, non-medicinal and chemotherapeutant treatment options, thresholds for determining which option will be the most effective and when, and correlates treatment with production activities.

The MCE IPMP incorporates the Mowi Policy on sea lice management and the Department of Fisheries, Forestry and Agriculture (FFA) Aquaculture Policy and Procedures, and Sea Lice Integrated Pest Management Plan

FFA Aquaculture Policy and Procedures Manual includes the following standards.

- Each Licensee must have a pest specific Integrated Pest Management Plan (IPMP) implemented and monitored by the company veterinarian. This will be updated as deemed appropriate by the veterinarian.
- The company IPMP must be submitted by the Licensee and approved by the provincial Aquatic Animal Health Division (AAHD) at the time of licensing and when amended.
- The company IPMP must be accessible to the provincial Chief Aquaculture Veterinarian.
- Licensees must participate in the provincial IPMP.
- The provincial Sea lice IPMP must be followed, where applicable.
- As of January 1, 2021, sea lice abundance numbers must be submitted on a monthly basis by the Licensee to provincial AAHD.
- As part of the provincial IPMP for sea lice, Licensees must submit sea lice numbers (where applicable) into an agreed upon third party database.

The FFA Sea Lice Integrated Pest Management Plan (IPMP) provides the sea lice monitoring processes, the timing, and criteria for treatments, and how non-chemotherapeutant control strategies can be used.

The MCE IPMP is a component of the MCE Salmonid Fish Health Management Plan that is reviewed annually, revised as required, and submitted to FFA for review to ensure all MCE policies and procedures comply with regulations and best practices that are formed from the latest research and farming experience.

Major components of the plan are prevention, monitoring, intervention, and research and development and includes the following.

- IPMP maximizes prevention techniques and minimizes the emphasis on intervention therapies.

- Constant monitoring is required to determine if sea lice prevention strategies are working. When prevention methods become overwhelmed, there may be a need to introduce intervention methods, but only as a last resort. Assessments should be made as to whether strategies (both preventative and therapeutic) are being effective. If at any time efforts are not being effective, changes are made to improve success.
- IPMP includes research and development to ensure that methods are constantly being updated to the most new and effective means of control.

Whenever there is a discrepancy between the MCE IPMP and local *Aquaculture Act* or regulations, the local *Acts* and regulations take precedence and will be strictly adhered to.

Responsibilities

- Fish Health and Welfare Director is responsible for working with the Saltwater Production Director to ensure the following.
    - IPMP is implemented properly.
    - IPMP is reviewed annually to keep strategies current.
    - Fish Health Unit (FHU) is properly trained and has the resources to fulfill their duties.
- FHU is responsible for providing direction to MCE staff on any procedures relating to the IPMP as follows.
    - assessing the IPMP and making decisions on how well therapies are working; deciding when an intervention therapy is required
    - scheduling of intervention therapies
    - monitoring fish welfare during the lice season
- FHU is also responsible for ensuring all appropriate acts and regulations are followed.
- Designated Veterinarian plays a lead role in monitoring fish health and welfare of the fish at all times including during the sea lice season. They are responsible for monitoring lice levels on fish and recommending intervention strategies to the FHU and area/site manager.
- The Development and Environmental Compliance Director is responsible for ensuring all appropriate site permits and licences are in place.
- Freshwater Production Director is responsible for the following.
    - ensuring the quality of smolt produced
    - working with the Fish Health and Welfare Director to ensure freshwater facilities are properly set up for any intervention therapies during the freshwater phase.
    - ensuring freshwater staff are available to assist with any therapies.

- The Saltwater Production Director is responsible for the following.
    - working with the Fish Health and Welfare Director to ensure that the IPMP is implemented properly.
    - ensure saltwater staff have the proper training and the resources to complete their responsibilities.
    - scheduling of vessels and resources required for treatments.
- The Regional Saltwater Manager is responsible for installing and maintaining any site equipment required.
- Saltwater Area Managers are responsible for ensuring staff have the proper training for sea lice monitoring and for ensuring all site managers in their area have a valid pesticide applicators licence should the need for a pesticide intervention therapy arise.
- Each site manager is responsible for monitoring sea lice numbers and reporting to the FHU and for monitoring and reporting any damage from sea lice on their fish.
- Site staff are responsible for monitoring fish behavior and reporting anything of concern to their site manager.

Prevention

Prevention of sea lice settlement on fish is the first goal of the IPMP. Fish with fewer lice are healthier and stronger fish and have less need for intervention therapies to reduce the number of lice. The following husbandry practices are used to prevent sea lice from accumulating on the fish.

- **Location of Sites**: Care will be taken to avoid locating saltwater farms close to known wild salmon runs to avoid transfer of sea lice to and from wild fish.
- **Year Class Separation**: All salmonid saltwater farms in the province are subject to Bay Management Area (BMA) agreements. As part of these agreements, all sites will be stocked with one year-class only. Single year class sites assist in sea lice management by strengthening fish health and easily allows for implementation of fallow periods. Healthy and strong fish are less susceptible to sea lice infections.
- **Fallowing**: Fallowing or allowing a site to sit vacant of fish for a specified period of time, allows for a break in the sea lice life cycle thereby reducing the sea lice infection pressure in the area.
- **Husbandry:** Good husbandry practices have a huge impact on fish health, and healthy fish are more able to withstand the impact of sea lice infection. Husbandry practices that can contribute to fish health include (but are not limited to) selective breeding, low stocking densities, good nutrition and feeding practices, strict biosecurity and hygiene practices, and predator control.

- **Technology:** Wherever possible, new technologies that aim to prevent sea lice settlements from occurring will be investigated and implemented.
- **Lice Guards**: Lice guards are a type of skirt that are designed to prevent the sea lice copepodid stage from entering the culture pens thereby reducing the number of lice in the pen and attachments on the fish.
    - This specialized piece of equipment has a mesh size small enough to prevent lice from flowing through it.
    - Care is to be taken to timing of installment of lice guards so there are no lice inside the fish culture pen (i.e., on the fish) prior to installation. If used improperly, the lice guard can prevent nauplii or copepodids produced by lice inside the pen from exiting, thus creating a situation that amplifies the self-infection pressure within the pen.
- **Cleanerfish:** The term cleanerfish refers to any species of fish that shows an affinity for removing ectoparasites (in this case, sea lice) from another fish. When choosing a species of cleanerfish, it is important to consider how well the cleanerfish reduces sea lice numbers and the potential to bring pathogens to the cultured salmon along with the cleanerfish. In 2023, cunners (*Tautogolabrus adspersus)* will be trialed at an MCE farm in the province with cunners stocked at approximately 7% of the salmon in the pen.
- **Mechanical "Treatments**": The term "mechanical treatments" refers to removing lice using equipment rather than a chemotherapeutant. Equipment options include hydrolicers, thermolicers, flushers, etc.
    - Lice are separated from the fish mechanically and the fish are pumped back into the pen. In all cases, lice are retained and disposed of on land either at composting facilities or biogenerator at New World Dairy.
    - Thermolicer – Water temperature is increased to approximately 12^{o} C or higher than ambient – a change that is tolerated by the fish but is lethal to the sea lice.
    - Flusher – Water sprayers positioned around the circumference of a pipe act as a pressure washer to knock the lice off the fish.

Monitoring

MCE monitors sea lice numbers on fish at all farms as part of IPMP and as an important component of the fish healthcare routine. Sampling protocols to determine lice numbers include the following.

- Site managers, with assistance from site workers, will normally conduct weekly (or as designated) sea lice counts.
- The lice counting process starts with the fish being anesthetized to allow careful

detection of larval stages. Staff are trained to recognize early life stages of lice, which is essential for timely implementation of mitigation strategies.

- Ten fish from each pen will be sampled and a minimum of six pens per site to be counted. These fish will be examined for lice and overall fish condition.
- Counts and observations of lice life stages are recorded and communicated to site management and the company veterinarian on the standard sea lice worksheet. The following categories will be counted and recorded for each fish:
    - Chalimus
        - Pre-Adult + Adult Males (PAAM)
        - Adult females (AF)
    - Caligus
- Water temperatures are recorded at 5 m below the surface to determine if counts can be performed.
- The following minimum counts will be performed, unless otherwise instructed by the FHU:
    - Lower than 5°C, counts will not be done to maintain the welfare of the fish during cold water temperatures.
    - Higher than 5°C, counts will be done weekly.
- During cold water periods, careful handling of fish is required as the skin, scale, and mucous layers can be disturbed and lead to winter sores and secondary bacterial infections from *Moritella*,sp. *Tenacibaculum* sp. etc.
- In periods of extremely high temperatures, handling of fish can cause excessive stress and mortality. Periods of extremely high temperatures tend to be short-lived and will only disrupt sea lice counting for brief periods of time.
- Given the importance of close monitoring of sea lice levels, protocols err on the side of conducting the counting whenever possible.
- Site staff will receive annual training on the identification of species, life stages and management strategies. Training authorities include (but are not limited to) government authorities, Atlantic Veterinary College (AVC), and MCE.

Reporting

MCE participates in the Decision Support System (DSS) for the collection and study of sea lice settlement and treatment data with the Centre for Aquatic Health Services at the Atlantic Veterinary College (AVC) and other industry members in the provinces of New Brunswick and Newfoundland and Labrador. This cooperative effort is intended to lead to a better understanding of the efficacy of sea lice management and control tools.

As part of this effort. staff from AVC may visit the site to assist in sea lice counts. MCE site staff provide transport to the site and give assistance to AVC staff, as necessary, to complete the counts.

All data, collected by either AVC staff or site staff, are submitted to the site management, the FHU, and to the DSS system. Data recorded includes date and method of treatment, compound used and volume.

Count Audits

Evaluating the presence of sea lice on fish provides the data used for making decisions on when and how to treat sea lice and therefore the counting must be consistently accurate. Sea lice counting methods must be comprehensive to collect all data required and easy to follow so data collection is dependable and can be compared across locations and over time.

To ensure data reliability, both AVC and FHU staff conduct audits. Annually, the FHU will perform a minimum of one audit on every site. The audit data are entered into the DSS and any staff member who fails an audit will be required to undergo additional training prior to being allowed to conduct further sea lice counts. If a staff member fails an audit, the type and amount of training required and when they are allowed to continue their role performing sea lice counts is determined by the Fish Health and Welfare Director.

Intervention and Action Triggers

The need for intervention will be based on data from sea lice counts and will only be undertaken through the direction of a company veterinarian. Thresholds for control strategies aim at preventing the development of gravid females (females with eggs) and are implemented if any of the following conditions is met:

- The average number of gravid females in a pen is 0.5 or higher.
- The average number of mobile lice (PAAM + AF) is 3 or higher.

Interventions will be made on a fish pen or a farm and may be made sooner than the above situations if the FHU thinks it is necessary.

Therapeutants

Different chemical interventions are available, please refer to section 6f Chemotherapeutant Management. Intervention strategies are as follows.

- MCE only uses therapeutants that are authorized for use for food production in Canada. Under no circumstances is a non-approved therapeutant used.
- All withdrawal periods are strictly adhered to. Under no circumstances are fish sent for

human consumption until all withdrawal periods have been met to ensure all seafood produced is healthy and safe to consume.

- Emamectin, salmosan, thermolicer and flushers are available for use within the province.
- Generally, thermolicer and flushers are not used when air temperatures are significantly below freezing.
- Peroxide treatments are options during Spring and Fall when sea water temperatures are between 8-12^{o}C.
- Any intervention therapy will be determined by a licensed veterinarian, in consultation with the Fish Health and Welfare Director.

The FHU will assess the efficacy of each intervention treatment. Any treatment that results in clearance of sea lice over 90% of the targeted life stages is an effective treatment. Treatments with less than a 90% clearance of targeted life stages will trigger an investigation as to why the clearance levels are less than expected.

There are a variety of reasons why a treatment may have resulted in sub-optimal clearance, as listed below, that will be investigated to improve techniques.

- Incorrect dose
- Incorrect mode of administration
- Incorrect water temperature
- Spoiled product – incorrect storage or expired product
- Incorrect therapeutant choice for the targeted life stage
- Inaccurate lice count – pre or post treatment
- Resistance

Resistance cannot be proven by a single treatment. Rather, resistance is shown by tracking trends of treatment efficacy over time. The DSS is a valuable tool for assessing the effectiveness of treatments. In an effort to avoid resistance, treatment rotation is used, instead of relying on one single treatment, and the effective dose for each therapeutant is closely followed.

Harvest

Fish welfare is a priority at all times during culture and harvest. If FHU determines that the lice levels have increased to the point that the welfare of the fish is in jeopardy, and none of the available treatments are able to decrease the lice load to an acceptable level, an early harvest is warranted. The decision to harvest fish early will be made by both the Saltwater Production Director and the Fish Health and Welfare Manager, with the final decision resting with the Fish Health and Welfare Director.

Euthanasia

In the extremely rare circumstance that lice levels are high enough that the welfare of the fish is jeopardized, and no treatments can bring the lice levels down to a reasonable level, but the fish are not cleared for harvest because they have not met all withdrawal period conditions, the fish will be humanely euthanized.

If a large-scale euthanasia event is warranted, it will be conducted as humanely as possible, facilitating a rapid and irreversible loss of consciousness. All policies and procedures surrounding euthanasia will be written and approved by the veterinarian.

Although the method of euthanasia may vary depending on the circumstances, all methods will be in compliance with the Canadian Code of Practice for the Care and Handling of Farmed Salmonids, Farmed Salmonids - Codes of Practice for the care and handling of farm animals (nfacc.ca) that includes the following direction.

> Fish must be promptly euthanized if they have a condition that compromises their welfare and they do not have a reasonable prospect of improvement or are not responding to treatment(s) within an appropriate timeframe, or treatment is not a humane option.

- A written euthanasia plan must be developed with veterinary input and implemented.
- A written contingency plan for depopulation must be developed with veterinary input.

Reporting

MCE consistently monitors sea lice at all farms as part of IPMP and all treatments are conducted under multiple levels of veterinarian care and reported to regulators.

As committed to in 2020, the aquaculture industry in the province provides sea lice information to the public according to Aquaculture Policy 17, https://naia.ca/index.php/media/public-reporting.

In addition, the MCE annual report provides data on the percentage of sites that reached national trigger levels, the proportion of fish treated with non-medicinal systems, and the quantity of sea lice medicines (oral, topical and hydrogen peroxide) used.

Additional Management Procedures

Addressing Increase in Lice in the Environment

With the recent increase in water temperatures on the south coast of the province, there has been a noticeable increase in the number of sea lice. For this reason, changes are being made to both operational procedures and sea lice treatment strategies to counteract this growing pressure on the fish and include the following.

New Management Techniques

- All 140 m pens used in the province will be fitted to allow the deployment of tarps for treatments in the pen. This will allow for a rotation of treatments in pens that previously could only use mechanical treatments. This adaptation provides more options for lice treatment.
- Additional training will be provided for deployment of tarps on 140 m pens which will create efficiencies in delivering treatment and greater success in lice management.

Increased Treatment Efficacy

The presence of mortalities can cause a delay in lice treatment and the following processes are being implemented for more efficient mortality removal and faster treatment delivery.

- All fish culture pens will be installed to allow for diverless mortality removal systems.
- Ongoing collaboration with Mowi farms globally will improve the installation of the Lift-up systems leading to greater efficiency in removing mortalities.
- A new mortality-specific vessel has been commissioned with 360 Marine with delivery in 2023.

In-house Bioassay Program

The FHU has completed special training to undertake in-house bioassays more frequently to closely monitor susceptibility and resistance trends. This allows for earlier and more accurate prediction of treatment success or failure. In turn, this will better inform treatment selection decisions throughout the lice season.

Research and New Treatments

In support of using fewer chemical treatments, Mowi invests millions of dollars annually into research, development, and application of alternative sea lice management technologies like vessels for greater treatment efficacy, mechanical treatments for sea lice removal, and cleaner fish.

MCE has determined the following research projects have potential merit and trials are ongoing.

1. A current cleaner fish project with Miawpukek First Nation includes evaluation of a local cunner species (*Tautogolabrus adspersus*) for removal of sea lice on cultured Atlantic salmon. The Nation has harvested the cunner on an experimental permit and MCE placed the cunners in 3 of 6 culture pens at Salmonier Cove. Data will be collected on the most effective cunner density and rearing conditions that enhance lice removal. This information will be used to develop effective protocols for using cunners to remove sea

lice from cultured salmon, determine the number of cunners required for the industry, and will be used by the Miawpukek Nation to apply for a fishing licence for cunners in 2024.

2. A hatchery on the south coast of the province is currently growing Lumpfish (*Cylopterus lumpus*) to determine husbandry protocols and rearing information for the purpose of supplying the salmon culture industry with a non-chemical sea lice management tool.
3. Freshwater treatment bioassays completed on lice from MCE farms have shown 100% susceptibility to freshwater. In 2021, permission was received to direct freshwater from a nearby pond in Rencontre East to a holding tarp on the farm. Fish trials are expected to start in 2023.
4. Extended duration Salmosan treatments are being trialed by MCE in the province for the first time in Canada. The duration of the Salmosan bath treatment will be increased from 1 hour to 3 hours. Mowi has experience with the extended Salmosan treatments in other jurisdictions and the efficacy of the treatment was increased significantly, reducing the need for repeat treatments.
5. Mowi AS has full-time staff working on researching and developing protocols for mechanical warm water sprays and low-pressure wash.

4.3m Fish Containment - Saltwater Farms

Guidelines: Describe methods for fish containment within sea cages as well as during any transfer periods.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide the regulatory requirements for MCE's fish culture infrastructure design and construction and conditions of animal welfare that are considered that pertain to fish containment. MCE meets or exceeds the requirements of all policies and procedures.

Table 61 Aquaculture Policies That Pertain to Section 4.3m

AP #	AP Title	Description
AP 17	Public Reporting	All suspected and confirmed escape events from a licensed finfish aquaculture site must be reported to the public within 24 hours of the suspected escape and/or confirmation of the escape.
AP 42	Animal Welfare	A Licensee must ensure optimal animal welfare during transport, sampling, fish handling, depopulation, and normal operations.

The goal of fish containment is to keep the cultured salmon enclosed within the culture pens by reducing or eliminating the potential for salmon to escape. Mowi Canada East Inc. (MCE) is committed to keeping all cultured salmon within farms.

This section provides information on the comprehensive regulatory requirements and the MCE management plans and operational measures to keep cultured salmon contained within the culture pens. This includes operating practices that prevent accidents and limit the potential for equipment damage that may lead to escapes.

Please refer to the following sections for additional information that pertains to this topic.

- Section 4.2c Saltwater Farm Construction
- Section 4.3a Salmon Rearing Operations
- Section 4.3p Regulatory, Incident Management, and Public Reporting
- Section 6d Farmed and Wild Salmon Interactions Management

Management of Wild and Farmed Salmon Interaction Plan

Mowi ASA has a global goal of zero escape incidents. MCE draws upon the experience of their parent company and prevents escapes by applying the global research into equipment integrity, latest training, and effective operational procedures developed from the experience of salmon farming in challenging environments worldwide.

Detailed protocols and procedures for reducing fish escapes are included in the MCE Environmental Management and Waste Management Plan, Management of Wild and Farmed Salmon Interactions. This plan is reviewed annually, revised as needed, and provided to the Government of Newfoundland and Labrador, Department of Fisheries, Forestry and Agriculture (FFA) for approval to ensure all regulations and best practices are followed.

The following are components of the Management of Wild and Farmed Salmon Interactions Plan.

- Farm infrastructure is engineer designed and certified to ensure strength and integrity throughout the rearing cycle and to withstand adverse weather and reduce the potential for equipment failure.
- All equipment will meet or exceed the conditions as determined in the provincial Code of Containment.
- Equipment will be routinely inspected and promptly replaced as needed.
- Specific training has been designed to ensure crew and operational staff are aware of the safest and best management and husbandry practices to safeguard salmon and reduce the potential for escape.

The application of regulations and MCE management plans has resulted in a reduction of escaped fish. The following table provides the very low number of escaped salmon from MCE farms in the province from 2018-2022.

Table 62 Total Fish Escapes for 2018-2022 with Number Captured and Farm Information

Year	Total Escape Incidents	Number of Escaped Fish	Total of Captured Fish	BMA	Farm Name	Licence Number
2022	1	1	1	13	Friar Cove	AQ1148
2021	1	4	1	12	The Gorge	AQ1135
2020	1	1	0	12	The Gorge	AQ1135
2019	0	0				
2018	0	0				

Code of Containment for Culture of Salmonids

Baskett et al 2013 states the greatest effect on reducing the influence of farmed salmon on the environment is to limit the opportunities for farmed fish to escape. The Code of Containment for Culture of Salmonids in Newfoundland and Labrador (The Code) addresses this by providing equipment standards, handling practices, documentation requirements, infrastructure testing, and reporting requirements, inspections, and reviewing company management plans and mitigating measures.

The Code is a management strategy for the culture of salmonids and focuses on containment of farmed fish as a fundamental aspect of a sustainable aquaculture industry.

- All salmonid licensees are required to abide by The Code under the authority of the Aquaculture Act and associated regulations.
- The Code represents the province’s commitment to maintaining sustainable development that is transparent, responsible, and collaborative.

The Code is managed by the provincial Department of Fisheries, Forestry and Agriculture (FFA) and the federal Department of Fisheries and Oceans Canada (DFO) with both regulators responsible for ensuring robust requirements are in place to minimize farmed fish escapes and to effectively deal with escapes if they do occur. Each regulator is responsible for elements of The Code under their respective mandates.

The Code is overseen by a Code of Containment Liaison Committee of government and industry stakeholders, non-government organizations and local government representatives. This committee meets annually to review compliance data and to discuss elements of The Code for revision.

The Code is modelled on a risk management approach and is consistent with the Oslo Resolutions passed in 1994 by the North Atlantic Salmon Conservation Organization (NASCO), in recognition of the need to minimize escapement of farmed salmon, and to establish design standards for salmonid aquaculture pen systems.

The Code also draws heavily on learning from other jurisdictions with salmonid containment standards in place and relies on recognizing global standards. As a result, it is reviewed often, and the inclusion of new technologies and procedures incorporated as necessary.

The objectives of The Code are as follows.

- Minimize escapes of farmed salmonids.
- Be forward-looking and seek continual improvement.
- Be comprehensive in terms of both general and site-specific application and standards.
- Be consistent with NASCO priorities concerning the containment of aquaculture salmonids.
- Be as stringent and robust as containment codes that currently exist in other jurisdictions.

Ensuring proper containment of cultured aquatic organisms is the aim of farming companies, regulators, and all interested stakeholders. Understanding this, The Code is based on the following robust principles.

- Licensees will ensure all farm equipment is in adequate working order and will take all precautionary steps to ensure cultured aquatic organisms remain contained and pen system integrity secured. FFA will conduct regular inspections and audits to ensure compliance with approved Management Plans and Standard Operating Procedures on file with FFA.
- Sites will be appropriately designed for specific site conditions.
- Licensees will develop and adhere to Management Plans and Standard Operating Procedures for fish handling events to mitigate fish escape. Plans will be approved by FFA as part of farm management/Incident Management System plans.

- Licensees will maintain accurate Inventory Records of cultured aquatic organisms and reports related to net testing, net cleaning, and inspections. These records shall be made available for FFA auditing.
- Licensees will adhere to recapture plan requirements, approved by DFO, and will ensure that staff are trained on how to use recapture gear and follow the recapture licence 5 conditions that are managed by DFO.
- Licensees will adhere to all reporting requirements under The Code. 3.0 Responsibilities 3.1 Licensee Responsibilities.
- Licensees will abide by licence conditions and enact measures to the full extent of The Code to minimize escapes from sea pens.
- Licensees will Provide information and maintain documentation, to be made available at the request of the FFA and DFO.
- Licensees will maintain equipment standards and employ practices as required and outlined in company Standard Operating Procedures and Management plans on file with FFA.
- Licensees will update Management Plans and Standard Operating Procedures as necessary when new equipment and methods are adopted, and ensure staff receive annual training on escape prevention and recapture.

Licensee Responsibilities

- Abide by licence conditions and enact measures to the full extent of The Code to minimize escapes from sea pen culture.
- Provide information and maintain documentation, at the request of the FFA and DFO.
- Maintain equipment standards and employ practices as required and outlined in company Standard Operating Procedures and management plans on file with FFA.
- Update management plans and Standard Operating Procedures as necessary when new equipment and methods are adopted, and ensure staff receive annual training on escape prevention and recapture.

Department of Fisheries Forestry and Agriculture Responsibilities

- Responsible for implementing and enforcing the regulations and procedures Licensees must abide by for containment of cultured aquatic organisms.
- Review and approve Licensee management plans and Standard Operating Procedures for adherence to The Code.
- Review inventory reconciliation information required by The Code.

- Provide the necessary monitoring and inspection to ensure containment practices and procedures outlined in The Code are followed and enforced.
- Coordinate annual stakeholder review and updates of The Code.

Fisheries and Oceans Canada Responsibilities

- Monitoring and enforcement of the recapture component of The Code.
- Monitor compliance with the practices and procedures of The Code through independent audit, site inspection/visits, or other investigations.
- Coordinate with FFA on stakeholder review and updates of The Code.

MCE fully supports the directives in The Code knowing effective containment of farmed fish is a fundamental aspect of good farming practices. MCE has included all equipment standards, handling practices, reporting and audit requirements, inspections, and mitigations in The Code into company policies and management practices that include the following.

- Infrastructure, including equipment, nets, moorings, designed to third-party party engineering standards and installation according to the engineered site layout" to ensure longevity and to withstand adverse conditions.
- Extra strength HDPE generational nets in the process of being deployed throughout the province to reduce net changes and for predator control.
- All nets labelled, inspected monthly and meet net testing breaking strength requirements as outlined in The Code.
- All fish handling practices meet or exceed those as outlined in The Code.
- Ice barriers are installed as needed.
- Escape prevention management and recapture and reporting strategies are developed and approved by the provincial government.
- Regular reporting of net inventory, inspection and testing, equipment inspections, biomass, mortalities etc. integrated in normal farming activities.
- Scheduled inspections and maintenance of all nets, pens, and surface mooring equipment.

Infrastructure Design and Construction

Third-party Certified Engineer Stamp of Approval

MCE complies with FFA Aquaculture Policy 2 which requires all saltwater infrastructure design to third-party engineering standards and installation according to the engineered site layout. To

date, MCE farms in the province have not experienced any failure due to environmental events.

The third-party standard covers all main components – pen and collar, culture net, moorings, barges - and auxiliary equipment and provides the following provisions.

- Material specifications
- Design approach with respect to analyzing methods and testing.
- Material and load factors for Serviceability Limit State, Ultimate Limit State and Accidental Limit State, and Fatigue Limit State
- Net specifications
- Environmental specifications

In addition to meeting the standards, all systems are constructed of new materials designed to reduce technical failure and are configured to reduce the opportunity for human error.

Site Specific Design

The saltwater farm site information, a risk analysis, plus operation and production requirements are all used to develop a site-specific technology design and installation and best operating practices. Culture infrastructure and moorings are designed specifically for the unique conditions of each site with the dimensions of floating collars, nets, and moorings based on environmental factors and include the following.

- The ability to withstand significant wave height, 1 in 50-year storms, and moving and fixed ice.
- Pens and mooring system designs have been tested in harsh environments globally without being damaged.
- Nets and pens are designed to accommodate the extra weight from ice.
- Pens are made of plastic and strong steel for flexibility and maximum escape prevention.
- Specially designed fish nets where lowering ropes do not come into contact with the net, eliminating a source of net wear and damage.
- Net pens minimum 20 m in depth, providing the salmon with access to colder high oxygen water during times of elevated surface water temperatures.
- Improved customized fish net design and net tensioning system where all components complement one another for optimal interaction creating greater longevity and reducing risk of friction, abrasion, and equipment damage.
- All new nets will be high abrasion resistant with high strength to reduce equipment failure with existing nylon nets retired as net inventory accumulates.
- Standard net mesh size of 36 mm has been tested in Norway with 60g fish, resulting in no escapes from technical failure even in the most adverse conditions. This mesh size

will accommodate the smallest fish transferred to the marine sites and complies with the minimum size defined in The Code.

- The system is designed to facilitate maintenance and repair to ensure all equipment is in good working condition at all times.

Specialized Equipment

- All MCE farms in the province are moving to abrasion resistant high strength HDPE (high density polyethylene) nets. Abrasion resistance is critically important as nets wear and are abraded on the pen infrastructure and/or with predator interactions. As nets abrade, they become more susceptible to rips and tears. This material is also “bite-proof” to predators, eliminating predator damage and an avenue for.
- Standard net mesh size of 36 mm has been tested in Norway with 60g fish, resulting in no escapes from technical failure even in the most adverse conditions.
- Generational nets are used which eliminates net changes during the grow-out cycle. HDPE nets are washed in-situ with special net wash units eliminating the need to change nets. Nylon nets are removed for cleaning at a land-based facility as frequently as needed, and as required by The Code. Existing nylon nets will be retired as the HDPE net inventory grows.

Infrastructure Inspections

Saltwater farm equipment inspection and maintenance schedule is provided in Section 4.3a Salmon Rearing Operations. The following inspections are part of the conditions of licence.

- Monitor and inspect surface components of mooring systems, pens, nets, and ropes on each site once per week and submit an internal inspection form to FFA every 30 days.
- Repair any identified damage to site equipment immediately, or within the timeline provided by the Compliance and Enforcement Division. Failure to do so may result in sanctions including fines, restrictions, suspension, or cancellation of the aquaculture licence.
- FFA inspections conducted at a minimum of twice yearly (one in the spring, after fish entries; one in the fall/early winter)
- During FFA inspection, all site inspection records at least one week before the scheduled inspection will be provided including copies of all site inspections performed by employees on the site.
- FFA shall provide a copy of the completed Code of Containment inspection form to the Licensee upon completion of inspections.

Innovations

MCE policies and procedures have the goal of minimizing net handling to reduce abrasion and weakening which may increase opportunities for escapes to occur. In addition, MCE, through global research and development teams at Mowi, continues to look to innovations for better anti-fouling strategies that reduce the need for net cleaning and for better sea lice treatment strategies that lessen net handling which can weaken infrastructure.

Operational Procedures

In a global survey, MCE identified three key areas to address equipment failure and specifically to keep salmon contained: 1) nets and equipment inspected regularly, 2) correct use of equipment, 3) review of operational procedures and risk assessment before operations.

The following practices have been developed to address these key areas.

- Checklists will be prepared for operational procedures that include escape-related risks.
- Checklists will be signed off prior to execution of operational procedures that involve risk of escapes and will be revised and updated, if needed, at least once per year.
- All mooring buoys and other markers will be installed as per Transport Canada requirements and maintained in good condition.
- The installation of moorings, pens and net combinations will be guaranteed and used according to minimum standards recommended by the supplier.
- User manuals for the pen system and moorings will be followed.
- Site management must investigate all reports of chafing and rectify them as soon as possible.

Detailed policies and procedures have been developed to ensure the most advanced containment procedures. These internal company procedures include the following.

- Escape Prevention and Response Plan
- Fish Containment Plan
- Escape Response Procedure
- Net Inspection Procedure
- Net Inspection (Diver and non-Diver)
- Predator Avoidance Plan
- Pen and System Daily Inspection (Daily and Post Storm)
- Risk Assessments - performed when running large operations or using new equipment.

Infrastructure Damage

Table 63 provides mitigation measures to reduce the opportunity for fish escapes if infrastructure is damaged due to accidents or environmental emergencies.

Table 63 Events and Mitigation Measures to Reduce Potential for Fish Escapes

Event	Mitigation Measure
Small Fish Swimming Through Net	Mitigation: All salmon smolt stocked at saltwater farms are 60+ g. All culture nets have 18 mm mesh, proven to contain fish smaller than 60 g.
Accidental Infrastructure Damage	**Mitigation:** Below surface pen inspections every 30 days and mooring structures inspections annually with maintenance conducted as required. Detailed inspection and maintenance records.
Environmental Emergencies	**Mitigation:** Environmental Management and Waste Management Plan and the Environmental Emergency Response Plan describe procedures to be followed. The plans are posted at an easily accessible location on each vessel, on the farms and at the central site for BMA. An emergency response orientation and training is provided to all staff and operators.

Net Use and Management

- All sites will have “generational nets” that remain in place during the entire production cycle eliminating the need to remove and replace nets that potentially create an opportunity for fish escape.
- Culture nets are 18 mm mesh size ensures smallest fish, are not able to swim through the mesh.
- Nets will be uniquely identified for traceability.
- Net inspection and maintenance log records details such as production date, repairs, strength tests etc.
- Security/catch/secondary nets will be used when sampling or handling fish to eliminate potential for escapes during grading or harvesting, see below for details.
- When pumping fish, a drop net and double walled pipes will be used to mitigate loss of fish.
- HDPE nets will be cleaned regularly with ROV in situ cleaning system that eliminates the need to remove the nets for cleaning, therefore eliminating an activity that has the potential for escape. Existing nylon nets are removed for cleaning at a land-based facility

prior to heavy fouling.

- Towing pens containing fish is not part of the production plan, however, should this activity become necessary, the operating procedure will be submitted to FFA for approval prior to any activity taking place.

Catch Net Management and Deployment

- All fish handling events, including but not limited to transfers, sampling, treatments, mortality removal, must have a catch net in place.
- All catch nets must be the minimum size to cover the working “area or risk”.
- All catch nets will be constructed of a mesh size that will contain the smallest fish within the population.
    - The minimum required size is 20’ x 30’, certain activities require larger catch nets must be identified during the planning and risk assessment phases of the fish handling activity.
- The vessel must be secured with a minimum of three tie up lines when attaching a catch net to any vessel.
- All catch nets must be secured in a manner that minimizes tripping hazards and other potential hazards.
- Each farm must have at least two catch nets, in good repair, on site.
- After each use, catch nets must be cleaned and disinfected as per the SOP and stored safely in a cleaned containment.
- All catch nets must be secured with ropes in such a fashion that prevents slipping out of place.
- All catch nets will be secured to ensure there are no low points that allow fish any access outside the area of containment. A minimum of ¼” rope will be used to secure all catch nets.
- “Draping” of catch nets without being secured by rope is not an acceptable practice.
    - All vessel scuppers must be closed or equipped with netting or mesh prior to sampling/lice counting to prevent an escape.

Lice Counting

- The catch net must be secured in a “box shape” around the working area.
- The entire perimeter must be secured to ensure all fish movement occurs within the elevated catch net area.
- Although sampling from a flat-deck vessel is not recommended, if unavoidable, the catch

nets must be secured to ensure the perimeter of the catch net is elevated to cover the entire work area and prevent an escape.

Harvesting

- The netting must be secured around the harvest vessel's intake hose and must be inspected for safe use prior to each day.
- A properly secured catch net must be used if a fish is to be sampled or dipped out of the pens.
- A catch net must be used during the removal of a seine net from the pen. This net must be properly secured and cover the area of risk as identified within this procedure.
- Vessel:
    - Netting must be secured around the intake and outflow of the vessels hoses and must be inspected for safe use prior to use each day.
    - A properly secured catch net must be used if fish are to be sampled or dipped out of the pens.
    - Vessel hoses are inspected for signs of wear and degradation.

Treatments (Flushing and Thermolicing)

- All vessel hoses and connections must be inspected each day prior to use.
- Catch nets will be placed directly under the inflow and outflow hoses secured to the pen top rail and the sides of the vessel. Ensure a risk assessment is performed to ensure all tripping hazards are identified and clearly marked.
- Sampling/Dip Netting Moribund fish: catch nets will be used as per this procedure.

Mortality Removal

- A properly secured catch net must be placed directly in the "area of risk" for mortality removal.
- When using a vessel to assist with mortality removal, the nets and vessels must be secured as identified within this procedure.
- A risk assessment is completed and reviewed when contractors are handling mortalities.
- Any time mortality is being handled and/or transferred into tubs/ensilage systems etc. a Mowi employee must be present and consider the following:
    - Be aware of environmental factors such as wind and waves.
    - Do not overfill buckets/pans.
    - Do a risk assessment to mitigate fish loss – a lost mort is still considered an escape.

- Make sure vessel scuppers are covered to catch any potential loss.
- When euthanizing, ensure catch nets are in place in the “area of risk” as identified in this procedure.

Catch Net Maintenance

- Catch nets must be inspected prior to each use. Inspection will include but is not limited to the following.
  - appropriate size of net is used in proportion to the “area of risk”
  - mesh strength and condition
  - mesh size matches fish size
  - secure tie-up points
  - overall condition, including if holes are present

Culture Net Inspection and Reporting

- Underwater inspections of all active nets are to be conducted at a minimum every 30 days by a qualified dive team or trained ROV operator.
- Additional net checks may be required following any operational activity or event that increases the risk of net failure, including extreme environmental conditions, net changes, fish delivery, treatments, seining activities, predator attacks, or vandalism. If a full check has been completed within the 30-day period, the due date of the next check is 30 days from the most recent check.
- For new stockings: As soon as a site is fully stocked of smolt, a net check must be performed and documented. This will serve as the first monthly net check.
- A diver visual inspection must be conducted systematically to ensure that all areas of the net are assessed.
- Divers will immediately repair the net in a manner that will maintain the integrity of the net and report any holes and make the site crew aware of any signs of chafing.
- To minimize the risk of escape, the diver door must only be dropped in the water long enough to allow diver(s) to enter or exit a pen.
- ROV inspection must be done either by properly trained site staff, or in conjunction with regular ROV net cleaning activities, provided that all areas of the net are inspected.
- Upon discovery of holes or chafing, ROV operator must immediately notify site manager so that containment kits can be deployed, and risk of escape assessed.

- Upon completion of ROV inspection:
    - In the case of an internal ROV inspection, ROV operator must complete and sign the internal net check report and submit it to site manager.

      or

    - In the case of an inspection done during net cleaning, a signed copy of the *in-situ* net cleaning report must be reviewed by the site manager prior to leaving site. Site manager to take a picture or photocopy for records.
- Internal net check reports are required for each inspection and must include the following.
    - Pen number
    - Size of hole(s) – described in number of mesh breaks
    - Shape of hole(s) – e.g., Round, slit, vertical/horizontal
    - Depth / location of hole(s)

Inventory Reconciliation

An annual Inventory Reconciliation Report for each site and each fish culture system is submitted to FFA with numbers of fish introduced, mortalities, harvested starting number, ending number, counting deviation and escapes.

Transport

MCE policy is to ensure all aspects of fish transport are conducted in a manner that reduces the risk of escapes. There has been no fish loss or fish escape in the past five years from either transfer of fish to and from the transport vessel or during vessel transport. This applies to transport of smolt to saltwater farms and transport of harvested fish to the processing plant. Standard procedures include the following.

- All staff and contractors will follow best practices with regards to escape prevention.
- For both fish culture and transport, staff training programs will ensure all staff and contractors can carry out their responsibilities for both escape prevention and inventory practices.
- Fish transfer lines will be permanent structures with flexible sections to facilitate fish handling with pipe joins using cam-lock fittings.
- The ends of the transfer pipe remain submerged in the fish pen and in the hold of the transport vessel at all times during transfer.
- Transfer pipes will be inspected for holes/splits, sharp edges, and integrity prior to each use and pipe joins will be inspected for proper fitting and support prior to transferring.

- Escape incidents or near misses during transport will be reported to the Freshwater Transport Manager.

Though unlikely that an escape will occur during transport, an Escape Response Plan is developed to minimize the potential effect on the environment and includes the following.

- Escape Response Kit – list of equipment, location, instructions for use.
- Suspected escape events response actions documented and available onsite.
- Confirmed escape events response actions documented and available onsite.
- Training for all staff and contractors on site.

Record keeping will include detailed accurate records of events leading up to the discovery, response, reporting and all communications related to the event and includes the following.

- Escape event description
- Fish production information – origin, transfer date, introduction of fish
- Mortalities
- Training
- Internal escape and investigation report

The vessel Main Operational Manual includes the following procedures to reduce the opportunity for fish escapes.

- The vessel shall have procedures and barriers to prevent fish from escaping during all operations. Good instructions and training prior to transport are important.
- Cover openings from deck with grating or net.
- Close valves for loading hoses.
- Cover loading and unloading hoses with small mesh net.
- Use pumps correctly.
- Check before loading and unloading for weaknesses or wear.
- Check for fish in loading and unloading hoses before and after use.
- Ensure risks have been addressed e.g., valves are closed and monitored to prevent being opened at the wrong time.

4.3n Recapture of Escaped Farmed Salmon

Guidelines: Provide methods to recapture fish should escapes occur.

This section provides the methods used to recapture cultured salmon that have escaped from saltwater farms, the freshwater hatchery, or during transport.

Unless otherwise indicated, the information in this section pertains to the saltwater culture of all MCE salmon in the province.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide the regulatory requirements for MCE's collaborative plan for recapturing escaped farmed salmon and reporting.

Table 64 Aquaculture Policies that Pertain to Section 4.3n

AP #	AP Title	Description
AP 4	Aquaculture Licensing Process	It is the responsibility of the licence holder to work with DFO to obtain the emergency recapture licence.
AP 17	Public Reporting	For all confirmed escape events, the license holder is required to report: • site(s) of the escape • species of the escaped • cause of the escape • estimated number of fish escaped • recapture plan for escaped animals • any other information deemed by FFA to be reportable

Saltwater

In the province of Newfoundland and Labrador, escape reporting requirements are provided by the Code of Containment of Salmonids in Newfoundland and Labrador (The Code) which is a condition of all salmonid aquaculture licences in the province. Jointly administered by Department of Fisheries and Oceans Canada (DFO) and the provincial Department of Fisheries, Forestry and Agriculture (FFA), The Code provides the measures for recapture of escaped fish, reporting of escape incidents, recapture data sheets, and a recapture plan and recapture licence application and includes the following.

- In the event of an incident where it is reasonable to believe there may have been a loss of fish, the incident is deemed to constitute an escapement and the license holder is required to commence discussions with DFO within 24 hours of the incident to determine if recapture efforts should be initiated.

- The Code requires recapture plans to be in place in order to recover stock, reduce the number of escaped salmonids in nature, and minimize the potential for interactions between wild and farmed fish.
- Recapture strategies may include directed recapture fishing by Licensees and use of other commercial, recreational, or Indigenous fisheries.

As per Aquaculture Policy (AP) 17, all escape events are immediately communicated to Department of Fisheries and Oceans Canada (DFO) and FFA verbally and followed with written notification to both agencies with 24 hours. Within 24 hours, discussion will commence with DFO and FFA to determine if recapture efforts should be initiated.

1. All suspected and confirmed escape events from a licensed finfish aquaculture site must be reported to the public within 24 hours of the suspected escape and/or confirmation of the escape.

2. For all suspected escape events, the licensee is required to report:
   - the site(s) of the escape;
   - the species escaped; and
   - any other information deemed by the department to be reportable.
3. For all confirmed escape events, the licensee is required to report:
   - the site(s) of the escape;
   - the species escaped;
   - the cause of the escape;
   - the estimated number of fish escaped;
   - the recapture plan for escaped animals; and
   - any other information deemed by the department to be reportable.

While all incidents are reported, not all escape incidents trigger recapture efforts. Authorization for recapture is at the discretion of DFO, in consultation with the Licensee and other stakeholders, see Figure 40.

To be eligible for a recapture licence, the licensee must have an approved DFO recapture plan and personnel trained in the deployment and retrieval of fishing gear.

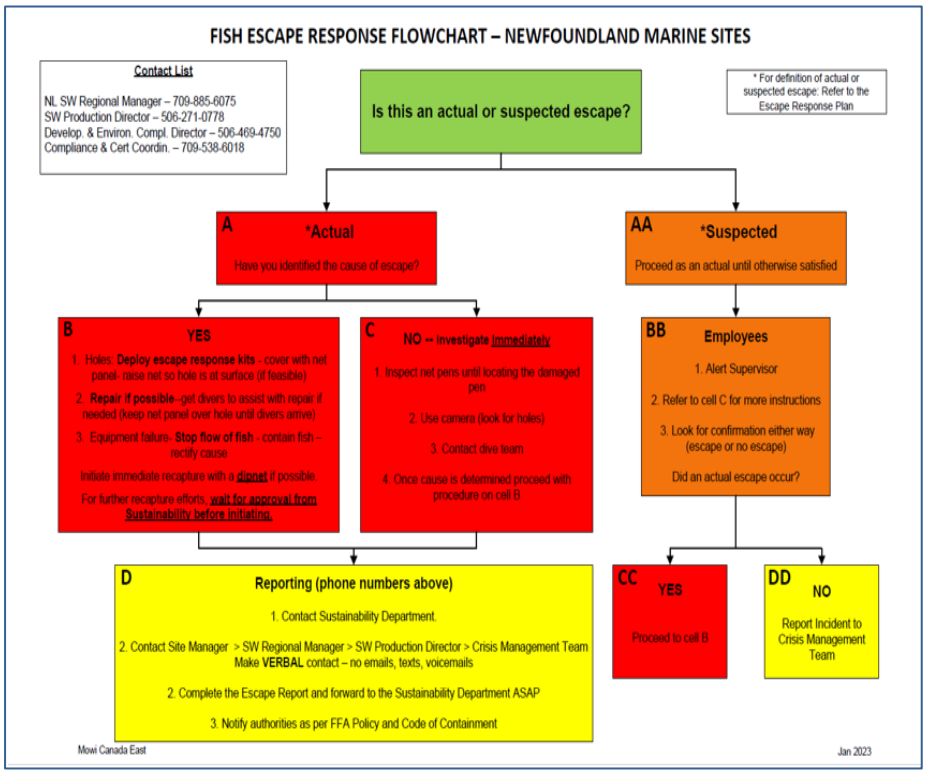
Fish Escape Management Plan

MCE has a comprehensive Saltwater Fish Escape Management Plan, a component of the Environmental and Waste Management Plan. It is reviewed annually, revised as needed, and submitted to FFA to ensure all practices and procedures meet regulatory and policy requirements.

As stated in the previous section, the goal is to have no escaped fish. There have been less than six fish escape from MCE farms in the province since 2018, please refer to Table 61 in section 4.3m Fish Containment Saltwater Farms.

Recapture of escaped salmon is initiated upon the direction of DFO. MCE will follow the collection and sampling protocol provided by DFO and in accordance with the aquaculture site licence condition 19, see Figure 40 for recapture procedures. If recapture is initiated, MCE will provide FFA with a copy of the recapture licence prior to initiating recapture.

Figure 40 MCE Fish Escape Response Flowchart



MCE will complete and submit the Escapement/Incident Report Annex 3 of The Code once the farm is secured, and recapture efforts have been completed.

MCE will follow the directions of both DFO and FFA regarding any follow-up measures that may result from the review of the Escapement/Incident Report which may include the resubmission of preventative measures for revaluation.

Collection Protocol

For gillnetting: Nets are set proximal to the pens where the escape event has occurred. Allow nets (probably 4-inch gill nets) to soak a maximum of 1 hour per set. Actively tend nets throughout the duration. The sampling should consist of six one-hour tended sets. If during the set it is obvious a fish has become entangled, the net is to be pulled and the fish processed as per below.

Salmon

1. All putative farmed salmon caught will be sampled for biological characteristics (Whole Weight, Gutted Weight, Fork Length, Sex, and Maturity), scales (see below), and a genetic sample (fin clip – see details below).
2. All farmed fish should be photographed. Prior to taking a photo of the fish, take a photo of the sample envelope with the specimen number on it (or at a minimum a photo of something other than a fish to be able to easily separate photos later). Photos should include:
    - Photo of left side of whole specimen on measuring board
    - Close up of tail on measuring board showing fork length.
    - Photos of fin wear
    - Photos of eye bulges or other abnormalities
    - Photo of gut still in body cavity
    - Photo of gonad
    - Photo of dissected stomach and contents
3. Record site ID and description, waypoint (coordinate information), start and end time, and environmental data (cloud cover, weather conditions, wind direction, water temperature, and air temperature).
4. All wild fish should be released as soon as possible.
5. All aquaculture fish should be lethally sampled and disposal according to DFO regulations.
6. Any wild salmon mortalities should be properly tagged and returned to NAFC for proper disposal according to DFO regulations.

Scales

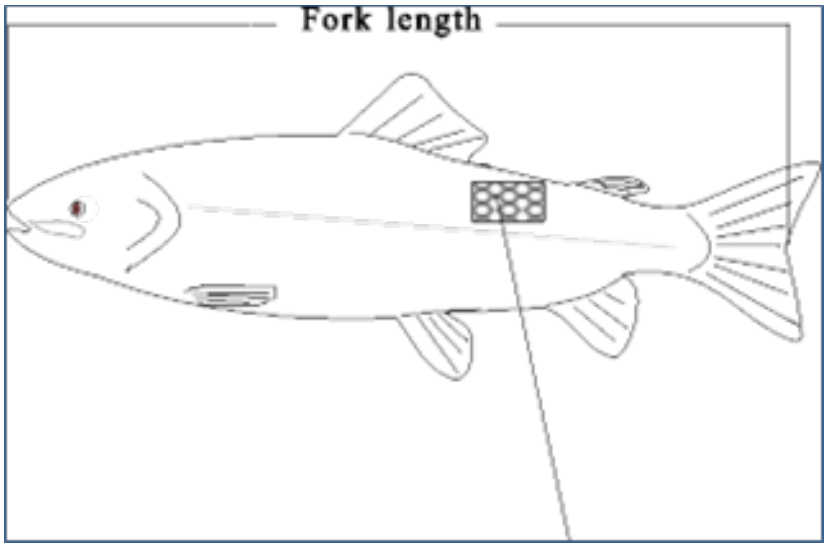
Scales are collected mainly for ageing purposes but can also be used to confirm the genetic identification of salmon which are suspected to be of farmed origin.

- Place the salmon on the measuring board with its left side up. Collect scale samples from an area 3-6 scale rows above the lateral line, just back of the dorsal fin preferably on the left-hand side of the fish.
- Using a clean knife remove the mucus from the sample area by rubbing the knife in a head-to-tail direction, see Figure 41.
- Clean the mucus from the knife and remove scales from the fish by scraping the knife in a tail- to-head direction.

- Try to remove approximately 20-25 scales and place them on paper (cut into small squares) before storing the sample in the envelope provided.
- Fold the paper so that it covers the scales on both sides but be careful to ensure the scales are not in the fold of the paper.
- Ensure scale envelope is labelled with all pertinent information, including FL, WW, Sex, fin clips, date, location, how collected, name of collector, etc.).

It is important to clean the knife thoroughly after taking scale sample, so the next sample is not mixed with scales from several fish (i.e., 'cross-contamination').

Figure 41 Scale Removal Area



Fin Clips

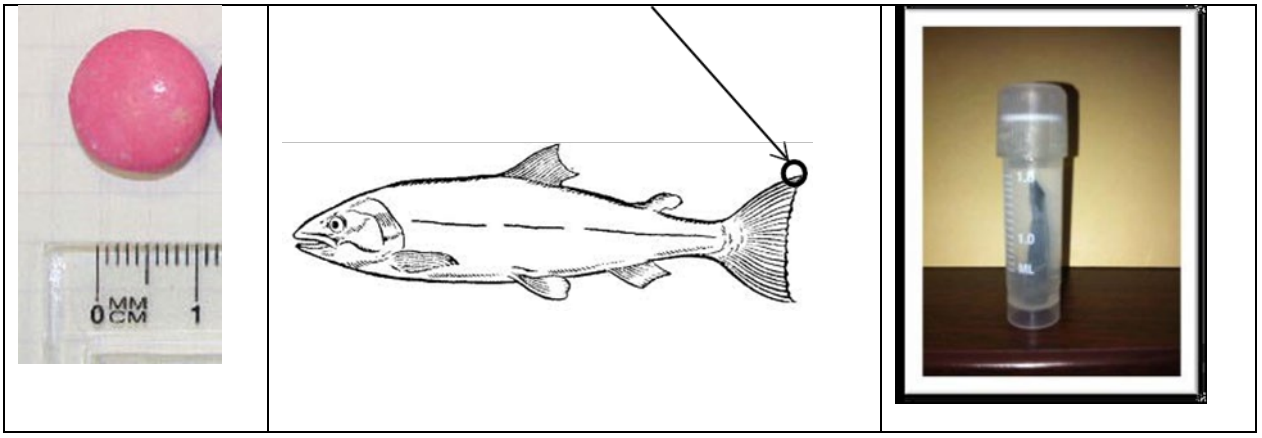
Used mainly for DNA identification, fin clips can be used to confirm the genetic identification of salmon which are suspected to be of farmed origin. Fin clips should be sampled from salmon which are either alive or as shortly after death as possible. Extensive time delays or freezing of samples results in DNA breakdown.

Collect fin clips (1 cm x 1 cm) from the caudal/tail fin, and quickly place in a vial containing 95% ethanol, see Figure 42.

- Tissue in vial should not exceed 25% of volume of preservative and each vial should be labeled with an identification number.
- Since the salmon may also be sampled for scales, use the same specimen/ID on the vial as on the scale envelope for that salmon. It is important to properly label the vial with the date, location, and ID on the log sheet provided.
- If samples are being stored, ethanol will generally need to be replaced after 2 weeks of

storage. Vials should be stored in a cool, dark place, if possible.

Figure 42 Caudal/Tail Fin Sample – Tissues Size, Location of Sample, and Sample in 2 ml Vial



Recapture Licence and Conditions

- Licence conditions specify the type, size, and quantity of fishing gear and equipment permitted; the manner in which it is to be used; the specific locations at which fishing gear is permitted; the period during which fishing is permitted to be carried out; and information that the licence holder shall report. This is the type of information required by DFO to issue the annual recapture licence.
- For the purposes and protection of fish, the conditions of a licence may be amended.
- Biological samples from catches may be required and the number and nature of samples will be determined by DFO.
- Where possible, all wild fish, except those exhibiting clinical signs of infectious disease, are to be released alive and in a manner that causes them the least harm, see Recapture Licence Conditions below.
- Recapture Licence is shown below with the details.

Fisheries and Oceans Pêches et Océans

2021

EXPERIMENTAL (RECAPTURE) LICENCE

NL-6053-21

Marine Harvest Atlantic Canada
PO Box 190
Saint Alban's, NL A0H 2E0

Contact: Aaron Bennett (506) 469-4750

Pursuant to Section 52 and Section 56 of the Fisheries (General) Regulations, permission is hereby granted to **Marine Harvest Atlantic Canada**, or designates, to fish, collect biological samples, and transport farm-origin Atlantic salmon subject to the following conditions:

1. This licence is valid from **January 1 to December 31, 2021**
2. **Purpose:** To remove and/or biologically sample suspected and known farm-origin Atlantic salmon in fish bearing waters and from aquaculture sites to identify the origin of escaped farm-origin fish and to determine the biological characteristics of escaped or wild salmon in order to evaluate and mitigate potential impacts on wild Atlantic salmon populations.
3. **Locations:** Coastal waters on the South Coast of Newfoundland in Salmon Fishing Area 11.
4. **Fishing Gear:** Gill nets. All gear must be marked with licence number **NL-6053-21**.
5. **Species:** Farm-origin Atlantic salmon and wild salmonids.
6. Fishing under authority of this licence will not commence prior to discussion with the Department of Fisheries and Oceans (DFO) Aquaculture Management.
7. Each day will consist of six one-hour tended sets at locations determined in consultation with DFO.
8. Gillnetting efforts will be conducted daily unless otherwise directed by DFO.
9. All gillnet sets are to cease if recovery efforts result in two wild Atlantic salmon mortalities.
10. Fish caught under the authority of this licence cannot be sold and must be destroyed following completion of experimentation unless determined to be wild salmon.
11. Data and biological samples (scale sample and fin clips) to be collected as per attached sampling instructions and held for collection by DFO.
12. All wild fish are to be immediately released back into the water. Those that are alive are to be released in a manner that causes the least amount of harm.
13. All fishing activities must be overseen by DFO personnel. Records of all fishing activity must be recorded and submitted daily to Elaine Rolls (Elaine.rolls@dfo-mpo.gc.ca).

Canada

Fisheries and Oceans Pêches et Océans

2021

14. Prior to activities taking place, the Conservation and Protection (C&P) Supervisor, C&P must be notified verbally of your activities (**Marystown, 279-7850**).

15. This licence must be carried at all times and must be produced for inspection upon request of a Fishery Officer or Fishery Guardian.

16. **Marine Mammal Interactions**:

You must provide information regarding all lethal and non-lethal marine mammal interactions during fishing trips. For the purposes of these conditions lethal and non-lethal marine mammal interactions is defined as interactions that include bycatch or collision of all marine mammals and all sightings of marine mammals entangled in fishing gear.

You must complete the DFO Marine Mammal Interaction Form and it must be submitted as per the instructions provided on the form. The form is located online at https://www.dfo-mpo.gc.ca/species-especes/mammals-mammiferes/report-rapport/page01-eng.html

This form can be completed and submitted online or if you prefer, you can fax or email the printed form. This form must be completed and submitted for all lethal and non-lethal marine mammal interactions.

If there is a whale (alive or dead) caught in fishing gear during recovery efforts, call 1-888-895-3003 immediately.

You must report all sightings of North Atlantic Right Whales by calling 1-888-895-3003 as soon as possible or at least 24 hours after sighting.

It is prohibited to disturb a marine mammal. You are not permitted to move or entice or cause a marine mammal to move from the immediate vicinity in which it is found. You are not permitted to trap it or its group between a vessel and the shore or between a vessel and one or more other vessels. For additional prohibitions, please refer to the Marine Mammal Regulations.

17. **Species at Risk**

In accordance with the recovery strategy for the Northern Wolffish (Anarhichas denticulatus) and Spotted Wolffish (Anarhichas Minor), the licence holder is permitted to carry out experimental fishing activities authorized under the Fisheries Act that may incidentally kill, harm, harass, capture or take the Northern Wolffish and/or Spotted Wolffish as per subsection 83(4) of the Species at Risk Act (SARA) subject to the following conditions:

Licence holders are required to return Northern Wolffish and Spotted Wolffish to the place from which it was taken, and where it is alive, in a manner that causes it the least harm.

Licence holders are required to report in the attached SARA Questionnaire any interaction with Northern Wolffish or Spotted Wolffish.

Failure to comply the conditions of this licence will result in the cancellation of the licence.

Canada

Recapture Gear

1. A minimum of two sets of gear and a set of gear for every two active aquaculture sites. A 'set of gear' is defined as four 50-fathom-long gill nets, one of each mesh size: 3½", 4", 4 ½" and 5" (89 mm, 102 mm, 114 mm, and 127 mm, respectively).
2. Recapture activity shall be permitted to use gillnets and seines with mesh sizes ranging from a minimum of 38 mm to a maximum of 127 mm.
3. Licensees engaged in recapture activity may be permitted to use traps (maximum mesh size 35 mm) and/or angling gear. The licensee shall discuss with DFO prior to the use of any additional gear types.
4. The 'Minimum Gear' guideline is intended to provide an initial response capacity to escape incidents, see Table 65. If necessary, it is expected that the Licensee will collaborate, by sharing recapture gear, or enter into arrangements with commercial fish harvesters to ensure that adequate recapture efforts are implemented.

Table 65 Minimum Gear Requirements

Number of Aquaculture Sites	Sets of Gear Required
2	2
3	2
4	2
5	3
6	3
7	4
8	4
9	5
10	5
1	6
12	6
1	7
14	7
1	8

Post Escape/Incident Review

An Escape/Incident Report is filed with FFA and DFO once the escape incident is over. The report will be reviewed to determine the following.

- Cause of the escape/incident.

- Whether the escape/incident was preventable.
- Level of remedial actions taken by the licensee.
- Success of recapture effort.
- Appropriateness of proposed future preventative measures for that type of incident.

Other considerations during the review also contribute to the knowledge of the event and assist regulatory agencies and the company in improving operational procedures and technology to reduce the potential for escapes in the future.

- History of site and licensee regarding escapes and incidents.
- Assessment of site documentation required by The Code (weekly site surface inspection/net inspection).
- Review of the previous code inspections undertaken by FFA.

Upon completion of the review, the following steps will be undertaken:

1. If it is determined that the licensee has performed its due diligence with regards to escape prevention, mitigation and response and the incident was not preventable, no further action is required.
2. If it is determined that the licensee's proposed escape/incident prevention measures are inadequate, the Licensee shall be required to resubmit new prevention measures for re-evaluation.
3. If it is determined that the licensee has not demonstrated due diligence with regards to The Code or has a history of similar escapes, FFA may take action under the *Aquaculture Act*.
4. If it is determined that escapes of a similar nature have occurred industry wide, FFA and/or DFO may propose changes to The Code to address the specific area of concern and present it to The Code Liaison Committee for inclusion.

All escape incidents, or incidents that may have led to an escape, will be identified in the Annual Compliance Report, including steps taken to prevent future escapes of a similar nature.

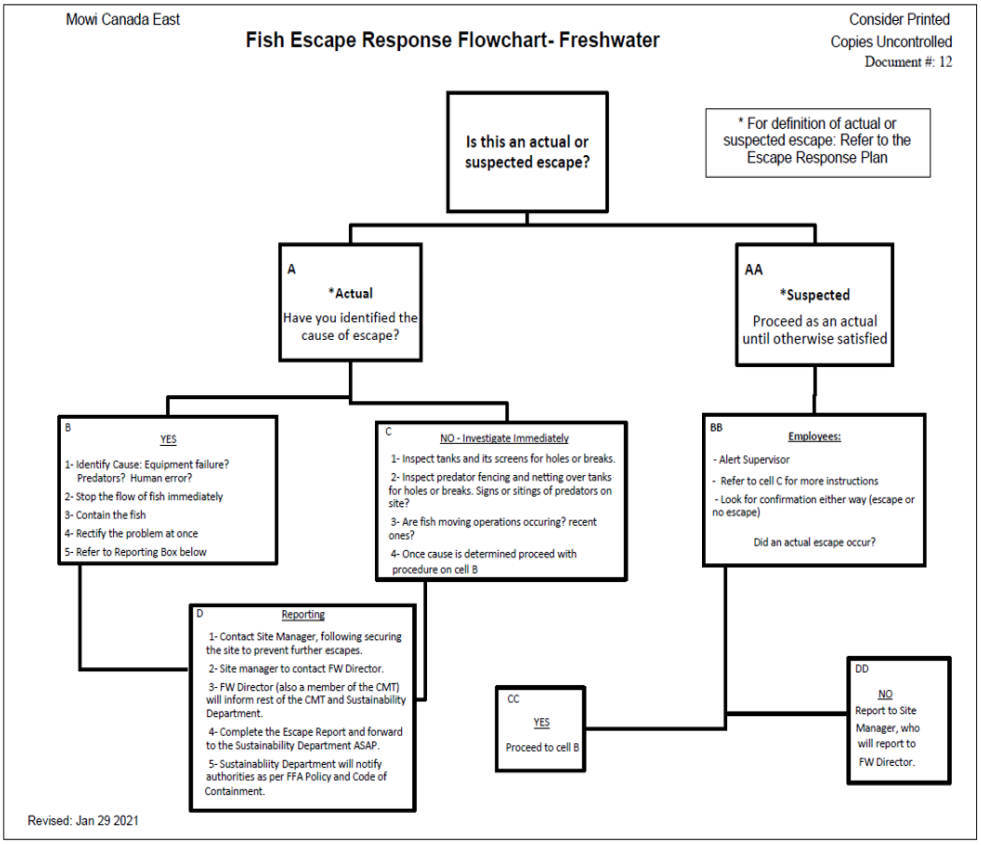
Hatchery

The MCE Escape Response Plan for the Indian Head Hatchery is included in the Environmental Management and Waste Management Plan that is reviewed annually, updated as required, and submitted to FFA for approval to ensure it conforms to all regulatory and policy requirements.

For the hatchery, FFA defines an escape as: escapement of fish from a freshwater site or vehicle into the wider marine or freshwater environment.

Hatchery staff monitor, evaluate, and maintain the hatchery infrastructure and equipment to eliminate potential for escapes. Staff are trained to respond with appropriate actions if an escape is suspected or if one occurs. The Escape Response Plan provides the appropriate steps to be taken, see Figure 43.

Figure 43 Hatchery Fish Escape Response Flowchart



Both FFA and DFO will be verbally notified immediately upon discovery of an escape or when it is reasonable to suspect that any escape incident has occurred. This is to be followed by a written notification that includes the following information.

- Site(s) of the escape
- Species escape
- Cause of the escape
- Estimated number of fish escapes
- Recapture plan for escaped animals
- Other information as determined by regulatory agencies

MCE will publicly report the escape and planned response via public communication acceptable to FFA, in addition to the MOWI or industry association websites. Public reporting will occur within 24 hours of confirming the escape incident and will include the following information.

- For suspect escapes: the site(s) of the escape and the species.
- For confirmed escapes: site(s) of the escape; species; cause of the escape; estimated number of fish escaped; and recapture plan for escaped animals.

MCE will initiate escape recapture upon the direction of DFO. The requirements and preparation of equipment for recapture will be the same as for the saltwater farms.

4.3o Predators and Controls

Guidelines: a description of potential predators and controls.

Predator controls are detailed in the following MCE management plans that are reviewed annually, revised as required, and submitted to the provincial Department of Fisheries, Forestry and Agriculture (FFA) for approval and to ensure the procedures comply with regulations and government policies.

- Environmental Management and Waste Management Plan (EWMP), Environmental Management: Wild Species includes detailed wildlife interaction measures.
- Salmonid Fish Health Management Plan includes Migratory Bird Response Plan.

MCE predator control measures are non-lethal and focus on avoiding interactions. Predator management starts with appropriate siting of the farm to minimize wildlife interactions in general. Good husbandry and operational practices reduce the attractiveness of the farm to wildlife and further reduce the potential for interactions.

This section provides an overview of the information provided in the management plans including potential predators at the hatchery and saltwater farms and the control measures.

Please refer to section 6g Species at Risk Management for a list of species potentially in the area and the requirements for managing interactions with species at risk, siting and reporting, and identification charts.

Predators

Predators, such as ospreys, eagles, gulls, seals, mink, and otters, are known to frequent the general area of the west coast of the Province of Newfoundland and Labrador where the

hatchery is located and the south coast where saltwater farms are located.

For saltwater farms, marine predatory species such as seals, dogfish, tuna, whales, and sharks are also potentially present.

Management Measures

General

MCE uses passive predatory deterrence that includes the following measures.

- For both the hatchery and farms, waste materials and fish mortalities are collected daily and disposed of in a safe and responsible manner to not attract predators. Please refer to section 4.3i Waste Management Normal Operations for waste types, volumes, and management procedures that limit attractiveness to predators and limit access.
- Roosting places that might attract mammals, birds, and other predators are removed.
- All feed is stored in closed covered containers.
- All staff are familiar with the control protocols as provided in the management plans.
- Government contact information is readily available and includes contacts for specific predators most likely to be seen in the area.

Hatchery

There is limited attraction at the hatchery for predators. All fish culture tanks are fully enclosed within buildings with bio-secure admittance that includes closed doors and no open access such as windows. On the rare occasion that a fish jumps out of the tank, staff are trained for quick disposal.

Saltwater Farms

On the saltwater farms, salmon are held within open mesh culture pens. This environment can attract birds, other fish, and marine mammals to cultured fish. Predators can cause damage to farm infrastructure potentially leading to escapes and salmon mortalities. They are also a biosecurity risk as they could spread disease.

Reducing attractiveness of the farm is key to deterring predators. Where required predator deterrence infrastructure is installed. Table 66 lists specific predators, control methods, and description of infrastructure.

Ensuring the salmon are protected from predators is also important.

- Robust pen system design including components and installation meet certified third-party engineering standards that have proven to withstand marine mammal predators in

other parts of the world.

- All MCE farms in the province are moving to high strength HDPE (high density polyethylene) netting. This material is predator “bite-proof” eliminating access to the cultured salmon and predator damage of containment nets which can be an avenue for escapes.
- On sites where required, predator nets are installed providing additional predator deterrent, see Table 66.

Table 66 Saltwater Farms Potential Predators and Management Measures

Predator	Control Methods	Equipment Description
Osprey, Eagle, Seagull	Equipment (where required): Top net stand and top net. Mortalities and refuse are held in closed containers at all times. Mortalities ensiled on site or contained in a closed xactac box for removal off site to eliminate odour and visual attractant.	Bird stand, where required, plus top net HDPE 200 mm with 25 mm mesh 2 m up the wall and secured to the handrail, marked with 10cm x 60cm yellow reflective tape in 4 locations of the top rail, equal -distant apart.
Seal, Mink, Otter, Shark, Tuna, Whales, Dogfish	Equipment (all sites): Single net system. Equipment (where required): Predator Nets Mortalities and refuse are held in closed containers at all times. Mortalities ensiled on site or contained in a closed xactac box for removal off site to eliminate odour and visual attractant.	Single Net System: 18 mm HDPE ultra-strong and abrasion resistant nets. Predator Nets (where required): 36 mm HDPE with 3.1 mm on the walls and bottom. Predation prevention nets (where required) on the bottom made from 4.2 mm HDPE with greater strength, and abrasion and predation resistance.

All marine mammal interactions, including sightings, are reported to Fisheries and Oceans Canada and any activity that involves the mammal will be undertaken with the direction of the federal authority.

4.3p Regulatory, Incident Management, and Public Reporting

Guidelines: a description of all government reporting, including incident management and public reporting requirements related to the hatchery and sea cage operations.

Regulatory agencies determine reporting requirements to ensure they receive timely and accurate information on situations they manage and situations that may require intervention. Agencies can also request additional information at any time.

Mowi Canada East Inc. (MCE) meets all reporting requirements and is open and honest in providing information about their salmon rearing practices in the province.

MCE recognizes that reporting supports effective regulatory management of the industry and keeps regulators informed about the successes and the challenges faced during salmonid culture.

Public reporting is also a method for MCE to be transparent about aspects of salmon culture operations. All reporting is an opportunity for the industry to be better understood and to build trust.

Transparency also ensures information is provided to the public for a better understanding of how salmon are cultured within the province and MCE's commitment to rearing salmon in an environmentally sustainable manner.

MCE fully complies with all reporting requirements including public reporting in specific situations. Unless otherwise indicated, the information in this section applies to all MCE salmon culture activities in the Province of Newfoundland and Labrador, including the rearing of the proposed Hatchery Expansion salmon.

This section provides information on the comprehensive salmon farming reporting obligations that ensure salmon farming is conducted according to the laws and regulations and also the latest policies and directives that incorporate research and knowledge that have been peer reviewed and proven advantageous for the environment and for salmonid health. At the end of this section, Table 69 and Table 70 provide the full reporting requirements for both the hatchery and saltwater farms.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide information to MCE on their responsibilities to provide information to regulatory agencies and the public in the Province of Newfoundland and Labrador. Details of these policies as well as other regulatory requirements that control the management of sea lice are also provided within the section.

Table 67 Aquaculture Policies That Pertain to Section 4.3p

AP #	AP Title	Description
AP 7	Annual Reporting	Annual Reporting is required for each licensed aquaculture site, regardless of whether there was activity at that site over the past calendar year. Data collected is dependent on the species cultivated and the nature of the operation. This policy applies to all aquaculture operations.
AP 8	Site Utilization	All licensed aquaculture sites should be developed in accordance with approved business and production plans on file with the department. Production plan updates must be submitted to the department on an annual basis outlining stocking plans and contingency plans.
AP 15	Net Washing	Licensees must submit an annual Net Cleaning and Disinfection Report to verify the Cleaning and disinfection of all nets serviced under its SOP. The report will include the net inventory number and verify the location and time of its cleaning and disinfection.
AP 17	Public Reporting	Marine areas surrounding the province are a shared, publicly owned resource. Aquaculture licensees have a responsibility to be open and transparent with the general public, with respect to escape, quarantine, depopulation, and incident events that occur on a licence aquaculture site, including sea lice numbers. This notification is separate from federal reporting requirements for disease, escape, quarantine, and depopulation events.
AP 23	Fish Disposal	Fish Disposal Plans must be submitted by the licensee and approved by the department, at the time of licensing, and on an annual basis.
AP 29	Aquatic Animal Health Surveillance	Detection of reportable diseases must be reported to the Chief Aquaculture Veterinarian within 24 hours. Quarterly Aquatic Animal Health Reports must be submitted to the CAV as described in the Aquatic Animal Health Reporting policy.
AP 32	Aquatic Animal Health Reporting	Industry must follow the Aquatic Animal Health Division (AAHD) species specific Surveillance Plan (Surveillance Plan) and if a Reportable disease is suspected or detected it must be reported to the Chief Aquaculture Veterinarian (CAV). The suspicion of detection of a Reportable disease will initiate the AAHD Contingency Plan (Contingency Plan) during a reportable disease event/outbreak.

AP #	AP Title	Description
AP 33	Aquatic Animal Health Contingency Plan	Licensees are required to follow the Aquatic Animal Health Division (AAHD) Contingency Plan during a Reportable disease event/outbreak. In the event of anInfectious Salmon Anaemia virus (ISAv) event, the AAHD Viral Management of Infectious Salmon Anaemia virus – Contingency Plan Guidelines are to be followed.
AP 35	Biosecurity and Biosecurity Audits	Licensed sites are required to have a company specific biosecurity plan approved by the Aquatic Animal Health Division (AAHD) at the time of licensing, enforced at all times, with responsibility designated to an employee of the licensed site. Biosecurity plans must be submitted to the department for review and approval at the time of licensing, when updates are made to the company's plan or upon request by the CAV.
AP 40	Integrated Pest Management Plans—Including Sea Lice Management Plans	Each licensee must have a pest specific IPMP implemented and monitored by the company veterinarian. This will be updated as deemed appropriate by the vet. As of January 1, 2021, sea lice abundance numbers must be submitted on a monthly basis by the licensee to AAHD.

Aquaculture Activities Regulations

In accordance with federal Aquaculture Activities Regulations (AAR) requirements, licensees are required to submit AAR reports on a regular basis to Fisheries and Oceans Canada (DFO). The information required will depend on the type of operation and associated reporting forms can be found at the following link: https://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-eng.htm.

Operational Management Plans

As per Aquaculture Policy 7 of the Aquaculture Policy and Procedures Manual, licensees are required to submit updated reports and management plans applicable to the operations as determined by FFA. Since reporting requirements may differ between operations, each January FFA communicates to Licensees the reports to be submitted. These reports and management plan updates are required 45 days prior to March 31 and may include the following.

- Production Statistics
- Employment Statistics
- Annual Aquatic Animal Health Report
- Production Plan Update
- Net Cleaning and Disinfection Report
- Net Inventory Report
- Net Storage Report

- Environmental and Waste Management Plan
- Fish Health Management Plan
- Biosecurity Plan
- Integrated Pest Management Plan
- Incident Management Plan

Quarterly Reports

Depending on the operation, FFA requires the submission of two quarterly reports: Biophysical Data and Aquatic Animal Health Report. The Aquatic Animal Health Division (AAHD) will provide guidance on Quarterly Aquatic Animal Health Reporting. Biophysical data must be submitted to the AAHD and ADD.

Quarterly reports are to be submitted on the following dates.

- April 15 (covering period of January 1 to March 31)
- July 15 (covering a period of April 1 to June 30)
- October 15 (covering period of July 1 to September 30)
- January 15 (covering a period of October 1 to December 31)

Monthly Sea Lice Reports

Licensees are required to conduct sea lice counts, enter the data into a third-party database, and publicly report the data on a monthly basis. Accurate and timely counting of sea lice is crucial to ensure the successful implementation of the licensee's Integrated Pest Management Plan. The data also assists in the monitoring of sea lice trends and enhancing mitigation and treatment strategies. Sea lice counts are typically suspended during the colder winter months due to animal welfare reasons.

The following reporting requirements are from FFA *Aquaculture Licensing Once Licensed: What to Expect* https://www.gov.nl.ca/ffa/files/Aquaculture-Licensing-Once-Licensed-What-to-Expect-May-2022-Version-1.0.pdf.

Incident Management Reporting

MCE is open and transparent with regulatory agencies and the public and adheres to provincial and federal reporting requirements with respect to disease presence in farmed salmon and effect of disease, requirements for quarantine and /or de-population, as well as suspected and/or confirmed cultured salmon escapes. MCE follows all requirements for reporting these incidents is outlined in the Aquaculture Policy and Procedures Manual, Aquaculture Operator Incident Reporting Guidelines, and the aquaculture licence conditions.

Table 69 and Table 70 provide detailed reporting requirements for incidents with abnormal mortality, mortalities from a reportable disease, or events associated with an escape of farmed

fish.

For other events, a risk assessment is used to determine the magnitude of impact to the health and welfare of farmed fish, marine or on-land installation or structure or vessel on a licensed aquaculture site, and the degree of hazard or harm to farmed fish or the containment of farmed fish or shellfish. The result of this assessment determines the reporting requirements.

Definitions for high, medium, and low categories are provided in the Aquaculture Operator Incident Reporting Guidelines with an assessment matrix as shown below.

Degree of Hazard Category	**High**	**3**	**4**	**5**
	Moderate	**3**	**3**	**4**
	Low	**1**	**2**	**3**
		Low	**Moderate**	**High**

- Red indicates the incident is an FFA and Publicly Reportable Incident.
- Yellow indicates the incident is an FFA Reportable Incident.
- Green indicates the incident is a Non-Reportable Incident.

For additional information on disposal of mortalities during an event with elevated numbers of moralities and/or is caused by a reportable disease, please refer to section 6c Elevated Mortality and Reportable Disease Event Management.

Confirmed and Suspected Escapes Reporting

For confirmed escapes, public reporting includes the site(s) of the escape, species, cause of the escape, the estimated number of fish escaped, and recapture plan for escaped animals is to be reported as well as any other information deemed by FFA to be reportable. For suspected escapes, the information that will be made publicly available is the site(s) of the escape and species as well as any other information deemed by FFA to be reportable.

Aquaculture Policy (AP) 17 Public Reporting, from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provides the reporting requirements for suspected and confirmed escape events from a licensed salmon aquaculture site.

1. All suspected and confirmed escape events from a licensed finfish aquaculture site must be reported to the public within 24 hours of the suspected escape and/or confirmation of the escape.

2. For all suspected escape events, the licensee is required to report as follows.
    - Site(s) of the escape.
    - Species escaped.
    - Other information deemed by the department to be reportable.

3. For all confirmed escape events, the licensee is required to report as follows.
    - Site (s) of the escape.
    - Species escaped.
    - cause of the escape.
    - Estimated number of fish escaped.
    - Recapture plan for escaped animals.
    - Other information deemed by the department to be reportable.

4. Detection of federally Reportable Diseases or quarantine or depopulation orders or directives issued by the Provincial Government for a licensed aquaculture site, must be reported to the public within 24 hours of the detection or order or directive being given. The department may issue a fine, directive or penalty in the event that these deadlines are not met.

5. For all detection of federally Reportable Diseases or quarantine or depopulation orders or directives, the licensee is required to publicly report on the following.
    - Site(s) impacted.
    - Species stocked on that site.
    - Estimated number of finfish species affected.
    - Orders and directives issued in relation to the action initiated.
    - Information related to disease detected.
    - Underlying reason for order, directive and/or action.
    - Method of depopulation or other mitigations.
    - Other information deemed by the department to be reportable.

Verbal and written notifications is provided to regulatory agencies prior to reporting publicly. The content of a public report is verified by FFA prior to reporting. Public reporting is via the Newfoundland Aquaculture Industry Association (NAIA) portal.

Reporting Tables

The following tables provide a detailed accounting of the comprehensive reporting obligations for salmonid aquaculture in the Province of Newfoundland and Labrador.

Table 68 has the list of the acronyms used in the reporting tables. Table 69 and Table 70 provide the full reporting requirements for both the hatchery and saltwater farms.

Table 68 Acronyms Used in Reporting Tables

Acronym	Name
AAHD	Aquatic Animal Health Division, Department of Fisheries, Forestry and Agriculture
AAR	Aquaculture Activities Regulations
ADD	Aquaculture Development Division, Department of Fisheries, Forestry and Agriculture
ADM	Assistant Deputy Minister
CFIA	Canadian Food Inspection Agency
COHFT	Certificate of Health for Transfer of Live Cultured Fish
DFO	Department of Fisheries and Oceans
DSS	Decision Support System, Atlantic Veterinary College
EA	Environmental Assessment
ECC	Department of Environment and Climate Change
ECCC	Environment and Climate Change Canada
ECRC	Eastern Canada Response Corporation
FFA	Department of Fisheries, Forestry, and Aquaculture
NAIA	Newfoundland Aquaculture Industry Association
SOPEP	Ship Oil Pollution Emergency Plan

Table 69 Freshwater Salmonid Culture Reporting

Situation	Report Type	Information Required	Report To	Regulation, Policy	Reporting Frequency
Operational	Groundwater Monitoring Program Reports		ECC	EA release	Biannually
	Transfers	Pre-Transfer Notification	FFA - AAHD	Transfer Permit condition 11	Seven days, 48 hrs, prior to transfer
		Pre-Transfer Notification	DFO	Transfer Licence condition 8	Prior to activities, email/call as directed by licence conditions
	Post Transfers	Transfer Report	FFA	Transfer Permit condition 4	31 days post transfer, as defined by transfer permit conditions, via Accela online
		Introductions and Transfers Licence Schedule I Transfer Report	DFO	Licence condition 9	Within 14 days post transfer
	Quarterly fish health reports	Disease detections	FFA - AAHD	AP 32 - Aquatic Animal Health Reporting	Apr 15, Jul 15, Oct 15, Jan 15
Event	Abnormal mortality, harm, or imminent threat to cultured fish, installation or structure at a licensed on-land aquaculture site, or any event that impairs the function of any equipment that sustains fish health and prevents escape	Notification of event	FFA - AAHD, ADD	AP 17 (8), licence condition 3, 12	Within 24 hrs, update every 10 days
		SOP for removal	FFA - AAHD, ADD	AP 17 (8), licence condition 3, 12	Within 24 hrs
		Posting to NAIA Portal	Public	Licence condition 13	
		Final numbers removed	FFA - AAHD, ADD	AP 17, licence condition 3	
	Detection of Federally Reportable diseases or quarantine or depopulation orders or directives issued by the Prov government		Public FFA - AAHD CFIA	AP 17 Public Reporting	Via industry website, within 24 hrs
	Suspected escape	Notification of event	DFO	Code of Containment	

Situation	Report Type	Information Required	Report To	Regulation, Policy	Reporting Frequency
	Suspected escape or escape incident (info as per AP 17 (2-3))	Suspected: site, species	Public	AP 17 (1)	
		Confirmed: site, species, cause, estimated number, recapture plan			
	Abnormal mortality, harm or threat to fish, marine installations or structure or vessels that impairs function of equipment to sustain fish health and prevent escape	Notification of Event	FFA - ADM	AP 17 (10,11), licence condition 11	
			Public	AP 17 (13), licence condition 13	
		Response Plan	Public	AP 17 (14)	
		Changes to Approved Response Plan	FFA	AP 17 (12)	
	Environmental issue - spillage of fuel, lubricant or any other material, siltation of water or depletion of any source of water used for any purpose in connection with the water withdrawal and use activities.		ECC	Water Use Licence condition 18	Within 24 hrs
Annual	Appendix B Report -- water use		ECC	Water Use licence - condition 8	Annually, on or before Jan 31
	Annual - smolt produced in previous year		ECC	to ensure original license is not exceeded (condition of ER)	Annually
	Production Statistics		FFA	Licence condition 12, AP 7 Annual Reporting	45 days prior to Mar 31 of each year
	Employment Statistics		FFA	Licence condition 12, AP 7 Annual Reporting	

Situation	Report Type	Information Required	Report To	Regulation, Policy	Reporting Frequency
	Environmental and Waste Management Plan	Waste Management Plan	FFA	Licence condition 12, AP 7 Annual Reporting	
		Environmental Mitigation Plan			
		Escape Response Plan			
		Environmental Impacts Management			
		Environmental Emergency Response Plan			
		Incident and Crisis Management Plan			
	Salmonid Fish Health Management Plan	Biosecurity Plan	FFA	Licence condition 12, AP 7 Annual Reporting	
		Fish Disposal Plan			
		Mass Mortality Contingency Plan			
	AAR Annual Report	Annual Report - Land Based Installation (online template)	DFO	Aquaculture Activities Regulations	Regional Aquaculture Mgt Office, Apr 1 of each year
		Drug and Pesticide Deposit Report			
	Annual Aquatic Animal Health Report		FFA	Licence condition 12, AP 7 Annual Reporting	45 days prior to Mar 31 of each year

Table 70 Saltwater Salmonid Culture Reporting

Situation	Report Type and Information		Report To	Regulations, Policy	Reporting Frequency
Operational	Net Checks		FFA	AP 4, Code of Containment,	Monthly
	Site Surface Inspections		FFA	Code of Containment, licence	Weekly
	Biophysical data		FFA - AAHD	AP 2, AP 6, licence condition 5	Quarterly
	Sea lice abundance numbers		FFA, Public	AP 17 (7), licence condition 8	Monthly
	Sea Lice Reporting		DSS		Monthly
	Transfers	Pre-transfer Notification	FFA - AAHD	Transfer Permit condition 11	Seven days, 48 hrs, prior to transfer
		Pre-transfer Notification	DFO	Transfer Licence condition 8	prior to activities, email/call as directed by licence conditions
	Post Transfers	Transfer Report	FFA	Transfer Permit condition 4	31 days post transfer, as defined by transfer permit conditions, via Accela online
		Introductions and Transfers Licence Schedule I Transfer Report	DFO	Licence condition 9	Within 14 days post transfer
Events	Increased Mortality - 3% per site, per day reportable to FFA, 10% publicly reportable		FFA - AAHD, ADD	AP 17 (8), licence condition 3, 12	within 24 hrs, update every 10 days
			FFA - AAHD, ADD	AP 17 (8), licence condition 3, 12	within 24 hrs
			Public	licence condition 13	
			FFA - AAHD, ADD	AP 17, licence condition 3	
	Suspected escape		DFO		
	Suspected escape/Escape incident		Public	AP 17 (1,2,3)	within 24 hrs
	Submission of recapture licence		FFA	licence condition 19	prior to recapture efforts

	Report Type and Information		Report To	Regulations, Policy	Reporting Frequency
	Detection of federally Reportable Disease (info required outlined in AP 17 (5))		Public	AP 17 (4), licence condition 7, 21	within 24 hrs
	Incident – abnormal mortality, harm or threat to fish, marine installations or structure or vessels that impairs function of equipment to sustain fish health and prevent escape		FFA - ADM	AP 17 (10,11), licence condition 11	
			Public	AP 17 (13), licence condition 13	
			Public	AP 17 (14),	
			FFA	AP 17 (12)	immediate verbal notification in advance of implementation, 24 hrs submission of updated plan
	Post Treatment Mortality AAR				
	Production plan changes		FFA	licence condition 4	within 30 days
	Spills/Environmental Emergencies		FFA, Service NL, ECCC, DFO	Management Plans/ provincial/federal legislation	
	Wildlife Interactions/Invasive Species		FFA, DFO, ECCC	Management Plans	
Annual Submissions & Reports	Annual statistics		FFA	Licence condition 30, AP 7 - Annual Reporting	Annually (due date as required by FFA)
	Yearly Employment Report		FFA	AP 7 - Annual Reporting	Annually
	Production Plans (3 yr)		FFA	AP 7 - Annual Reporting	
	AAR Annual Report	Annual Report – Marine and Freshwater Cage Finfish Operations (online template)	DFO	Licence condition 28, Aquaculture Activities Regulations	Regional Aquaculture Mgt Office, Apr 1 of each year
		Drug and Pesticide Deposit Report			
	Mooring Replacement Plans		FFA	Code of Containment	Annually - Jan 31
	Inventory Reconciliation		FFA	Code of Containment	Annually – Jan 31
	Net Inventories		FFA	Code of Containment	Annually – Jan 20

	Report Type and Information		Report To	Regulations, Policy	Reporting Frequency
	Net Cleaning and Disinfection report		FFA	AP 15 - Net Washing, AP 7 - Annual Reporting	Annually
	Aquatic Animal Health Report		FFA	AP 7 – Annual Reporting	
	Environmental and Waste Management Plan	Waste Management Plan	FFA	AP 2, licence condition 20, AP 7 - Annual Reporting	
		Environmental Mitigation Plan	FFA	AP 2, licence condition 20	
		Escape Response Plan	FFA	AP 2, licence condition 20	
		Environmental Emergency Response Plan	FFA	AP 7 - Annual Reporting	
		Incident and Crisis Management Plan	FFA		
	Salmonid Fish Health Management Plan	Biosecurity Plan	FFA		
		Integrated Pest Management Plan	FFA		
		Fish Disposal Plan	FFA		
		Mass Mortality Contingency Plan	FFA		Annually
	Renewal for Oil Spill Support		ECRC	required under barge SOPEP	
	Pesticide Permit Annual Report		ECC	Permit Licence condition	

5.0 PROJECT ALTERNATIVES

Guidelines: Alternative means of carrying out the project to meet the stated purpose and rationale must be provided. The EPR must identify, describe, and evaluate alternative means and locations of carrying out the project that are technically and economically feasible. The following steps for addressing alternatives are recommended:

- *alternatives to sea cage method of grow out;*
- *Identify the environmental effects of each alternative means and location;*
- *Identify the preferred means and location and provide rationale for selection; and,*
- *Provide reasons for the rejection of alternative sites.*

Include information from previous project related studies describing alternate locations that were considered, including the expansion of existing sites, reasons for rejection, and reasons supporting the proposed site as the preferred location, if applicable. Alternative locations should be clearly outlined on maps of a suitable scale.

Section 3 Nature of the Undertaking and section 4 Description of the Undertaking have provided information on the culture life stages, equipment, and operations for growing Atlantic salmon and the status of the Hatchery Expansion.

Section 6 Potential Environmental Interactions and Mitigations has possible negative environmental impacts and operational management practices. The ability to culture Atlantic salmon on a production scale and in an environmentally sustainable way are main considerations when assessing alternatives to the proposed Hatchery Expansion.

Atlantic salmon culture stages have different requirements therefore when contemplating other options, the following stages of culture are considered separately.

1. Rearing from egg to smolt at the Indian Head Hatchery.
2. Transport of salmon smolt from the hatchery to saltwater farms on the south coast of the province.
3. Saltwater culture of salmon smolt through to harvest.

5.1a Indian Head Hatchery Expansion

The Hatchery Expansion is integrated into the existing Indian Head Hatchery production. This facility is MCE's only hatchery in the province. Alternatives to hatchery production include 1) re-locating smolt production to another location in the province or 2) increasing smolt capacity at a hatchery outside of the province and importing the smolt to the Province of Newfoundland and Labrador saltwater farms.

The Indian Head Hatchery was licensed in 2011 and has been in continuous operation since then. It is in the Port of Stephenville Industrial Park, near the shore of the Port of Stephenville, less than 1 kilometer from a deep-water port.

MCE has made tremendous financial investment specifically to improve the efficiency and the production of Atlantic salmon smolt at this location. This investment demonstrates MCE's commitment to the Province of Newfoundland and Labrador and to the Town of Stephenville to continue operating the land-based facility at the current location. MCE remains dedicated to this commitment therefore has no business reason to abandon the Indian Head Hatchery.

There is also no fish culture reason to leave the Indian Head Hatchery. The Stephenville area is a good location for freshwater culture of Atlantic salmon for the following reasons.

- It is in proximity to the ocean on the shore of Bay St. George providing access to saltwater for the culture of saltwater acclimatized smolt.
- The natural aquifer has abundant water for hatchery production, proposed Hatchery Expansion production and the requirements of other users.
- The aquifer water quality fits the parameters required for Atlantic salmon culture.
- The land has a natural slope from the aquifer to the Port of Stephenville with the hatchery located in-between. This natural drainage ensures no water accumulation around the hatchery infrastructure and allows water to flow by gravity from the reservoirs to all culture areas. This environmentally friendly method of water movement reduces the need for expensive pumps and other infrastructure, reduces energy consumption, decreases the cost of salmon production and the pressure on natural resources, and reduces the facility's carbon footprint.
- The hatchery is in the Port of Stephenville Industrial Park, serviced by the Town of Stephenville. Paved roads, potable water, and power are all readily available. The Port of Stephenville is a deep-water facility for transporting smolt from the hatchery to the saltwater farms.

Of the many factors that make the current location good for salmon culture, the one that cannot be replicated in another location, is the natural aquifer that provides fish culture water of a quality that does not require additional treatments. Also, the volume of the water available

meets the full production needs while not limiting the water available to other users in the community. Water quality tests have shown a very low risk of disease transmission or contamination from other sources.

In order to protect the aquifer, MCE regularly monitors the volume of water used and submits reports to the provincial Department of Environment and Climate Change (ECC) so their experts can determine the state of the aquifer and react accordingly, if required.

MCE also pays $30,000 CAD annually for a Water Quantity and Quality Monitoring Station which provides ECC scientists with real-time data to manage the aquifer and any environmental concerns that may arise. For details on aquifer management please refer to section 6a Capacity and Suitability of the Indian Head Aquifer.

Another alternative to meet the requirement for increased smolt production is to invest in the expansion of a hatchery outside of the province and import the smolt to the saltwater farms located here. Though this is an option, it does not align with MCE's commitment to develop an independent business unit in the Province of Newfoundland and Labrador.

Please refer to the following sections for additional information on the aquifer and freshwater use.

- Section 4.3e Freshwater and Saltwater Use at the Hatchery
- Section 4.3f Hatchery Groundwater Source and Operational Volumes
- Section 6a Capacity and Suitability of the Indian Head Aquifer

5.1b Transport of Salmon Smolt

Mowi and MCE have a culture of continuous improvement that is evident in all aspects of salmon production and recently very clear in the large investments made to transporting of the Indian Head Hatchery smolt including: 1) a fully enclosed environmentally sound Fish Transfer System from the hatchery to the Port of Stephenville and 2) a new state-of-the-art vessel for transporting smolt from the Port of Stephenville to the saltwater farms.

Fish Transfer System

The established system of moving fish by truck from the hatchery to the transport vessel was reviewed during the planning for the Hatchery Expansion and alternatives considered. As a result, a new Fish Transfer System was designed for efficient and secure movement of smolt from the new Modular RAS Building to the hold of a vessel docked at the Port of Stephenville.

Currently, salmon are loaded on a trailer at the hatchery and driven to the deep-water dock where they are pumped to the vessel. Trailering salmon has all the potential environmental interactions of transporting fish by road including use of carbon-based fuel and resulting emissions plus the potential for fish escapes and spillage of fish culture water into natural waterways.

MCE contracted an engineering team to design a system unique to the Indian Head Hatchery that addressed the environmental concerns listed above. This new alternative system efficiently transfers the fish to the vessel with minimal handling and improved fish health and welfare. The system also loads the vessel in less time and returns the fish transport water securely to the hatchery without spillage concerns.

The result is a permanent, fully enclosed system as described in section 4.1b. Once constructed, it will be a good alternative to the existing procedure as it meets production requirements and eliminates environmental interactions.

Vessel Transport

Vessel transfer of smolt from the Port of Stephenville dock to the saltwater farms is an established procedure. As described in section 4.3b, a recent addition is a modern vessel with the latest technology to safeguard the environment and ensure fish health during transport. This new vessel was designed and constructed to rigorous standards and is expected to be working in the province in late 2023.

The new vessel technology and operations are described in Sections 4.2b, 4.3a and 4.3b and has the following advantages.

- Higher fish carrying capacity – can move more smolt in fewer trips, thus decreasing the carbon footprint and reducing opportunities for environmental interactions.
- State-of-the-art on-board fish culture technology provides continuous water quality monitoring and automatic aeration and oxygen systems for the duration of the trip.
    - Fish health and welfare sustained through enhanced water quality management during the duration of the voyage.
- Fully enclosed vessel transport standard protocol is to run with no water exchange with natural environment during the trip.
- Fully secure fish hold with barriers to reduce potential of escape.
- Advanced technology to reduce and manage all waste including holding for disposal on land, including human waste.

- Vacuum pumping for transferring smolt securely to net pens via enclosed lines.
- On-board disinfection and cleaning system used after each trip to reduce pathogen transmission.

The only alternative to transporting fish to the saltwater farms by vessel is to truck the fish by road to either Burgeo or Harbour Breton and transfer to a vessel for the remainder of the trip to the saltwater farms. This would result in road travel of up to 560 km compared to the current short distance of less than 1 km to the dock at the Port of Stephenville and the elimination of road travel upon the completion of the Hatchery Expansion.

Road travel has significant risks for the environment and for the fish. There is the potential for fish escape and loss of culture water into natural waterways. The longer the trip, the more stress and greater potential for fish health issues. This is not a viable alternative due to the environmental concerns, potential for compromised fish welfare, and the requirement for additional resources and infrastructure.

The use of this new vessel for transportation of salmon smolt is the preferred alternative for fish health and welfare and the most ecologically sound transport option.

5.1c Saltwater Culture

Atlantic salmon live in the ocean for the latter part of their life cycle and the Indian Head Hatchery smolt must be transferred to saltwater farms for this stage. All production from the Indian Head Hatchery has been stocked on saltwater farms on the south coast of the province.

Alternatives include: 1) abandoning all saltwater farms in the province and growing smolt on saltwater farms in other provinces, and 2) culturing salmon for full life cycle in land-based facilities.

Using Out of Province Farms

The Province of Newfoundland and Labrador has areas that are good for salmon culture and the regulatory oversight provided by federal and provincial agencies supports sustainable development of the industry. For these reasons, MCE is committed to continuing to invest in the province and develop an independent business unit.

- The locations for MCE saltwater farms undergo a comprehensive selection process with many alternative sites discarded in this process. Only sites with excellent characteristics for salmon culture become candidates for an aquaculture licence application.

- Alternative sites not pursued have conditions that limit salmon production and/or limit MCE's ability to safeguard the environment. These sites do not fit MCE environmental sustainability strategy, nor do they fit the business development plan and therefore would not be worth the resources required to submit a licence application.
- As part of the licence application process, several government agencies review the proposed site potential for environmental impacts from salmon farming. To approve the licence application, they are required to agree that the impact of farm operations is mitigated by the proponent's management plans and operational practices.

The Hatchery Expansion represents a dedicated investment in the province which goes hand in hand with a corporate responsibility for the future.

- MCE is committed to the communities in the areas where farms are established, those employed and/or provide services providing jobs, and supporting supply services.
- Moving salmon farming out of the province would create hardship and economic difficulties for everyone who currently benefits from salmon farming.

The alternative of abandoning salmon farming in the province and leaving for another area is not in the long-term business plan for MCE.

Land-based Saltwater Culture

An alternative to growing salmon in the ocean is land-based culture. On-land culture is an established part of Atlantic salmon early life stages.

Despite the global industry's long history with freshwater culture, the viability of growing salmon to market size (5 kg) at a land-based facility has not yet been established for commercial scale production.

Research and land-based start-ups continue to increase our knowledge and may in the future lead to business success. However, at this time the increased environmental footprint compared to marine farming is not in alignment with Mowi Sustainability Goals. The larger requirement for power and water and the environmental cost of highly technical infrastructure makes this alternative nonviable.

> *"The results are not promising. The IRR [internal rate of return] of a large farm is 8.7% while the IRR of a medium farm is 5.8% … Those rates of return are far too low to attract the investment required to incentivize the development of a RAS salmon farming industry in British Columbia."*

The report points to regulatory uncertainty, high capital cost, low returns on investment, and lack of incentive to locate facilities in BC as the primary restraints challenging the development of

recirculating aquaculture systems.

A further consideration is that land-based production would be established near major markets to reduce transportation time and costs. These markets are currently large cities in the USA. Again, moving operations outside of the province is not in alignment with MCE's current commitment to build an independent business unit in the Province of Newfoundland and Labrador.

Research

MCE relies on government research, independent business reviews, and other sources to provide the information taken into consideration when making decisions on land-based salmon culture. The following documents have provided information for this section.

Bjørndal, T. and Tusvik, A. (2019) Economic Analysis of Land-based Farming of Salmon, Aquaculture Economics & Management, 23:4, 449-475 DOI: 10.1080/13657305.2019.1654558

Chen, Samuel. (2018) Removing the Blinders on Land-based Aquaculture - Aquaculture North America. Removing the blinders on land-based aquaculture - Aquaculture North America

Cherry, Drew. (2020) $2 Billion Doesn't Buy You Much Fish in the Land-based Aquaculture World. $2 billion doesn't buy you much fish in the land-based aquaculture world | IntraFish.com

Evans, John. (2022) Market Continues to Punish Land-based Salmon Farming Stocks. Market continues to punish land-based salmon farming stocks | IntraFish.com

Fisheries and Oceans Canada. (2019) State of Salmon Aquaculture Technologies. State of Salmon Aquaculture Technologies, 2019 (dfo-mpo.gc.ca)

Fisheries and Oceans Canada. (2019) Salmonid Alternative Production Technologies Technical Working Group Report and Recommendations. Salmonid alternative production technologies technical working group report and recommendations (dfo-mpo.gc.ca)

Government of British Columbia. (2022) RAS Salmon Farming in British Columbia: Economic Analysis & Strategic Considerations. Report: Moving BC salmon farms to land may not be economically viable - Responsible Seafood Advocate (globalseafood.org)

Oyehaug, K.O. (2023) As reported in Here Are the World's Biggest Land-based Salmon Farming Projects. Interfish Feb 2023. https://www.intrafish.com/salmon/here-are-the-worlds-biggest-land-based-salmon-farming-projects/2-1-1385256

5.2 Preferred Means of Project Delivery

Salmon farming has been improving and evolving in the Province of Newfoundland and Labrador since inception. The Hatchery Expansion is an example of MCE's dedication to business development in the province and continuous improvement of both on-land and saltwater Atlantic salmon culture.

Since receiving endorsement from the Government of Newfoundland and Labrador in 2018 and aligning the business development plan with the provincial 'The Way Forward' growth plan, MCE has built a multi-million-dollar enterprise in the province and has a plan for an independent business unit.

Because of the importance of the increased number of smolt to this plan, all alternatives were considered. The proposed Hatchery Expansion is the preferred means of achieving the additional production. This is a key component in the plan for an independent self-sustaining business unit in the Province of Newfoundland and Labrador.

6.0 POTENTIAL ENVIRONMENTAL INTERACTIONS AND MITIGATIONS

Guidelines: Provide information regarding the potential effects of the project on the environment and the proposed mitigation to be used to avoid adverse environmental effects.

Mowi ASA has the goal of providing a growing world population with delicious, healthy, and nutritious food from the ocean, in a way that respects the planet and allows local communities to flourish.

This section provides information on the potential environmental effects of rearing salmon in the Province of Newfoundland and Labrador and the management practices employed by Mowi ASA and Mowi Canada East Inc. (MCE) to safeguard the environment.

Unless otherwise indicated, the information in this section pertains to the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador and the rearing of the proposed additional Hatchery Expansion salmon.

Corporate Commitment to the Environment

Mowi understands healthy oceans are essential for a thriving planet and for healthy farmed salmon. The company's continuous improvement values have, for years, provided support for salmon farming innovations aimed at reducing potential environmental interactions across all areas where the company farms.

The Hatchery Expansion was designed to produce additional salmon smolt to support an independent business unit in the Province of Newfoundland and Labrador. The project also provided the opportunity to install new state-of-the-art equipment that lowers the risk of environmental impacts, such as the adoption of advanced culture water re-use technologies, elimination of truck transport of smolt, and the employment of additional effluent treatment prior to discharge.

Ecological Protein Production

Farming fish is currently the most ecological form of protein production and has the smallest environmental footprint. In a world on track to reach 8.5 billion people by 2030, having methods of sustainable food production is a priority.

With salmon's superior sustainability credentials, including carbon footprint, compared with other animal proteins, Mowi's salmon production saves the world 2 million tonnes of CO_2 emissions annually by replacing the corresponding amount of land animal protein production.

Mowi Sustainability Strategy

The Mowi Sustainability Strategy is a company-wide recognition of the value of the environment and corporate responsibility in safeguarding the environment for the future.

> *Our Sustainability Strategy is centered around our guiding principles Planet and People and underpins commitments across our social and environmental performance through the value chain. Our commitments are set to make our business future-proof and are aligned with the UN Sustainable Development Goals.*

Sustainable Development Goals (SDGs) have been agreed to by all 193 United Nation member states in 2015 and guide governments, civil society, and the private sector in a collaborative effort for change towards a sustainable future. Details on SDGs can be found at: The Sustainable Development Goals (SDGs) - Mowi Company Website

As a result, significant changes have been made in emissions.

- Emissions within the company control were reduced 9% in 2022 and 33% since 2019.
- Emissions as a consequence of company activities but not from sources owned or controlled by Mowi were reduced 3% in 2022, and 10% since 2019.

MCE is aligned with the Mowi Sustainability Strategy and has employed environmentally conscious farming practices in the Province of Newfoundland and Labrador since 2018. The company is an established part of the social and economic fabric of the south coast of the province and the Town of Stephenville on the western shore.

Most Sustainable Animal Protein Producer

Mowi is a recognized leader in sustainable food production with robust policies on responsible sourcing, animal welfare, and environmental sustainability across all farming areas including the Province of Newfoundland and Labrador. For the fourth consecutive year, Mowi was ranked the most sustainable animal protein producer in the world in 2022 by the Coller FAIRR Protein Producer Index.

Best Aquaculture Practices

The Best Aquaculture Practices (BAP) standards are designed to reduce the impact of aquaculture on the environment and increase production efficacy through science and research. It is a voluntary program, administered by third-party certification bodies, and requirements encompass four pillars: Environmental Responsibility, Animal Health and Welfare, Food Safety, and Social Responsibility.

MCE is committed to BAP standards and has participated in the program since 2012. The Indian Head Hatchery was the first hatchery to be BAP certified in North America. Also, MCE farming practices follow Global Sustainable Seafood Initiative (GSSI) protocols which are aligned to the UN Sustainable Development Goals.

BAP standards provide the framework for ecological sustainability. Certification ensures the use of best practices and implementation of those practices through external audits. An example of those best practices is that no antibiotics or hormones are used to promote growth.

Standards and Certifications

Mowi also recognizes the following leaders in food safety and environmentally sustainable food production. MCE salmon production in the Province of Newfoundland and Labrador follows at least one of these standards through every segment of the value chain, see Figure 44.

Salmon Feed Production

- GLOBAL GAP – Good Agriculture Practices, set of standards for good agricultural practices.
- IFFO – Marine Ingredients Organization, responsible development of marine ingredients, sources and traceability and global food security.
- ProTerra – sustainable feed and food production with full transparency and traceability, social responsibility, and ecosystems and biodiversity health.

Salmon Farming

- GLOBAL GAP – Good Agriculture Practices, set of standards for good agricultural practices.
- ASC - Aquaculture Standards Certification, program for responsibly farmed seafood.
- BAP – Best Aquaculture Practices, certification for safe, responsible, and ethical farm-raised seafood.

Figure 44 Mowi Environmental Certification Strategy

In addition to commitment to the UN Sustainable Development Goals and the standards listed above, Mowi has a strategy to reduce plastic waste in the environment. Research projects provide knowledge and operational procedures direct salmon farming to meet the following targets.

- By 2025, 100% of plastic packaging will be reusable, recyclable, or compostable.
- By 2025, at least 25% of plastic packaging will come from recycled plastic content.
- By 2023, all large plastic farming equipment (nets, pens, feeding pipes) are reused or recycled.

Mowi is committed to a Circular Economy

1. The circular economy is an economic system based on the reuse and regeneration of materials or products, especially as a means of continuing production in a sustainable or environmentally friendly way.
2. The notion of a circular economy has gained traction with many companies looking to operate in a way that minimizes waste.

The independent Coller FAIRR Protein Producer Index evaluates 60 of the largest global meat, dairy, and aquaculture companies annually and has recognized farmed salmon producers as the most sustainable animal protein producers in the world. By all indicators, salmon farming is the most environmentally efficient form of animal production on the planet: lowest freshwater use, lowest carbon emissions, and smallest environmental footprint.

In December 2022, **Mowi ASA was ranked the most sustainable protein producer globally for the fourth year in a row.** Overall, Mowi scored 81 out of 100 and was rated **"Industry Best"** against criteria aligned to the SDGs including greenhouse gas emissions, deforestation and biodiversity, use of antibiotics, animal welfare, working conditions, food safety and governance.

Operational Mitigations Summary

The following table lists potential environmental interactions, the section in the EPR where the interaction and mitigation efforts are discussed, operational mitigation practices currently employed by MCE in the culture of salmon in the province, and the regulations and policies that govern the associated fish culture activities. In all cases, MCE meets or exceeds the regulatory requirements.

This synopsis indicates the extensive operational mitigations currently in place. These practices have evolved over time and will continue to be improved. The goal is sustainable salmon culture that provides consistently high-quality seafood while safeguarding of the environment.

Table 71 Summary of Potential Environmental Interactions and Operational Mitigations Summary

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.1e	Pollution sources near undertaking adversely affect water quality leading to reduction in fish health and welfare and/or mortality.	Hatchery Fish culture system, buildings are fully enclosed with biosecurity protocols, deep water wells with no contamination. Pollution managed by the Port of Stephenville Industrial Park adhering to the Town of Stephenville regulations. Saltwater Farms No pollution sources within 2.5 km of a farm.	Fisheries, Forestry and Agriculture will not approve pollution generating operations to be installed near a licensed aquaculture facility Aquaculture Policies and Procedures Manual 2019 AP 9, AP 13
4.1f	Restrictions on use of land/water due to ownership and/or zoning lead to inability to complete undertaking as described, loss of production, fish health and welfare issues and potential mortalities	Hatchery – holds valid licence for salmon production and groundwater use for fish culture. Port of Stephenville Industrial Park is zoned Light Industrial as required by the hatchery. Saltwater Farms - All farms are fully licensed for salmon culture and hold a valid Aquaculture Licence, Crown Land Lease, Water Use Licence, and Transport Canada approval.	Aquaculture Policies and Procedures Manual 2019 AP 1, AP 2, AP 5 *Provincial Aquaculture Act* Aquaculture Activities Regulations *Water Resources Act* *Navigable Waters Protection Act*
10	Delay in receiving authorization may require authorization of pre-smolt fish cultured for the Modular RAS Building or transport of smaller less robust fish to saltwater farms leading to potential fish health issues during saltwater culture	Hatchery All permits are in place for construction to start immediately upon receiving authorization. Culture of smolt for Modular RAS Building will not commence until Environmental Assessment release is received. Saltwater Farms All farms have the required licences and authorizations for site development and salmon rearing operations. Fish transfer permits and licences and Production Plan with stocking dates & number and farm site to approved by FFA prior to stocking.	Aquaculture Policies and Procedures Manual 2019 AP 12, Provincial *Aquaculture Act*

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.2d, 4.3i	Spillage or discharge of solid or liquid waste to environment during construction and during normal operations	Management Plans Material Storage, Handling and Waste Disposal Plan dictates how waste is managed at both freshwater and saltwater facilities and is a component of the Environmental Management and Waste Management Plan that is reviewed annually, revised as required, and approved by FFA. Emergency Response Plan provides protocols and practises efficiently manage spills.	Department of Fisheries, Forestry and Agriculture, Applicant Guidance Document - Environmental and Waste Management Guidelines Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 2
4.1b, 4.2b, 4.3a	Additional smolt transfers by vehicle from hatchery to the Port of Stephenville require additional use of fossil fuels, increased opportunity for fish escapes, and contamination of the environmental from loss of fish culture water	Reduction of Potential Environmental Interactions Hatchery Expansion includes construction of fully enclosed secure fish transfer line from the hatchery to the vessel reducing potential for fish escapes, fish culture water is held with the fish or securely returned to the hatchery, no fossil fuels required,	
4.1b, 4.2b, 4.3a	Additional smolt transports from the hatchery to the sea farms create increased potential for environmental interactions, greater use of fossil fuel, increased opportunity for escapes	Management Plans Vessel Garbage Management Plan Operational Procedures Fish are fully enclosed in vessel during transport with continuous monitoring and environment control during transport. Standard protocol is to run closed with no water exchange with the environment. Best Aquaculture Practices certification ensures transport methods support fish health and welfare. If there is a weather event of concern, the vessel does not sail.	Pre-transport fish health survey and risk assessment required prior to FFA transfer permit and a DFO Introductions and Transfer Licence Aquaculture Policies and Procedures Manual 2019 AP 36 *Canadian Environmental Protection Act*, 1999 Disposal at sea legislation and regulations International Convention for the Prevention of Pollution from Ships for management of on-board generated sewage, greywater, ballast water, wash water, and other forms of garbage. MARPOL 73/78, Annex V, regulation 10 (2,3) Garbage Management Plan

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3b-d, 4.3m-n, 6b-c	Reportable disease event or elevated mortality event leading to transmission of pathogens to wild fish species.	<u>Management Plans</u> Environmental Event Mitigation, Fish Health Management Plans: rearing requirements for fish health Mass Mortality Contingency Plan: managing elevated mortalities & reportable disease Fish Disposal Plan, Environmental Management and Waste Management Plan, Salmonid Fish Health Management Plan: mortality management. <u>Reducing Incidence of Disease in Farmed Fish</u> Fish health and disease risk assessment by Aquatic Animal Health Division prior to transport to saltwater farms. Vaccination of smolt for known diseases prior to transport Fish health surveillance and management of all health events to reduce occurrence of disease in farmed fish. Discretionary use of anti-microbials where required with most efficacious application. <u>Reducing Interaction with Wild Fish</u> Policy of no fish escapes to keep farmed and wild fish separate. Infrastructure 3rd party engineer certified for resilience and longevity to keep cultured salmon contained Staff trained to identify activities and situations that have potential for escapes and manage situation to reduce the risk. <u>Operational Practices</u> Hatchery effluent UV disinfection to kill pathogens 1 km separation between company farms, 5 km between companies or agreement on fish health practices Annual reporting to provincial regulators, Health Assessments prior to approval of transport permits, Aquatic animal health surveillance, aquatic animal health reporting, Aquatic Animal Health Contingency Plan, Biosecurity Protocols and Biosecurity Audits, Salmon Health Management Plan. All practices conform to the NFACC standards.	Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 2, AP 12, AP 17, AP 23, AP 29, AP 33, AP 42, AP 43 Federal Department of Fisheries and Oceans Canada and provincial Department of Fisheries, Forestry and Agriculture Code of Containment for the Culture of Salmonids in Newfoundland and Labrador Province of Newfoundland and Labrador *Aquaculture Act*.
	Farmed fish disease and pathogen transmission to wild species causing disease and mortality		Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 7, AP 12, AP 16, AP 23, AP 27, AP 29 AP32, AP 33, AP 35, AP 41, AP 42, AP 43 Federal Department of Fisheries and Oceans Canada and provincial Department of Fisheries, Forestry and Agriculture, Code of Containment for the Culture of Salmonids in NL Canadian Code of Practice for the care and handling of Farmed Salmonids, Farmed Salmonids (NFACC) - Codes of Practice for the care and handling of farm animals

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3l	Increase in number of sea lice in area of saltwater farms reducing water quality and adversely affects the health of wild fish and farmed fish	Management Plans Mowi Policy on Integrated Pest Management for Sea Lice Control: comprehensive and systematic approach to effective sea lice management based on proven techniques and approaches Integrated Pest Management Plan: provides direction for lice assessments, responsibilities within the company and treatment options. The plan is reviewed annually, revised if required and submitted to FFA to ensure alignment with the Sea Lice Integrated Pest Management Plan. Reporting - Average Sea lice numbers are publicly reported monthly via industry association website	Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 6, AP 17, AP 40 Department of Fisheries, Forestry and Agriculture, Sea Lice Integrated Pest Management Plan
4.3d, 6f	Chemotherapeutant and/or anti-microbial use may cause antibiotic resistance and/or adversely impact the environment and/or non-target species	Responsible Use of Treatments Policy on Use of Anti-microbial Agents - responsible use of licensed anti-microbials in line with World Health Organization guidelines. Procedures align with regulatory requirements and industry standards: GLOBAL Good Agriculture Practises Best Aquaculture Practices that reduce the risk of resistance development. Only approved treatments used and only as directed by Health Canada limiting the impact on non-target species . MCE has not used medications to treat fish diseases for the past two years in the province Reducing Incidents Requiring Treatment Fish Health Management Plan and Biosecurity Plan reviewed annually, revised as required, and submitted to the Department of Fisheries, Forestry and Agriculture for approval. Maximum fish density on MCE saltwater farms 15kg/m3. All smolt vaccinated prior to being transferred to the saltwater farms. Reporting - all drug use reported annually to DFO, as per Aquaculture Activities Regulations.	Department of Fisheries, Forestry and Agriculture Bay Management Principles and Aquaculture Policies and Procedures Manual 2019 AP 7, AP 17, AP 34, AP 40, AP 41 Aquaculture Licence Condition #2 states “fish transferred … vaccinated … in a manner approved by AAHD”. DFO Aquaculture Activities Regulations Department of Environment and Climate Change Environmental Protection Act approves pesticide use CFIA Food and Drug Regulations Act Health Canada, Veterinary Drugs Directorate, Health Canada, Pest Management Regulatory Agency, under the Canadian Pest Control Products Act.

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3d, 6f	Chemotherapeutant and/or anti-microbial use may cause antibiotic resistance and adversely impact the environment and non-target species	Responsible Use of Treatments Policy on Use of Anti-microbial Agents - responsible use of licensed anti-microbials in line with World Health Organization guidelines developed to mitigate the risk of anti-microbial resistance. Procedures align with regulatory requirements and industry standards: GLOBAL Good Agriculture Practises, Aquaculture Stewardship Council and Best Aquaculture Practices standards that address aspects of anti-microbial use and reducing the risk of resistance development. Only approved treatments used and only in the method required by Health Canada. **MCE has not used medications to treat fish diseases for the past two years in the province** Reducing Incidents Requiring Treatment Fish Health Management Plan and Biosecurity Plan reviewed annually, revised as required, and submitted to the Department of Fisheries, Forestry and Agriculture for approval. Maximum fish density on MCE saltwater farms 15 kg/$m^{3.}$ All smolt are vaccinated prior to being transferred to the saltwater farms. Reporting - all drug use is reported annually to Fisheries and Oceans Canada, as required by the Aquaculture Activities Regulations.	Department of Fisheries, Forestry and Agriculture Bay Management Principles and Aquaculture Policies and Procedures Manual 2019 AP 7, AP 17, AP 34, AP 40, AP 41 Finfish Aquaculture Licence Condition #2 states “All fish transferred from hatcheries must be vaccinated against known fish pathogens and in a manner approved by Aquatic Animal Health Division”. Fisheries and Oceans Canada Aquaculture Activities Regulations Department of Environment and Climate Change *Environmental Protection Act* approves pesticide use Canadian Food Inspection Agency *Food and Drug Regulations Act* Health Canada, Veterinary Drugs Directorate Health Canada, Pest Management Regulatory Agency, under the *Canadian Pest Control Products Act.*

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
6e	Deposition of uneaten food and fish waste deposited to benthic environment below saltwater farms causing anoxic conditions	Pre-farming Site Evaluations Original state of the area and modelling predicts deposition for the proposed farm. Several regulatory agencies review depositional modelling and site characteristics prior to a licence being granted. Site Management and Monitoring ROV surveys conducted regularly with survey and analysis methods and schedule conforming to the AAR. Best Aquaculture Practices (BAP) require monitoring of sediment conditions at peak feeding during the production cycle according to the farm's operating permits. Benthic monitoring is performed by third-party consultant once every production cycle for active sites and submitted to DFO Management Plans Feed Management Plan, Salmonid Fish Health Management Plan. Fish Culture Operations Maximum 15 kg/m^3 biomass at all times. Fallow period following the production cycle. Use of wet feed and fish fed to satiation only.	Fisheries Act. Aquaculture Activities Regulations (AAR) Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 7, AP 16, AP 23, AP 26, AP 27 Department of Fisheries, Forestry and Agriculture Bay Management Strategy

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3g, 4.3k	Groundwater source does not meet minimum water quality parameters required for freshwater fish culture leading to fish health issues and/or mortality	Recirculating Aquaculture Systems (RAS) technology uses minimal water per fish grown with up to 97% water cleaned and re-used, and less than 5% new water required daily. Hatchery Water Use Licence WUL 18-9929 has been revised and approved for Hatchery Expansion requirements and as a condition of this licence water use has been reported since 2019 with no reduction in water available. Aquifer Assessments Extensive testing and modeling was completed prior to submission of ER 1975 in 2018 demonstrated the aquifer has the capacity to meet the fish culture requirements. Long term modelling ensures no impact on water required by other users. Quarterly and annual reporting, real-time monitoring system managed and paid for by MCE with data and reports sent to Water Resources Management Division, Department of Environment and Climate Change.	Department of Environment and Climate Change Water Resources Management Division provided instructions and criteria for the assessment of the aquifer and for the continuous monitoring, approved the well locations, development criteria, and issued a Water Use Licence for the extraction of the water for fish culture. Environmental Protection Act Water Resources Act
4.3f, 6a	Groundwater source volume is not adequate for current and proposed fish culture operations leading to draining of aquifer and loss of available water for wild species and other users, reduction in fish health and welfare, and potential fish mortality		
4.3h	Fish culture effluent discharge adversely affects the environment and wild species near the outfall	Recirculating Aquaculture Systems (RAS) technology uses minimal water per fish grown with up to 97% water cleaned and re-used, and less than 5% new water required daily. Effluent Treatment Solids removed to 37 microns, triple screened, UV disinfected to kill pathogens, discharge at a deep ocean outfall	NLR 65/03 Environmental Control Water and Sewage Regulations, 2003 Province of Newfoundland and Labrador Environmental Control Water and Sewage Regulations, 2003, under the Water Resources Act provides the regulations for discharge to a body of water

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3m, 6d	Escapes from saltwater farms and during transport compete with wild stocks for food and spawning grounds and have the potential for genetic introgression	<u>Management Plans</u> Management of Wild and Farmed Salmon Interactions, Environmental and Waste Management Plan includes detailed procedures for managing fish escapes. Saltwater Fish Escape Management Plan, Environmental Management and Waste Management Plan Escape Prevention and Response Plan Fish Containment Plan Predator Avoidance Plan Escape Response Procedure Net Inspection Procedure and Pen and System Daily Inspection (Daily and Post Storm) <u>Operational Procedures</u> Mowi has a policy of no fish escapes and only 6 fish have escaped with 2 recaptured in past 3 years. Infrastructure 3rd party engineer certified design and constructed accordingly to ensure longevity during production cycle. Continuous monitoring of fish using surface and sub surface cameras, as well as subsurface inspections of nets completed monthly and submitted to FFA Regular assessments of equipment to determine wearing and if replacement is required. Immediate reporting on suspected and actual escapes to regulatory authorities and if approved recapture of escaped salmon.	Federal Department of Fisheries and Oceans Canada and provincial Department of Fisheries, Forestry and Agriculture Code of Containment for the Culture of Salmonids in Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 17, AP 42

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
4.3o	Predators (marine and terrestrial) cause damage to infrastructure leading to harm to cultured fish and fish mortality, potential escapes and/or spread of disease	Management Plans Predator management and wildlife interaction directions and Migratory Bird Response Plan in the Environmental Management and Waste Management Plan, Environmental Management: Wild Species Salmonid Fish Health Management Plan Operational Procedures: Hatchery - All fish culture tanks are fully enclosed within buildings with bio-secure entries and no open access such as windows, area is kept clean, Fish mortalities and waste materials contained to not attract predators. Operational Procedures: Saltwater Farms Robust fish culture system design and installation, certified third-party engineering standards proven to withstand marine mammal predators in other parts of the world. High strength HDPE (high density polyethylene) netting that is predator “bite-proof” eliminating access to the cultured salmon and predator damage of containment nets which can be an avenue for escapes. On sites where required, predator nets are installed over the fish culture nets providing additional deterrent Farm sites are kept clean, wastes including fish mortalities are contained and covered to not attract predators.	
6g	Species at Risk disturbed or otherwise adversely impacted by hatchery and sea cage operations and associated activities	Best Aquaculture Practices (BAP) certification - List of endangered species, identification guides available on site. Operational Practices Staff trained to identify species and contact information for regulatory authorities available. Area and facility are kept free from waste and debris to reduce attractants for all species. Mowi policy to report any mortality of birds and mammals. Saltwater Farms - No farms are located above areas where species at risk are known to inhabit, and no shore-based activities are undertaken in sensitive habitat or near species at risk.	*Species at Risk Act* Species Status Advisory Council, Committee on the Status of Endangered Wildlife Province of Newfoundland and Labrador Endangered Species Act, under the National Accord for the Protection of Species at Risk Marine Mammal Regulations under the *Fisheries Act*

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
6h	Spread of aquatic invasive species due to saltwater farm operations and hatchery effluent discharge	Hatchery - Effluent is screened to remove invasive or other species less than 37 microns in size and disinfected to kill smaller organisms. Hatchery and Saltwater Farms Staff are trained to identify and report aquatic invasive species and follow strict biosecurity procedures to reduce the risk of spreading invasive species. All sites have AIS Identification Booklet for staff to recognize suspected organisms and current maps of locations where invasive species have been identified. Biosecurity protocols limit the spread of invasive species and include using foot baths and regular Cleaning and maintenance prevent build up on equipment to limit opportunity t transfer of invasive species from one area to another. Vessels All MCE vessels have self-cleaning holds and hulls. Fish transport water is contained which reduces the risk.	Aquatic Invasive Species Regulations, federal *Fisheries Act* Aquatic Organisms Risk Assessment Protocol National Code on the Introductions and Transfers of Aquatic Organisms

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
6i	Extreme environmental conditions causing damage to or loss of infrastructure, reduction in water quality, unsafe working conditions, leading to fish health and welfare issues, mortality and/or escapes	Management Plans Environmental Management and Waste Management Plan. Hatchery Power, fire, water, sewage services managed by Town of Stephenville. Staff on site at all times and designated off-site staff are available 24/7. 100-200% backup power for fish culture and staff requirements. 9 weeks of fish feed, 30 days of oxygen on site at all times. Effluent lines are underground, two effluent management buildings that can be run independently. RAS technology for management of fish culture systems with reduced water. Saltwater Farms Site selection to avoid extreme conditions. Infrastructure design and construction with third-party engineering certification. Real-time water quality management, remote data reporting, phytoplankton monitoring. Cameras in culture nets provide 360 degrees view and air stones for each pen.	Federal Department of Fisheries and Oceans Canada and provincial Department of Fisheries, Forestry and Agriculture Code of Containment for the Culture of Salmonids in Newfoundland and Labrador Aquaculture Policies and Procedures Manual 2019 AP 2

Section	Environmental Concern and Potential Effect	Operational Mitigations	Regulatory Control
6j	Interference with the rights of other legitimate land and marine owners/users	Good Neighbour Policy - ensures shared marine resources and collaborating with other users. MCE has open-door policy to resolve potential issues. Public Engagement - events organized to provide information on MCE projects and invite public comments are opportunities to share information on other users. Operational Procedures Saltwater Farms MCE farms are in remote areas and have activities on the water only. General area access is not impeded by the farm infrastructure or activities, farms licensed after 2019 have 40 m channel between infrastructure and all shore lines. Areas used for fishing or recreational activities are generally avoided, the exception is lobster harvesting and MCE allows lobster gear near the farm structures. All navigational buoys and lights are installed and maintained as per Transport Canada requirements.	Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 AP 5, AP 13 Transport Canada *Navigable Waters Protection Act*

Regulatory Commitment to the Environment

Provincial agencies led by the Department of Fisheries, Forestry and Agriculture (FFA) have comprehensive regulations and policies that focus on managing salmon farming effects on the ecosystem.

- All saltwater farm sites are assessed by provincial and federal governments to determine sensitive habitats and species and potential environmental interactions prior to an aquaculture licence being approved and continue to be assessed throughout production.
- Several provincial and federal authorities review aquaculture licence applications. If an aquaculture licence is granted, operational licences, permits and approvals from various government departments are required before development can commence.
- Once operational, regulations and policies govern all aspects of salmon culture with a focus on sustainability of the natural environment. This includes the use of aquatic resources and the interaction between salmon culture and the environment.

All MCE production facilities are fully licensed ensuring compliance with all licensing and operational regulatory and policy requirements and have operational and management plans and policies that meet or exceed the regulatory requirements.

Indian Head Hatchery

- Aquaculture Licence #1087
- Water Use Licence # WUL 18-9929
- Annual Production: 4.5 million smolt

Saltwater Farms

- Aquaculture Licence
- Crown Lands Lease
- NPA Approval
- Water Use Licence

Seventeen farms are currently licensed under Marine Harvest Atlantic Canada and thirty-three licensed under Northern Harvest Sea Farms. Both companies are wholly owned by MCE.

All farm sites have undergone the aquaculture licensing review process prior to licensing and have been fully assessed, including the following appraisals.

- Environmental assessment review by the Department of Fisheries and Oceans Canada

(DFO) and Transport Canada (TC).

- Review of benthic environment and potential impacts on same (DFO)
- Mitigation measures to protect the environmental and the farm site (DFO, Department of Fisheries, Forestry and Agriculture FFA)
- Wild and farmed interaction, both traditional fishery species and wild salmon (DFO)
- Operational Plans (FFA)
- Water use and environmental review (Department of Environment and Climate Change, ECC)

In addition to the licensing review process, only the Saint John River stock, approved by DFO for aquaculture use in the province, is used. DFO manages the species/stock of salmon cultured through the National Code of Introductions and Transfers of Organisms Program that requires approval for all fish movement within the province and between the Canadian maritime provinces to reduce potential effects of introducing a non-native species.

In 2003, Canada's provincial, territorial, and federal governments jointly implemented the National Code of Introductions and Transfers establishing an objective decision-making framework and consistent national process for assessing and managing the potential ecological, disease and genetic risks associated with intentionally moving live aquatic organisms into, between, or within Canadian watersheds and fish rearing facilities.

Under the legislative authority of the *Health of Animals Act* and associated regulations, the Canadian Food Inspection Agency (CFIA) fully implemented the National Aquatic Animal Health Program (NAAHP) on December 31, 2015. Under the NAAHP, the CFIA assumed the federal lead for managing disease risks associated with movements of aquatic animals.

The signatories have committed to delivering an effective and integrated Code that effectively manages ecological, disease, and genetic risks. The foundation of this program is the utilization of science-based, objective risk assessment frameworks to inform the licensing/permitting process required to move aquatic organisms. The robust risk assessment process contributes to the shared goal of responsible ecological stewardship and sustainable use of aquatic resources for the benefit of Canadians.

6a Capacity and Suitability of the Indian Head Aquifer

Guidelines: The EPR should provide up to date results of testing, monitoring, and modelling that has been conducted to determine the capacity and suitability of the aquifer to supply the freshwater requirements of the hatchery expansion project.

100% of the salmon culture water at the Indian Head Hatchery is freshwater and is sourced from the local aquifer. The Hatchery Expansion includes the development of a saltwater source for fish culture to acclimatize smolt to the marine environment prior to transport to the saltwater farms. This component is not currently completed.

The capacity and suitability of the Indian Head aquifer has been evaluated for Mowi Canada East Inc. (MCE) and the Town of Stephenville on several occasions. All tests and monitoring confirm the capacity of the aquifer and the suitability of the water for fish culture.

The ongoing use of the aquifer water is managed by the Department of Environment and Climate Change (ECC) Water Resources Management Division. Regular aquifer assessments are undertaken by MCE with data provided to ECC. All assessments and data from monitoring confirm the capacity of the aquifer to supply the current and proposed hatchery requirements and the suitability of the water for Atlantic salmon culture.

The results of the aquifer assessments and monitoring efforts are provided in this section. Unless otherwise indicated, the information in this section pertains to the Indian Head Hatchery in general and applies to the current production of the licensed 4.5 million smolt and the proposed Hatchery Expansion 2.2 million smolt.

Please refer to the following sections for additional information that pertains to the capacity and suitability of the aquifer.

- Section 4.1a Geographic Location and Physical Components Indian Head Hatchery for the location of the fish culture freshwater and saltwater sources.
- Section 4.3f Hatchery Groundwater Source and Operational Volumes for the volume of water drawn from the aquifer and used for fish culture from 2019 to 2022. This includes an estimate of the volume of freshwater and. saltwater required for fish culture once the Hatchery Expansion RAS Modular Building is complete and all four fish culture modules are operational.
- Section 4.3g Influent Water Quality Management for groundwater monitoring and comparison to salmonid water quality requirements.

Water Use Licence

The Indian Head Hatchery was licensed in 2011 for the culture of Atlantic salmon after full environmental review (ER 1544). Based on the groundwater assessment, a water use licence was granted. The hatchery has been using the aquifer as the sole source of fish culture water since that time. Monitoring of the water use by ECC and the hatchery water quality testing shows the aquifer capacity and water quality has not diminished over time.

The groundwater source has been assessed several times since including for Hatchery Expansion ER 1975 in 2018. Upon completion of ER 1975 environmental assessment in 2018, the water use licence was revised to include the volume required for the Hatchery Expansion additional production.

Aquifer Assessments

1999 3D Modelling for the Town of Stephenville undertaken to define the watershed boundaries and provide a basis for developing a well field protection plan. Additional modelling was used to determine the impact from other water supply areas.

In 2009, a hydrogeological assessment of the area was completed to develop a water supply plan for the Indian Head Hatchery development, to determine if the water quality was suitable and in adequate quantity for fish culture while not compromising the water required by other users.

In 2018, Assessment of the groundwater supply potential from the overburden aquifer was undertaken as a component of Environmental Registration 1975 (ER 1975). It provided current data on aquifer use and confirmed the aquifer capacity and water quality were appropriate for the proposed Hatchery Expansion. This assessment was used to develop a well field plan.

2019 Hydrogeologic assessment of the groundwater source undertaken pursuant to the requirements of the 2018 release decision for ER 1975.

2020 Well field and aquifer monitoring for near-field and far-field monitoring undertaken pursuant to the requirements of the 2018 release decision for ER 1975.

2021 Hydrogeology and predicted response of the aquifer to long term withdrawals undertaken pursuant to the requirements of the 2018 release decision for ER 1975.

2023 3D-model predictions of the worst-case response to long term withdrawals undertaken pursuant to the requirements of the 2018 release decision for ER 1975.

Groundwater Monitoring and Testing

Indian Head Hatchery Expansion Project (ER 1975) Conditions of Release

The initial release of the Hatchery Expansion included conditions to further assess the aquifer and monitor water levels and water quality. MCE has complied with all conditions and provided the data to ECC as required. This data enables ECC scientists to evaluate the effect on the aquifer of the hatchery water use.

- **Hydrogeologic Assessment of the Groundwater Source -** carried out by a qualified hydrogeologic professional and submitted to the Minister for approval.
    - Progress reports to the Water Resource Management Division every two months until the assessment is complete and accepted by the Minister.
- **Groundwater Monitoring Program** – program developed with and approved by ECC to monitor water levels and water quality.
    - Water level data collected continuously using a recording data logger.
    - Water quality parameters monitored, and annual reports submitted for at least two years.
- **Real-time Water Quality and Quantity Monitoring Network -** to monitor water levels and select water quality parameters. The proponent is to bear all costs associated with the groundwater monitoring network and installation, operation, and maintenance.
- **$1,000,000 surety bond** provided by the company as financial security should the hydrological assessment and groundwater monitoring, including real-time monitoring, not be completed and as per the release condition.

A full description of the Conditions of Release is included in Appendix C: Indian Head Hatchery Expansion Project ER 1975 Conditions of Release.

Ongoing Monitoring

Several levels of monitoring continue to evaluate the aquifer response to hatchery use. The well fields are monitored by a common wireless three node system with control and real-time monitoring of water level and flowrate/pump discharge from each production well at a control center in the hatchery. Each production well has an individual flow meter and an individual water level sensor, see Figure 45 and Table 72.

The sensors are hardwired into the wireless node for each well field. The data is recorded in real-time on a set time basis.

- The water supply pumps in each well are equipped with variable frequency drives. These variable frequency drives are controlled from the hatchery control room through

each well field wireless node.

- The flow meters are calibrated against a calibrated turbine flow meter on an annual basis.
- The water level sensors in each well are calibrated by direct measurement of water levels using a standard water level meter.

The pump discharge pipe at each new well head is designed for the collection of water quality samples taken quarterly for the first year and then every six months after the first year of operation.

- Water quality for the combined freshwater and the saline water supply is monitored on a real-time basis to ensure fish health and to provide data to ECC.

The water level and recharge capacity after draw-down is monitored using piezometers located in or near well field one and two. The capture areas and the travel times for the Hatchery Expansion wells were computed and confirm the piezometers are well located to monitor changes in water levels and water quality within the recharge area and within the aquifer.

Continuous monitoring of the aquifer water levels, using self-contained data loggers (Leveloggers), records water levels and temperatures every 15 or 30 minutes. Each sensor has a direct reading cable to allow for regular downloading of the recorded data.

Based on the computed travel times, periodic water sampling in piezometers will provide a clear indication of any changes over the long term and as such the piezometers serve as sentry wells. Quarterly sampling was conducted during the first year followed by sampling every six months.

This periodic water sampling, with the same analytical program as that designed for the water supply wells along with near-continuous recording of water levels will provide the data needed to achieve real-time monitoring of the aquifer performance and water quality.

Real-time data flows to a central management station at the hatchery and ECC Water Resources Division has ready access to the full monitoring system and the real-time database to confirm the groundwater monitoring program is being executed as outlined and determine effects on the aquifer.

Please refer to section 4.3g Influent Water Quality Management for more details on water source assessment and monitoring programs. Table 72 provides the production wells' monitoring with the applicable guidelines and parameters that are monitored. Figure 45 shows the location of the production wells.

Table 72 Monitoring and Production Wells and Analytical Parameters, Sample Frequencies, and Parameters

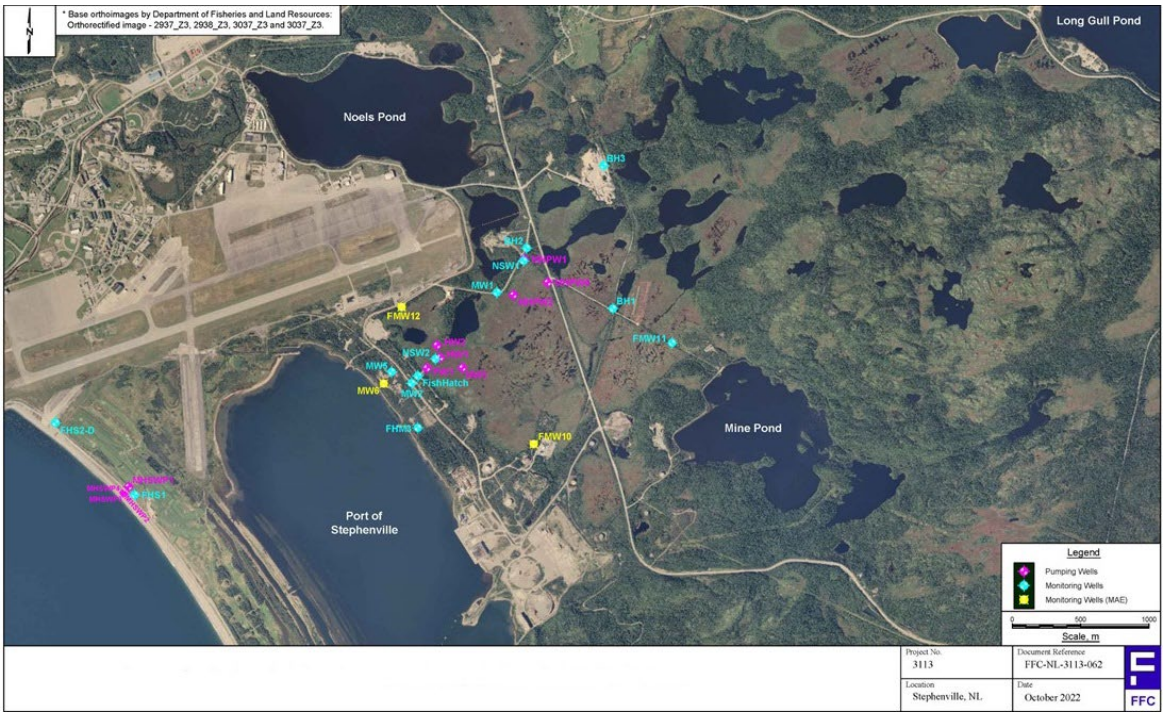
Reproduced from *Well Field and Aquifer Monitoring December 2022 Semi-Annual Sampling Event Report.* Prepared by: Fracflow Consultants Inc.

Locations	Event	Applicable Guidelines	Chemical Parameters
Freshwater Production Wells (MHPW 1, MHPW 4, HW 1-3)	Monthly	FWAL[1]	Standard Water Chemistry, Total Metals, Hydrogen Sulphide, Dissolved Oxygen
	Quarterly	FWAL	Monthly parameters plus Mercury
	Annual	FWAL, AWWQGP[2]	Quarterly parameters plus Phenolics and Hydrocarbons
	Biennial (Odd Years)	FWAL	Annual parameters plus Herbicides and Pesticides
Saltwater Production Wells (MHSW P1-4)	Monthly	MAL[1]	Standard Water Chemistry, Total Metals, Hydrogen Sulphide, Dissolved Oxygen
	Quarterly	MAL	Monthly parameters plus Mercury
	Annual	MAL	Quarterly parameters plus Phenolics and Hydrocarbons
	Biennial (Odd Years)	MAL	Annual parameters plus Herbicides and Pesticides
Near-Field Monitoring Wells	Semi-Annual	FWAL, MAL	Standard Water Chemistry, Dissolved Metals including Mercury
	Annual	FWAL, MAL	Semi-annual parameters plus Petroleum Hydrocarbons
	Biennial (Odd Years)	FWAL, MAL	Annual parameters plus Herbicides and Pesticides
Far-Field Monitoring Wells	Annual	FWAL, MAL	Standard Water Chemistry, Dissolved Metals including Mercury
	Biennial (Odd Years)	FWAL, MAL	Annual parameters plus Herbicides and Pesticides

[1] Guidelines for Protection of Freshwater Aquatic Life (FWAL) and Marine Aquatic Life (MAL), as issued by the Canadian Council of Ministers of the Environment CCME (latest version)

[2] Ambient Working Water Quality Guidelines for Phenols as issued by the British Columbia Ministry of Water, Land and Air Pollution (2002) and applies to freshwater only.

Figure 45 Location of Monitoring and Production Wells



Reproduced from *Well Field and Aquifer Monitoring, September 2022 Quarterly Sampling Event*, Fracflow Consultants Inc.

Results of Assessments and Monitoring

All groundwater assessments and monitoring indicate the aquifer capacity has not been diminished and the water quality has not been compromised.

Model simulations show MCE groundwater withdrawals are not dewatering the aquifer.

- The hydraulic head contours in Figure 46 show a fairly uniform northeast to southwest hydraulic gradient of 0.004.
- Most of the aquifer is covered by a 3 to 5 m thick layer of bog or peat producing a perched water table with the depth to the water table ranging from 16 m to 24 m.
- The three production wells have a total well yield capacity of approximately 8 to 10 m^3/min.
- Figure 46 and Figure 47 show the 3D transient model simulations of the water table drawdowns based on the measured groundwater withdrawals.

The following three figures are reproduced from 3D Model Predictions of the Worst-case Response of the Mowi Canada East – Northern Harvest Smolt Ltd. Freshwater Aquifer to Long Term Withdrawals, Stephenville NL. Fracflow Consultants Inc.

Figure 46 Hydraulic Head Contours for Steady State at Water Table Level

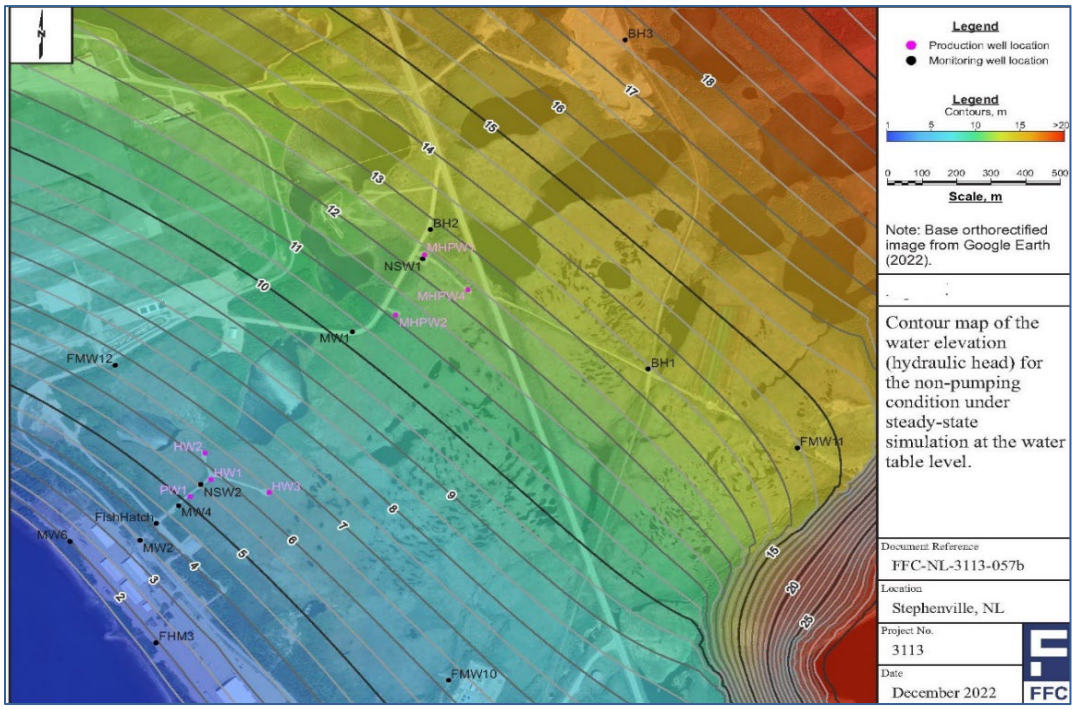


Figure 47 Capture Area of the Transient Model at the Water Table Level

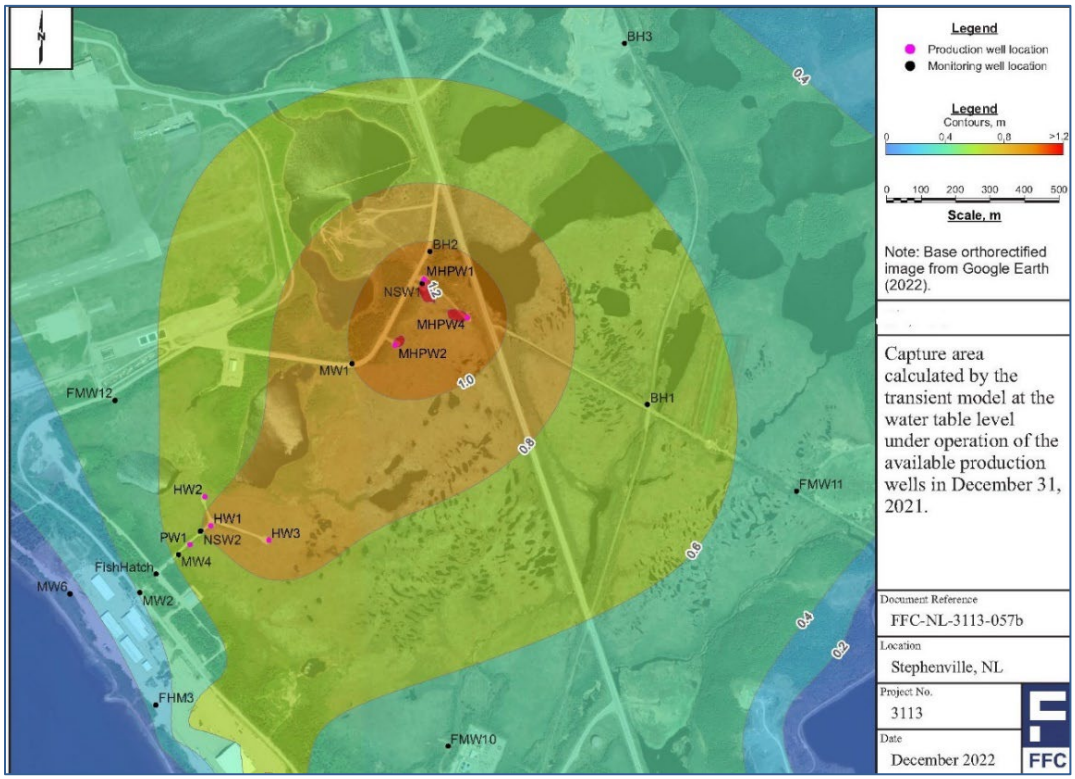
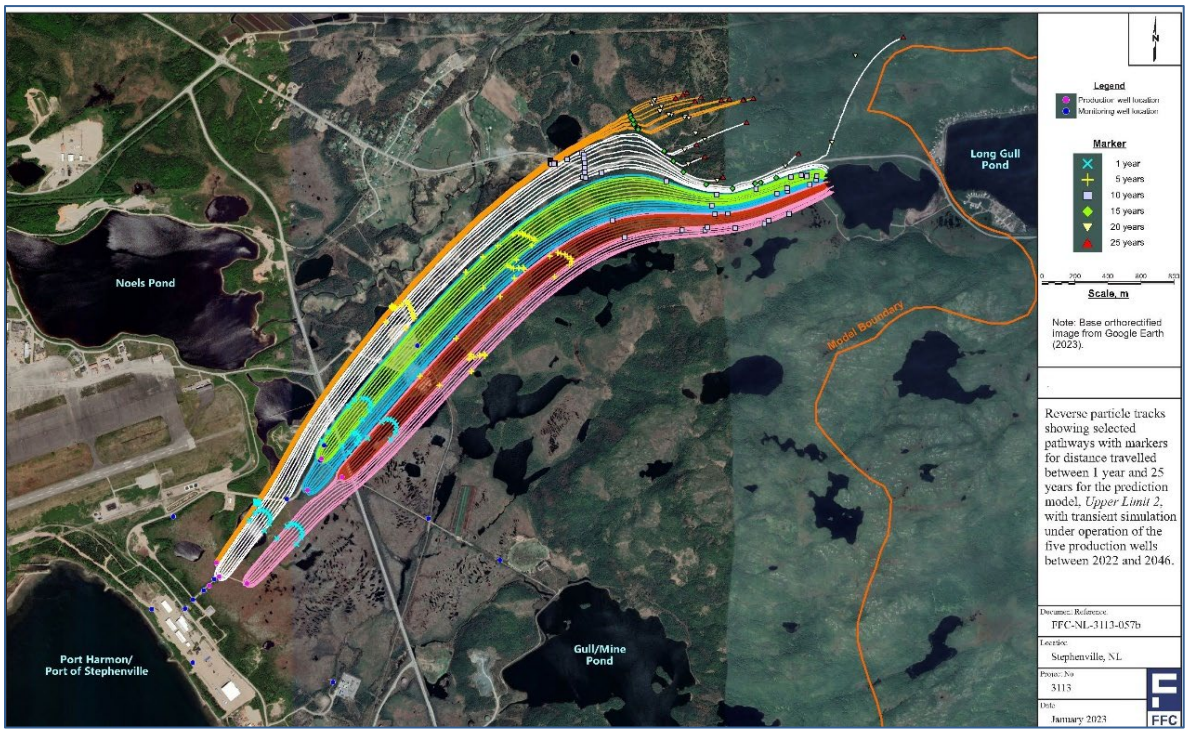


Figure 48 Predicted Particle Tracking for Distance Travelled Between 1 and 25 Years (2022-2045)



Most recent results show water quality remains within fish culture parameters.

- General chemistry, total metals, and dissolved metals testing shows mercury was below detection levels in all samples.
- Copper and zinc concentrations are within range and decreased with an increase in pumping.
- Total Dissolved Solids (TDS) and hardness were typical of groundwater and did not change significantly.
- All hydrocarbon components were below detection levels.

Reporting

The following reports, submitted to ECC Water Resources Management Division quarterly, semi-annually or on an annual basis – as determined by ECC. The data provide government scientists with the tools to manage aquifer use.

- **Water Withdrawal and Use from Freshwater and Saltwater Wells for Land Aquaculture Hatchery, Appendix B** – provides monthly volume of water used, reported annually from 2019.

- **Real-time Monitoring Data** – Water levels and water quality data provided to the hatchery control center for well management, also provides data to ECC Water Resources Management Division.
- **Groundwater Monitoring Program Report** – Compilation of the testing and assays completed in the year with conclusions, reported annually since 2019.
    - In accordance with the ECC approved monitoring plan, annual sampling events for near-field and far-field monitoring wells, and quarterly sampling for production wells is provided to ECC in a comprehensive annual report.
- **Groundwater Assessment Program Installation Progress and Aquifer Monitoring Reports**
    - **Groundwater Assessment Hydrogeological Progress Tech Memos** – status of production well development and well testing results reported bi-monthly 2019-2020.**Well Field and Aquifer Monitoring Semi-Annual Sampling Event** - groundwater level and water quality from active well areas (1 & 2), reported quarterly 2021.
    - **Well Field and Aquifer Monitoring -** groundwater testing and water quality from active well areas (1 & 2), reported every 6 months starting June 2022.
- **Modelling of aquifer response as required by ECC Water Management Division.**

6b Mitigation Strategies to Limit Potential Pathogen Transmission

Guidelines: Describe mitigation strategies that will limit potential pathogen spread between farmed and wild populations.

The following policies from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019 control MCE's salmon farming activities that have the potential for transfer of pathogens between wild and farmed salmon. The policies identify situations of risk and provide operational requirements for these situations that reduce the likelihood of pathogen communication. All policies and procedures are strictly adhered to.

Table 73 Aquaculture Policies That Pertain to Section 6b

AP #	AP Title	Description
AP 12	Transfers and Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the Minister or designate. Health of all fish to be transported to be assessed by the Aquatic Animal Health Division Chief Aquaculture Veterinarian prior to transporting.
AP 23	Fish Disposal	Fish Disposal Plans must be submitted by the Licensee and approved by the department, at the time of licensing, and on an annual basis.
AP 24	Single Year Class	Licensees must comply with the stocking schedule outlined in the Bay Management Areas Agreement for Atlantic salmon. This agreement is reviewed by the Bay Management Committee on a regular basis.
AP 26	Site Separation	Aquaculture licence applications (commercial and non-commercial) are reviewed to ensure that proposed sites meet the minimum site separation distances approved by the department.
AP 32	Aquatic Animal Health Reporting	Treatment and health records for any escape events must be made available to the CAV, upon request.
AP 33	Aquatic Animal Health Contingency Plan	Licensees will follow the AAHD Viral Management of Infectious Salmon Anaemia virus (ISAv) - Contingency Plan Guidelines during an ISAv event or outbreak.
AP 34	Aquatic Animal Health Disease Surveillance Designation	Licensees are required to meet the species-specific Surveillance Plan. Only Aquatic Animal Health Division (AAHD) designated veterinarians, fish health technicians and laboratories can be utilized as part of the Surveillance Plan.
AP 42	Animal Welfare	A Licensee must ensure optimal animal welfare during transport, sampling, fish handling, depopulation, and normal operations.

Having diseased or sick fish is not a routine situation for MCE. Regular fish health surveillance has supported an almost disease-free status on MCE salmon farms in the province. Antibiotics have not been used for several years.

However, as the ocean is an open environment, there is always risk of naturally occurring pathogens affecting farmed salmon. MCE has extensive Fish Health Management Plans and procedures to reduce the opportunity for pathogens to affect cultured salmon and if affected to limit the potential transmission within the culture population and to wild salmon.

This section describes the management policies and farming procedures developed to reduce the presence of pathogens and to reduce the opportunity for wild and farmed salmon interactions.

Unless otherwise indicated, the information in this section pertains to the rearing of salmon at all MCE saltwater farms in the Province of Newfoundland and Labrador.

MCE has a multi-headed approach to reducing the opportunities for pathogen spread between farmed and wild fish that involves the following.

1. Appropriate siting of farms.
2. Commitment to fish health to reduce the pathogens present in farmed salmon.
3. Prevention of interaction between wild and escaped farmed salmon through rigorous containment measures.
4. Accurate and timely reporting of fish health events to enable area disease management.
5. On-going training for all staff to minimize opportunities for wild and farmed salmon interactions.

Please refer to the following sections for additional information on this topic,

- Section 4.3c Veterinary Services for All Life Stages
- Section 4.3b Biosecurity Protocols
- Section 4.3l Integrated Pest Management Plan
- Section 6d Farmed and Wild Salmon Interactions Management

Location of Saltwater Farms

One of the most important aspects of ensuring fish health and welfare and reducing the potential effects of fish farming on the environment is to locate the farms appropriately.

Choosing the right site ensures cultured salmon have access to clean cold sea water and are protected from natural events such as ice flows and extreme weather. Appropriate siting also means choosing a site that has a natural ability to disperse waste particles and where the farm will not be above or near sensitive habitat or species at risk. Most of MCE farms are in areas free of wild salmon streams.

Commitment to Fish Health

Finding farmed salmon diseases in wild salmon is very rare. However, farmed fish can be affected by the same diseases as wild fish. These diseases are present naturally in the aquatic environment. One of the best methods of reducing transmission of potential pathogens from farmed to wild salmon is to reduce the pathogens present in farmed fish.

Also, the farming environment can encourage rapid transmission and MCE staff take extra

precautions to control of diseases that can affect farmed fish, such as Infectious Salmon Anaemia (ISA), that is endemic to Atlantic Canada and can affect farmed as well as wild salmon.

Best Aquaculture Practices Certification

Best Aquaculture Practices (BAP) standards include annual audits of active farms to ensure compliance as well as the following.

- Where weather conditions allow, trained staff shall make at least daily inspections and reports on the culture facility, water quality, and behavior and condition of fish.
- The fish health professional shall ensure compliance with all legal requirements for disease testing, fish movements (including zoo sanitary regulations of inbound and outbound transports), treatments for fish diseases, and reporting of notifiable diseases.
- Written procedures for the diagnosis and treatment of disease in fish shall include monitoring for endemic parasitic, bacterial, and viral infections.
- Observations by farm staff of disease indicators and resulting actions concerning disease diagnosis and treatment shall be recorded.

Management Plans

Mowi and MCE are committed to growing robust healthy fish. Biosecurity policies have been developed to ensure the culture environment supports fish welfare and the fish's natural ability to withstand disease.

Fish health procedures are designed to further support fish health and include all smolt being vaccinated against known diseases prior to being transported to saltwater farms.

The following plans are reviewed annually, revised as needed, and submitted to the Department of Fisheries, Forestry and Agriculture (FFA) for approval to ensure all practices comply with regulations and government policies.

1. Salmonid Fish Health Management Plan
2. Biosecurity Management Plan
3. Integrated Pest Management Plans

These plans and the associated standard operating procedures provide MCE staff with the knowledge and procedures to maintain fish health and welfare. A comprehensive health program, operational procedures, and veterinary services address any health concerns quickly and appropriately.

The Salmonid Fish Health Management Plan serves three purposes.

1. To outline good health conditions for cultured finfish
2. To comply with the principles, concepts, and required elements of fish health management unless otherwise required by site-specific conditions of licence.
3. To provide day-to-day interaction between site staff and other fish health staff who are responsible for maintaining and monitoring the good health status of the fish, and by the Fish Health Unit, who makes decisions related to fish health.

Biosecurity policies further reduce the opportunity for pathogens to enter the farm site and infect farmed fish. Fish Health and Integrated Pest Management practices monitor fish daily and initiate mitigating actions.

The protocols and procedures outlined in these plans and policies reduce the opportunity for disease in the farm population and decrease the pathogens that can be transmitted from farmed fish to wild species.

- Fish are routinely monitored for signs of disease. All staff are familiar with normal fish appearance and behaviour. Early detection of altered activity is key to maintaining health and disease management. Changes in behaviour and physical condition are logged and reported to facility managers upon discovery.
- To minimize stress and mortality, fish are held at specific densities. At saltwater farms, fish are reared at a maximum density of 15 kg/m^3.
- Reasonable, due-diligent attempts are made to exclude predators from the facility and from interacting with the fish and follow mitigation procedures for minimal predator interaction with the cultured fish.
- Healthy, hygienic feed requires proper storage to maintain its nutritional value. Feed is stored in structures designed to minimize spillage, spoilage, and wildlife's access to feed and is protected from extremes of heat, sunlight, and moisture.

Healthy Fish Prior to Entering Saltwater

All salmon transported to saltwater farms are healthy and thriving. This is determined through a fish health assessment and a disease risk evaluation on the results of the assessment prior to transport.

- The Health Policy for the Transfer of Live Cultured Finfish in Atlantic Canada (Policy) provides requirements for the fish health assessment. The Provincial Aquaculture Veterinarian determines if additional testing is required and if an Atlantic Canada Finfish Certificate of Health for Transfer (COHFT) is required.
- The Policy addresses fish health, pathogens of concern, reporting obligations, and roles

and responsibilities of the producer/designated aquaculture veterinarian and the provincial aquaculture veterinarian. For more details, please refer to section 4.3c Veterinary Services for All Life Stages.

For all fish transports, a federal Fisheries and Oceans Canada Introductions and Transfer Licence and a provincial Fisheries, Forestry and Agriculture Transport Permit are required. A condition of both authorizations is completion of a health assessment that meets the Provincial Aquaculture Veterinarian's requirements.

Vaccination

Vaccines are used to boost the fish's immune response and their ability to overcome disease threats. Vaccines are administered at the hatchery and occasionally at sea sites and form part of an integrated fish health management program. MCE vaccinates all smolt prior to being transported to the saltwater farms.

Only immunizing agents authorized by Health Canada are available for fish vaccinations. The Fish Health and Welfare Director, in conjunction with the Freshwater Production Director, decides the type of vaccine to be administered. Fish can be immunized by immersion in vaccine, 30 seconds to 2 minutes, by injection, and/or orally by mixing vaccines with feed.

Surveillance/Monitoring

The occurrence of disease is rare in MCE's salmon, especially in situations that require treatment. However, fish are monitored regularly for the presence of disease as an early warning precaution and to effectively manage fish health events should they occur.

- The freshwater facility is surveyed a minimum of once every 2 months by the company veterinarian or their designate to screen fish for the presence of bacteria, viruses, parasites, or other factors that may contribute to a decline in fish health.
- Elevated mortality or suspected disease is reported to the Fish Health and Welfare Director immediately and triggers additional visits and sampling, depending on the suspected cause.
- Schedule for veterinarian visits may increase as determined by management or as required by the Government of Newfoundland & Labrador Fish Health Surveillance Program.
- At minimum, the following sample protocols will be followed.
    - Once every 2 months: 5 fish per site
    - Kidney tissue plated on SKDM, TSA, BA, and Cytophaga agars

    - Pooled organ sample (pools of 5 fish - kidney, spleen, heart, gill) for cell culture, plated on ASK, EPC, and CHSE
- All farm staff observe fish behaviour and appearance during normal feeding operations and communicate observations to the site manager on a daily basis. Observations of abnormal behaviour or appearance are to be recorded on the Daily Site Report (DSR) and reported to the MCE Fish Health Unit.
- Where possible, mortalities are classified by cause according to the mortality worksheet.
- Feed records are entered into the database, which is examined regularly by site management, to observe feeding patterns, and to identify fish health problems.
- At minimum yearly, the veterinarian or designate will conduct an audit of biosecurity and disinfection practices at each farm site.
- Additional testing required by the Certificate of Health for Transfer (COHFT) will be performed by the designated veterinarian.

Diagnosis and Treatment

- Diagnosis of any health issues will be made by a licensed aquaculture veterinarian.
- The veterinarian keeps a health record for each site, which will include all results from the surveillance visits, as well as results for any additional diagnostic testing that has occurred due to a fish health concern.
- Drug treatments will only be given after a prescription from the licensed veterinarian has been received.
- All therapeutants are approved by the Fish Health and Welfare Director prior to administration.
- Therapeutants will be from credible and responsible sources and will only be used when it is necessary for proper fish health.
- Use of all therapeutants complies with existing regulations. Any therapeutant residues in fish for human consumption are below the limits set by the receiving country, the environmental impact is reduced as much as possible, and animal health is promoted through husbandry practices and judicial use of approved therapeutants.
- Treatment records for all therapeutants will be kept in the fish health records.
- Prior to harvest, appropriate residue testing will be performed by an accredited laboratory facility and clearance declarations will be obtained from the prescribing veterinarian.

Integrated Pest Management

An effective Integrated Pest Management Plan (IPMP) consists of three key components: prevention, intervention, and research and development. It is important that an integrated pest management plan minimizes intervention therapies and maximizes the use of prevention techniques. For more details on policies and procedures associated with pest management please refer to Section 4.3i Integrated Pest Management Plan**.**

Prevention: Every effort is made to prevent the parasite from attaching to the fish. Prevention is the cornerstone of the pest management plan.

Monitoring: An essential activity to determine sea lice abundance to determine effective control procedures and make management decisions. Monitoring will be conducted as per MCE procedures, or upon instruction by the veterinarian, the Fish Health Management Team, the FFA Aquatic Animal Health Division or the aquaculture licence requirements.

Monitoring is also required to determine if sea lice prevention strategies are working. When prevention methods become overwhelmed, there may be a need for intervention methods, but only as a last resort. Data from monitoring provides information on whether strategies (both preventative and therapeutic) are effective. When efforts are not effective, changes are made to improve success.

Research: A successful pest management plan should include research and development to ensure new more effective methods are being tested. The knowledge is used to provide the most effective means of control. Whenever there is a discrepancy between this plan and local *Aquaculture Acts* and regulations, the local *Acts* and regulations will take precedence and be strictly adhered to.

Escape Prevention

In a study by Baskett et al, 2013, authors assessed strategies to minimize the effect of farmed salmon on wild populations. A reduction in the number of farmed fish escapes was indicated as the first line of defense to directly reduce effects on wild salmon.

Please refer to section 6d Farmed and Wild Salmon Interactions Management for additional information on escape prevention and management.

Mowi AS has years of experience and research in escape prevention including farm management practices, equipment standards and design, and training and operational procedures developed from salmon farming in the north Atlantic. Mowi also has a global goal of zero escape incidents. MCE has incorporated this goal and benefits from Mowi expertise for the

site development and system design, infrastructure engineering, and operational practices developed for the Province of Newfoundland and Labrador.

Code of Containment

MCE fully complies with all aspects of The Code of Containment for the Culture of Salmonids in Newfoundland and Labrador (The Code) which outlines requirements for reducing the risk of escapes and specific measures for recapture and reporting. Operating procedures and training programs have been developed that align with The Code requirements.

As per The Code, the first level of management to minimize escapes of farmed salmon is adhering to the equipment standards, handling practices, documentation and reporting, inspections and mitigating measures as detailed in The Code.

The Code contains the following sections that are the basis for developing standard operating procedures to minimize opportunities for fish escape.

- Appropriate precautions must be taken to prevent escapes during stages of handling, including fish transfers, counting, grading, harvesting, net changing or cleaning and towing stocked pens.
- Observing fish during handling, and for a period after handling, ensures any negative effects are noted and steps are taken to mitigate impacts.
- Staff minimize the time fish are exposed to stressful events, such as crowding and out-of-water events (i.e., moving, counting, grading, tagging, injecting, etc.).
- Each handling event is logged.
- SOPs operating procedures describe specific actions to be undertaken on a daily, weekly, monthly, and annual basis to prevent escapes focusing on inspection of gear and equipment, checklists and sign off prior to operations that could have potential for escape, actions to take to assess escapes potential and appropriate response to potential escape incidents.
- Recapture of escaped fish and reporting will be conducted as directed in The Code of Containment – Measures for the Recapture of Escaped Fish.

A comprehensive plan for managing potential interactions with wild salmon has been prepared and is revised annually with the latest research and regulatory updates. This document provides management policies and procedures to manage wild and farmed salmon interactions as required by The Code.

Detailed procedures to manage an escape event are also included in this document. This plan will be posted and readily available on all sites and staff will be trained in these procedures.

Fish Culture System Design

In addition to the operational procedures that align with The Code, MCE is designing farms and installing equipment to a 3rd party engineering standard that covers the following areas.

- Material specifications
- Design approach that incorporates the fish culture methods and the regulatory requirements for equipment testing
- Material and load factors for Serviceability Limit State (SLS), Ultimate Limit State (ULS) and Accidental Limit State (ALS), and Fatigue Limit State (FLS)
- Net specifications
- Environmental specifications

A modification specifically for salmon farming in the Province of Newfoundland and Labrador is minimum 20 m depth for all salmon culture nets. The net depth will provide a greater area in the pen for salmon to access colder deeper water if surface temperatures are too warm.

Salmon culture systems (the floating collar or pen, fish culture nets, and mooring system) must be engineered for the unique conditions of each site with the dimensions of floating collars, nets and moorings based on environmental factors.

- Withstand significant wave height, 1 in 50-year storms, and moving and fixed ice. The proposed pens and mooring systems have been tested in the harshest environments to understand the limits of the systems.
- Nets and pens are designed to accommodate an extra ice load.
- Pens are made of flexible plastic and strong steel for maximum escape prevention.
- Specially designed fish nets where lowering ropes do not come into contact with the net, eliminating a source of net wear and damage.
- Improved customized fish net design and net tensioning system where all components complement one another for optimal interaction creating greater longevity and reducing risk of equipment damage.
- Nets will be HDPE (high density polyethylene) material, selected because of its high abrasion resistance. This material is “bite-resistant” to predators, eliminating predator damage and an avenue for escapes and resisting environmental damage.
- Infrastructure engineered to facilitate maintenance and repair to ensure all equipment is in good working condition at all times.

International Procedures

Mowi and MCE are committed to zero escapes. MCE has adopted the Mowi advanced containment procedures that include the following. These management plans and processes have the goal of reducing the opportunity for fish escapes through equipment inspection and repair, rapid response should a situation arise, and the knowledge to perform risk assessment for any situation not specifically covered by a management plan.

- Escape Prevention and Response Plan
- Fish Containment Plan
- Escape Response Procedure
- Net Inspection Procedure
- Net Inspection (Diver and non-Diver)
- Predator Avoidance Plan
- Pen and System Daily Inspection (Daily and Post Storm)
- Risk Assessments - performed when running large operations or using new equipment.

Fish Transfer

No fish loss or fish escape has occurred in the past five years during transfer of fish between the culture pens and transport vessel. However, as this is an activity with the potential for fish escape, the following measures are in place.

- Security/catch/secondary nets installed around fish transfer equipment and when pumping fish.
- Transfer hose ends are always subsurface in the pen and submerged in the fish hold.
- Transfer lines are double walled pipes.
- Catch nets are installed around exposed areas.

The following sections provide additional information on the technology and processes for reducing the risk of escapes during transfer between vessels and culture pens and during transport of salmon.

- Section 4.3a Equipment and Procedures for Culture of All Salmonid Life Stages
- Section 4.3b Biosecurity Protocols

Culture Net Use and Management

Generation nets remain in place during the entire grow out eliminating the need to change nets and create a potential situation for fish escapes. With the use of generation nets, the requirement to move salmon from one pen to another for net cleaning has been eliminated. These nets are being phased in over two years.

- Nets are uniquely identified to ensure traceability.
- Net treatment log details production date, repairs, strength tests etc.
- Reduce net handling to reduce abrasion and weakening of the nets which may increase opportunities for escapes to occur.
- Nets are cleaned regularly with an ROV *in situ* cleaning system that eliminates the need to remove the nets for cleaning, therefore eliminating an activity that has the potential for escapes Global research and development teams at Mowi continue to look to innovations for better anti-fouling strategies that minimize the need for net cleaning and for better sea lice treatment strategies that minimize net handling.

Equipment Failure Management

Equipment failure can be an opportunity for cultured salmon to leave the pen. In a global survey, Mowi identified three key areas to address equipment failure and specifically to reduce escapes: nets and equipment inspected regularly, correct use of equipment, reviewing operational procedures, and performing risk assessments before operations that have a potential for escape incidents.

The following practices have been developed to address these areas.

- All equipment is designed to an approved third-party engineer certified standard with a focus on equipment integrity and longevity in local conditions.
- Installation of moorings, pens, and net combinations according to the engineered site layout. This ensures longevity and the ability to withstand adverse conditions and are used according to minimum standards recommended by the supplier.
- Checklists prepared for operational procedures that include escape-related risks.
- Checklists signed off prior to execution of operational procedures that involve risk of escapes and will be revised and updated, if needed, at least once per year.
- All mooring buoys and other markers installed as per Transport Canada requirements and maintained in good condition.
- User manuals for the pen system and moorings strictly followed.

Escape Management

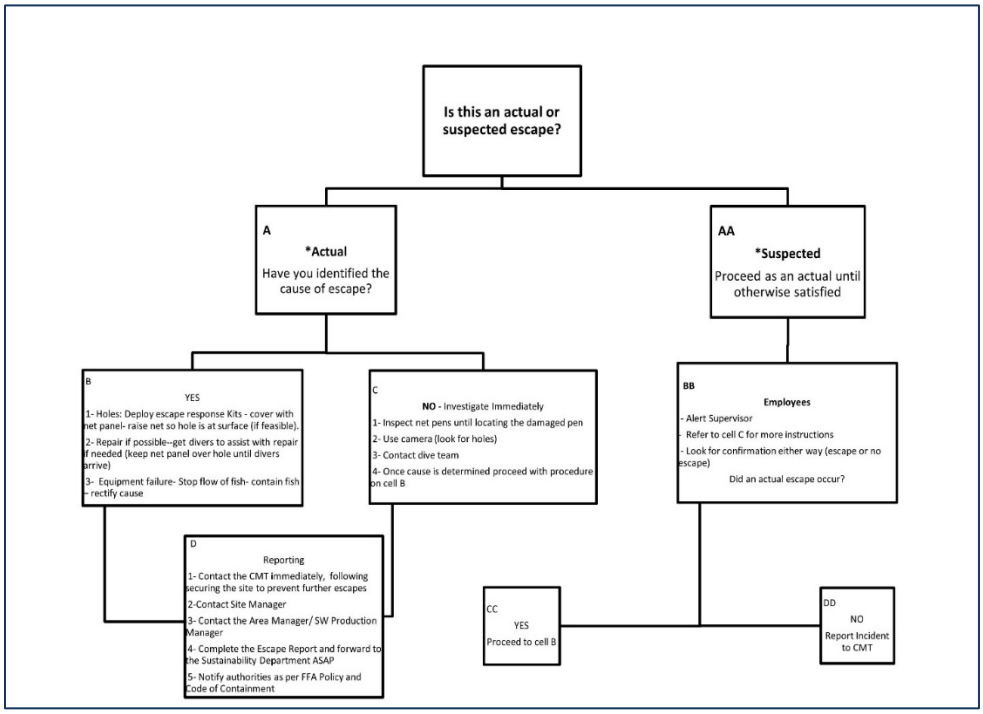
Even though escapes are a rare occurrence, management plans are in place to reduce the likelihood of these occurrences and a rapid response plan is in place to reduce the potential effects of an escape.

Escape management is detailed in the Environmental and Waste Management Plan, Management of Wild and Farmed Salmon Interactions. This document is submitted to the Department of Fisheries, Forestry and Agriculture (FFA) annually for review and approval as part of the aquaculture licence validation.

In the unlikely event of fish escaping, MCE's facility staff will immediately put into place notifications and procedures as outlined in the Escape Response Flow Chart, see Figure 49. These procedures have been developed to limit the potential for interaction between wild and farmed salmon.

For additional information on escape management please refer to Section 4.3n Recapture of Escaped Farmed Salmon.

Figure 49 Escape Response Flow Chart



Fish Health Reporting

MCE reports any incident of disease according to Aquatic Animal Health Reporting Policy and the Environmental Management and Waste Management Plan that is reviewed and approved by the Government of Newfoundland and Labrador.

In addition, the Aquaculture Policy and Procedures manual requires the submission of, but not limited to, the following.

- Net Cleaning and Disinfection Report
- Environmental Waste Management Plan
- Annual Aquatic Animal Health Report
- Reporting of any mortality events determined to be disease related within 24 hours, all policies and practices outlined in The Code are followed.
- Code of Containment requires regular testing of salmon pen infrastructure and reporting on the following:
    - Net testing results
    - Annual net cleaning and disinfection reports
    - Annual submission of inventory reconciliation including number of fish stocked, mortalities, removals, and explanation of any discrepancies.
- Monthly report on sea lice numbers. These numbers are available to the public.
- Reporting on a minimum of three mandatory veterinary visits over the course of a year is a requirement of a Certificate of Health Transfer for Live Cultured Finfish.

Training

All farm staff realize their responsibility is to reduce the potential for escapes. All staff are trained in specific methods to avoid situations where escape may result. Training is an essential part of achieving the goal of zero escapes.

- All staff are required to read, understand, implement, and report upon all operational procedures.
- Training is provided prior to starting on a farm site and is renewed at least annually.
- Employees must participate in annual Escape Prevention training and testing pertaining to escape prevention. The training program is aimed at everyone involved in farming operations where there is a risk of fish escaping. It highlights the importance of preventing human errors by having well-established routines, simple checklists to be followed and signed off prior to operations, and effective communication.
- Training aims to reaffirm MCE internal standard for seawater management, including the sharing of experiences and lessons to be learned after escapes, and the highlighting of behavioural changes that can make a difference.

The training program is also an important platform for sharing new knowledge, internal experiences and lessons learned after escape incidents. Lessons learned can be used to simplify procedures and develop more efficient checklists to help prevent human error leading to escape.

6c Elevated Mortality and Reportable Disease Event Management

Guidelines: Describe biosecurity measures and contingency plans for fish disposal due to mass mortality and depopulation events due to reportable diseases. Identify disposal sites and capacity of those sites to accommodate the maximum volume of waste that may be generated by a mass mortality or reportable disease event. EAC Revised June 13, 2023.

This section provides information on the comprehensive regulatory control and MCE management plans and practices that are used in response to an abnormal fish culture event or incident. The focus for this section is on events that have abnormal or elevated mortality and/or are associated with a reportable disease.

Unless otherwise indicated, the information provided in this section applies to the rearing of all MCE salmon in the Province of Newfoundland and Labrador including the proposed Hatchery Expansion salmon.

The following definitions from the FFA Aquaculture Operator Incident Reporting Guidelines 21055-Aquaculture-Incident-Reporting-March-25.pdf (gov.nl.ca) are used in classifying an event and determining the most effective management of an event.

- **Incident**
    - Any event that caused or under slightly different circumstances would have caused abnormal mortality, harm, or an imminent threat to farmed finfish or shellfish, marine, freshwater, or on-land installation or structure or vessel on a licensed finfish or shellfish aquaculture site.
    - Any event that impairs the function of any equipment required to sustain aquatic fish health and prevent escape, and any other event deemed reportable by FFA.
- **Abnormal Mortality**
    - Mortality equivalent to 3% or higher of the current aquaculture inventory within a marine and freshwater site, vessel, or other method of transport and/or transfer for salmonid and cleaner fish aquaculture licensed sites
    - Any incident at an on-land salmonid and/or cleaner fish aquaculture licensed site, where an incident is encountered, which requires additional resources for the on-land facility to address and mitigate the incident.
- **FFA and Public Reportable Mortality Incident**
    - Mortality equivalent to 10% or higher of the current aquaculture inventory within a

marine and freshwater site, vessel, or other method of transport and/or transfer for salmonid and cleaner fish aquaculture licensed sites.

- Any event at an on-land salmonid and cleaner fish aquaculture licensed site, where an incident occurs which requires additional resources for the on-land facility to handle and mitigate the event.
- Detection or confirmation of a Reportable Disease
- Suspected or confirmed escape.
- High outcome as determined by the Incident Management Risk Assessment Matrix.

- **FFA Reportable Mortality Incident**
  - Mortality equivalent to 3% or higher than the current aquaculture inventory within a marine or freshwater site, vessel, or other method of transport and/or transfer for salmonid and cleaner fish aquaculture licensed sites
  - Any event at an on-land salmonid and cleaner fish aquaculture licensed site, where an incident caused or under slightly different circumstances, would have caused abnormal mortality, harm, or an imminent threat to cultured fish, installation or structure at a licensed on-land aquaculture site, or any event that impairs the function of any equipment that sustains fish health and prevents escape.
  - Detection or confirmation of a Reportable Disease.
  - Suspected or confirmed escape.
  - Moderate outcome as determined by the Incident Management Risk Assessment Matrix.

Reportable diseases are identified on the following websites: https://inspection.gc.ca/animal-health/aquatic-animals/diseases/reportable-diseases/eng/1322940971192/1322941111904 and/or Newfoundland-and-Labrador-Aquatic-Animal-Reportable-and-Notifiable-Diseases-September-2020.pdf (gov.nl.ca)

The following sections have additional information on the management of specific incidents and disposition of mortalities associated with the incident. Information included in other sections is referenced in this section but is not repeated.

- Section 4.1f Ownership and Zoning, subsection Saltwater Farms Reporting – Abnormal Events has the aquaculture licence requirements for management of abnormal events such as elevated mortality.

- Section 4.3b Biosecurity Protocols, subsection Transporting Fish and Mortality Management for information on disposal of mortalities.
- Section 4.3l Integrated Pest Management Plan, subsection MCE Integrated Pest Management Plan, Euthanasia has details on management of an elevated number of mortalities or depopulation event.
- Section 4.3p Regulatory, Incident Management, and Public Reporting includes the following.
    - Reporting requirements for incidents with elevated mortality and/or mortalities from a reportable disease
    - Risk assessment used to determine the magnitude of impact to the health and welfare of farmed fish, marine or on-land installation or structure or vessel on a licensed aquaculture site, and the degree of hazard or harm to farmed fish or the containment of farmed fish or shellfish. The result of this assessment determines the reporting requirements.

Contingency Planning

At all MCE facilities, vigilant monitoring and detailed record keeping support the early detection of incidents as defined above that may lead to compromised fish health and/or elevated mortality. MCE uses the Incident Management Risk Assessment Matrix to determine the magnitude of the event and potential effect on the health and welfare of farmed fish, marine or on-land installation, structure/vessel on a licensed aquaculture site, and the degree of hazard or harm to farmed fish or the containment of farmed fish or shellfish. The result of this assessment determines the response to the event.

Once an event has been assessed, specific steps are developed to contain the incident and safeguard the remaining fish and the environment. Prior to an event, contingency plans are developed to facilitate rapid and effective incident response.

Department of Fisheries, Forestry and Agriculture (FFA) regulations, management plans and guidelines and Aquaculture Policies provide the regulatory requirements for contingency planning and for incident response. The MCE management plans are developed to meet or exceed all regulatory requirements and align with Mowi Sustainability Strategy principles. The management plans are reviewed annually and revised as needed and submitted to FFA for approval.

Rapid response is essential, but effective management must be determined on a case-by-case basis by a team that includes MCE designated veterinarians, the Fish Health Unit, and the regulatory authority.

Regulatory Management

Guidelines and Contingency Plans

FFA recognizes the requirement for early response to an abnormal event and has developed detailed pre-event preparation and event response requirements in the following documents. These documents set the standards for licence holder's management plans and operating procedures in order to be prepared in advance of an event and efficiently and effectively respond.

- Viral Management of ISAv Contingency Plan https://www.gov.nl.ca/ffa/files/Viral-Management-of-ISAv-Contingency-Plan-Guidelines-for-Newfoundland-and-Labrador.pdf
- Aquatic Animal Health Division Biosecurity Audit Plan www.gov.nl.ca/ffa/files/Aquatic-Animal-Health-Division-Biosecurity-Audit-Plan-September-2020.pdf
- Integrated Pest Management Plan for Sea Lice Newfoundland and Labrador Integrated Pest Management Plan for Sea Lice (gov.nl.ca)
- Aquaculture Incident Reporting 21055-Aquaculture-Incident-Reporting-March-25.pdf (gov.nl.ca)
- Newfoundland and Labrador Aquatic Animal Reportable and Notifiable Diseases Newfoundland-and-Labrador-Aquatic-Animal-Reportable-and-Notifiable-Diseases-September-2020.pdf (gov.nl.ca)
- Aquaculture Policies and Procedures Manual www.gov.nl.ca/ffa/files/licensing-pdf-aquaculture-policy-procedures-manual.pdf. See details below.
- Reportable diseases are identified on the following website: https://inspection.gc.ca/animal-health/aquatic-animals/diseases/reportable-diseases/eng/1322940971192/1322941111904

MCE contingency plans and practices are developed to safeguard the health of fish and safeguard the environment. They also comply with all regulatory requirements, including following the FFA Aquatic Animal Health Division (AAHD) Contingency Plan and FFA AAHD Viral Management of Infectious Salmon Anaemia virus (ISAv) - Contingency Plan Guidelines during an ISAv event or outbreak. Also, where a disease event or outbreak is under the care and control of the Canadian Food Inspection Agency (CFIA), MCE adheres to any applicable federal regulations,

FFA Aquaculture Policies

The following Aquaculture Policies, from the FFA Aquaculture Policies and Procedures Manual 2019, provide specific requirements for MCE's management and reporting of elevated mortality events and reportable disease events for the purpose of managing adverse events to reduce the spread of disease and pathogens. Specifically, AP 23 and AP 33 state licensees must follow the comprehensive provincial Contingency Plan Guidelines when managing a Reportable Disease Event.

Table 74 Aquaculture Policies that Pertain to Section 6c

AP #	AP Title	Description
AP 2	Application Requirements	Business plan must include an Environmental and Waste Management Plan and Incident Management System Plan
AP 12	Transfers and Permits	Transfers of live aquatic animals into or within the province require the prior written approval of the Minister or designate. Health of all fish to be transported to be assessed by the Aquatic Animal Health Division Chief Aquaculture Veterinarian prior to transporting.
AP 17	Public Reporting	Public notification for: escapement of fish from sea-cage, Quarantine Order to prevent the introduction or spread of a disease; Depopulation Order to remove fish from a defined area; and other event that caused or could cause abnormal mortality, harm, or threat to farmed finfish or shellfish, marine installation or structure, or vessel on a licensed aquaculture site.
AP 23	Fish Disposal	During a Reportable Disease event, the Fish Disposal Plan will be subject to additional requirements as required under the NL AAHD Contingency Plan.
AP 29	Aquatic Animal Health Surveillance	In all cases of increased mortalities, operators must verbally notify the Assistant Deputy Minister immediately, followed by submission of a written report to the Assistant Deputy Minister, Chief Aquaculture Veterinarian and Director of Aquaculture Development within 24 hours.

AP #	AP Title	Description
AP 32	Aquatic Animal Health Reporting	A licensee must immediately report to the Chief Aquaculture Veterinarian any suspicion or knowledge of a Reportable Disease or zoonotic disease. A written report must be submitted no later than 24 hours after the telephone report. The written report must include the following: • Name of licence holder; • AQ number; • Location of site (address); • Contact information (both email and telephone); • Species • Age or year class; • Average weight of the animals; • Total number of animals on the aquaculture site/facility; • Total number of cage/tanks/holding units on site; • Number of animals suspected affected and the associated cage/tanks/holding units; • Any recent movement off the aquaculture site/facility; • Presumptive diagnosis; • Recent mortality numbers; • Clinical signs; and • Diagnostic testing results (if applicable).
AP 33	Aquatic Animal Health Contingency Plan	License holders are required to follow the Aquatic Animal Health Division (AAHD) Contingency Plan during a Reportable disease event/outbreak. In the event of an Infectious Salmon Anemia virus (ISAv) event, the AAHD Viral Management of Infectious Salmon Anemia virus – Contingency Plan Guidelines are to be followed.
AP 42	Animal Welfare	A Licensee must have their designated veterinarian performing, overseeing, or instructing employees on the humane euthanasia of fish during fish handling, sampling events, depopulation, and normal operations.
AP 43	Provincial Criteria for Aquaculture Quarantine Facilities	Licence holders with a quarantine facility must grant access to the aquaculture facility by Aquatic Animal Health Division (AAHD) staff or designated representatives to conduct biosecurity audits as per the AAHD Biosecurity Audit Plan.

Aquaculture Policy 23 Fish Disposal has the following requirements for the licence holder's Fish Disposal Plan.

- All farms will have a Fish Disposal Plan, outlined in a Waste Management Plan.
- Fish Disposal Plans must be submitted and approved by the department, at the time of licensing, and on an annual basis.
- License holders must submit Fish Disposal Plans to all relevant agencies with a regulatory responsibility for waste management prior to implementation.
- License holders must submit amendments for approval by the department and all other external agencies with a regulatory responsibility for waste management prior to implementation.

- During a Reportable Disease Event, the Fish Disposal Plan will be subject to additional requirements as required under the FFA Aquatic Animal Health Division Contingency Plan.
- Any fish or fish by-products (including mortalities) in a quarantined area, under a Quarantine Order, must obtain a Licence To Move before they can be moved off the aquaculture facility/site.
- The Fish Disposal Plan must be accessible to FFA.
- FFA may request additional information regarding the Fish Disposal Plan.
- FFA Aquaculture Policy 33 Aquatic Animal Health Contingency Plan

Aquaculture Policy 33 Aquatic Animal Health Contingency Plan provides mitigation measures to be implemented during reportable disease events. These measures have the purpose of preventing pathogen spread.

AP 33 provides the following instructions for management of reportable disease events.

1. Licensees are required to report diseases listed as Reportable by the Federal or Provincial Government to the appropriate regulatory bodies as identified in the Aquatic Animal Health Reporting policy.
2. The department may issue a Quarantine Order when a Reportable Disease is suspected, designating any aquaculture site/facility, growing region (i.e., Bay Management Area), equipment, vessel, or vehicle as a quarantined area.
3. Upon receipt of the Quarantine Order, the licensee must submit to the CAV inventory of all items within the quarantine area. This must be provided to the CAV within 72 hours of the Quarantine Order being issued. Items to be included.

Fish numbers	Buoys, Lines
Fish cages/tanks with identification numbers	Trays/cages/tanks/socks or other applicable holding units
Fish nets with net identification numbers	Other items/equipment contained within the quarantine area
Vessels, Barges, Trucks,	Equipment

4. A Quarantine Order, issued by the department, will remain in effect until it is lifted by the department. Criteria that will allow the Quarantine Order to be lifted:
    a. Animals in the quarantined area are not confirmed positive and are no longer suspect positive of a Reportable Disease. In addition, a Depopulation Order must not have been issued.
    b. For Atlantic salmon at marine cage sites: all animals, equipment and things have been removed from the quarantined area with an approved Licence To Move (LTM) and this has been reconciled with the original site inventory. After the quarantine has been lifted, the site must remain fallow for 4 months. Restocking of fish at marine cage sites can only occur in accordance with the Bay Management Areas (BMA) Agreement or BMA principles.

c. For Atlantic salmon marine cage sites exposed to Infectious Salmon Anemia virus (ISAv), with only grid lines remaining in the quarantined area: All animals, equipment and things with the exception of grid lines have been removed from site, with an approved Licence To Move, and this has been reconciled with the original site inventory. After a negative ISAv test result, using viral culture, has been received by the CAV for the grid lines, the quarantine will be removed. The site must remain fallow for 4 months. Restocking of fish at marine cage sites can only occur in accordance with the Bay Management Areas (BMA) Agreement or BMA principles.
d. For salmonid hatcheries or nurseries: Animals, equipment and things that must be removed from the quarantined area are removed, cleaning and disinfection of the facility and negative specific pathogen test results have been received by the Chief Aquaculture Veterinarian (CAV). After the Quarantine Order has been removed, the site must be fallow for 4 months.
e. For all other species in the marine environment or on land: All animals, equipment and things must be removed from the quarantine area with an approved Licence To Move and a fallow period (based on a risk assessment conducted by the AAHD) has been met;
f. If a risk assessment conducted by the AAHD concludes that a different fallow period is required for the specific Reportable Disease event or outbreak, this fallow period must be adhered to; and
g. Once the Quarantine Order has been lifted and restocking has resumed, the CAV may order the licensee to conduct specified diagnostic testing of the new stock for a specified period.

5. Upon receipt of the Quarantine Order, the licensee must submit Standard Operating Procedures (SOPs) to the Aquatic Animal Health Division (AAHD) for review. The licensee is responsible for approval of the SOPs from agencies with regulatory authority of the practices outlined in the SOPs. SOPs will be approved by the CAV or their designate.
    a. SOPs to be submitted:
        i. General site biosecurity
        ii. Personnel movement to and from the site
        iii. Cleaning and Disinfection protocols
        iv. Mortality Removal
        v. Mortality Disposal
        vi. Other as deemed necessary by the Designated Veterinarian or the CAV

6. Upon receipt of the Quarantine Order, the licensee will be provided with the AAHD Reportable Disease Questionnaire from the CAV or their designate. This must be returned to the CAV within 72 hours after receipt.

7. Prior to any animal, animal by-product (including mortalities), object or thing being removed from a quarantined area, an SOP must be submitted to the AAHD for review 72 hours prior to movement. SOPs will be reviewed by the AAHD and approved by the CAV or their designate and a LTM will be issued prior to

movement. Nothing can move out of a quarantined area without an LTM. Once an LTM is issued by the CAV, 72 hours of notice of the movement must be given. The CAV has the discretion to alter these timelines under special circumstances. The CAV will list on the LTM the approved wharf that may be utilized by a site under a Quarantine Order.

8. All aquatic animal health records must be available for review upon request by the CAV.

9. Additional data requested by the AAHD as part of the case investigation must be provided within three days of the request.

10. AAHD staff, or a designated representative, must be granted permission to audit the facilities/activities.

11. Licensees must participate in the AAHD enhanced surveillance plan.

12. The department may issue a Depopulation Order for a group of animals with an agreed upon deadline for animal removal and timeline for cleaning and disinfection for the site. The Depopulation Order will include the date required for animal removal as well as the cleaning and disinfection completion date. The department may issue a fine, directive or penalty in the event that these deadlines are not met.

13. The licensee must start preparations for depopulation within 24 hours of receiving a Depopulation Order. All activities involved in Depopulation must have SOPs approved by the CAV or their designate. Any animals, animal products, equipment or things that are removed from site must have a Licence to Move.

14. A licensee that depopulates a site, which is under a Quarantine Order, must submit an SOP to the AAHD for review. SOPs must include a deadline for animal removal and timeline for cleaning and disinfection for the site. The department will issue a Depopulation Order which will include the date required for animal removal as well as the cleaning and disinfection completion date. The department may issue a fine, directive or penalty in the event that these deadlines are not met. All SOPs will be approved by the CAV or their designate. Any animals, animal products,

MCE Management Plans

MCE has extensive management plans and operational procedures to be used in response to abnormal events that are assessed annually and revised as required and provided to FFA for review and approval.

Elevated mortality events occur rarely however, MCE has comprehensive management plans that provide procedures required to satisfactorily manage elevated mortality and/or reportable disease events. These plans take into consideration the following.

- Disposal of large number of mortalities focuses on efficient removal of the mortalities

before they decompose to reduce potential negative effects on the remaining fish and the environment.

- Disposal of mortalities from a reportable disease event includes enhanced biosecurity measures to ensure the disease is contained. These requirements are decisions determined in conjunction with regulatory fish health experts.
- Both types of events could trigger a requirement to depopulate a farm or part of a farm and/or remove a large number of mortalities.

Mass Mortality Contingency Plan

MCE has developed a comprehensive Mass Mortality Contingency Plan (MMCP) for both the saltwater farms and the hatchery with the objective of having steps in place that can be executed quickly and, in a bio-secure manner while working in collaboration with regulatory agencies.

The plan addresses elevated mortality events resulting from environmental events, as well as disease events and includes mortality retrieval, transportation of fish products, and environmental management during removal activities.

The MMCP aligns with the requirements of the FFA Aquaculture Policies and the conditions of farm's aquaculture licence under the Province of Newfoundland and Labrador *Aquaculture Act*. Specifically, Aquaculture Policy (AP) 2 – Aquaculture Requirements, AP 17 – Public Reporting, AP 23 – Fish Disposal, AP 32 – Aquatic Animal Health Reporting, and AP 33 - Aquatic Animal Health Contingency Plan.

The MMCP is reviewed annually, updated as needed, and approved by the Government of Newfoundland and Labrador, Department of Fisheries, Forestry and Agriculture (FFA) Licensing Division and Aquatic Animal Health Division and is part of the annual validation of the farm's aquaculture licence.

Emergency Management Team

All elevated mortality events trigger the MCE Incident and Crisis Management System (ICMS) – as per Aquaculture Policies 2 and 17. ICMS includes both internal and external reporting and the immediate establishment of an Emergency Management Team (EMT). The MCE component of the Emergency Management Team includes Senior Management Team members.

- Managing Director
- Fish Health Director
- Saltwater Director
- Freshwater Director
- Development and Environmental Compliance Director

- Processing Director
- Communications Director

Depending on the event, government representatives may participate through an external Emergency Management Team (EMT). Participation of government agencies in collaboration with industry will allow for a comprehensive response that includes permitting and regulatory controls and ensures smooth flow of information between industry, government, and the public.

In the event of an elevated mortality response, the following will be invited to join the external EMT.

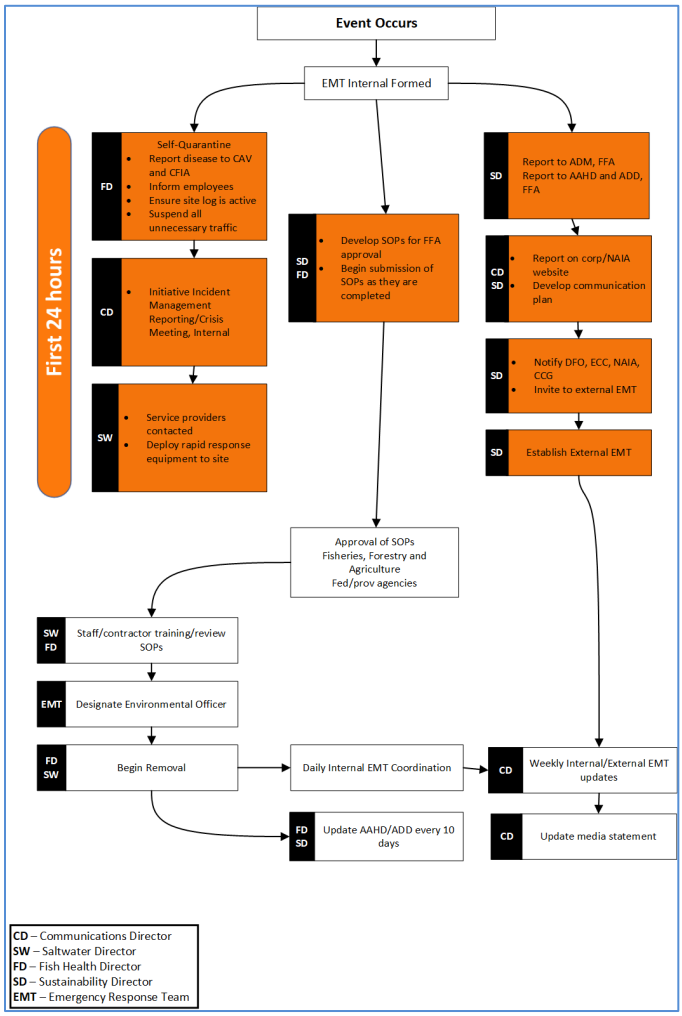
- Aquatic Animal Health (AAHD) and Aquaculture Development (ADD) Divisions, Fisheries, Forestry and Agriculture, Government of Newfoundland and Labrador
- Ecosystem Management Division, Fisheries and Oceans Canada (DFO)
- National Environmental Emergencies Centre, Environmental Protection Operations Directorate
- Environment and Climate Change Canada (ECC)
- Canadian Wildlife Service, Environment and Climate Change Canada (CWS)
- The Canadian Food Inspection Agency (CFIA)
- Newfoundland Aquaculture Industry Association (NAIA)

Reportable Disease Response Plan

For a reportable disease event, the management objective is to keep the pathogen concentration as low as possible to prevent the spread to other fish within the facility and to prevent the spread of disease off the facility. The MCE Reportable Disease Response Plan is part of the Salmonid Fish Health Plan, included in the Environmental Management and Waste Management Plan. It is reviewed annually and provided to the FFA AAHD for approval to ensure it meets all conditions and requirements determined by regulatory authorities.

In the situation where elevated mortality is caused by a reportable disease, additional levels of biosecurity are required. As soon as a reportable disease is suspected, both the Canadian Food Inspection Agency (CFIA) and the provincial Chief Aquaculture Veterinarian (FFA) are notified. Additional biosecurity measures for disinfection, sterilization, and decontamination are approved by these agencies prior to response being initiated. Figure 50 provides the general process followed for a reportable disease or other abnormal event. This process and all activities undertaken will be in accordance with Internal SOPs and regulatory requirements.

Figure 50 General Process for a Reportable Disease or Other Abnormal Event



The Response Plan for abnormal mortality levels or reportable disease events includes the following components. Each component has detailed Standard Operating Procedures (SOPs).

- Mass Mortality Detection Procedures
- Mortality Retrieval Processes
- Transport from Affected Site Procedures
- Site Decontamination Procedures
- Monitoring and Reporting
- Communications
- Training and Maintenance
- Post Event Analysis

If quarantine is required for reportable disease events to contain the spread of disease, the following additional measures are taken.

- The designated site veterinarian should institute self-quarantine procedures until the suspected disease is either confirmed or disproven.
- If a site is confirmed to have the suspected disease, SOPs will be submitted to the province for approval by the Chief Aquaculture Veterinarian.
    - SOPs will change depending on if the disease is suspected/confirmed and will vary by site and life stage of the fish diagnosed.
- Depending on the disease diagnosed, either the CFIA or the FFA will place a quarantine on the site.
- All SOPs and protocols that have been approved by the regulating body will be strictly followed at all times.
- No staff or equipment will move to/from the site without approval from the Fish Health and Welfare Director
    - Approvals will only be granted once a License to Move has been received from the regulating body.

Fish Disposal Plan

MCE Fish Disposal Plan (FDP) is a component of the MCE Environmental Management and Waste Management Plan, Fish Health Plan. The FDP is reviewed annually, revised as needed, and provided to the FFA Licensing Division and Aquatic Animal Health Division to ensure it is comprehensive for all potential situations and adheres to all regulations and policies. The FDP is a comprehensive set of directions for fish disposal for normal operations and for abnormal events. It addresses all regulatory requirements, Mowi sustainability principles and MCE internal policies. Detailed operating procedures have been developed from the FDP. Depending on the reason for the abnormal event, the options for disposal of mortalities will be discussed with and approved by FFA AAHD. As soon as a reportable disease is suspected, both the Canadian Food Inspection Agency and the Chief Aquaculture Veterinarian will be notified.

Fish health emergency is any situation where the health of a fish population is suddenly at risk. This may be due to disease-causing agents (such as a pathogenic virus) or to abrupt water quality changes (such as plankton blooms, a toxin, or a sudden, severe decline in dissolved oxygen).

- **Elevated mortality** or a mass mortality event is a fish health emergency that results in increased level of mortalities and/or requires the depopulation of a site.

- **Outbreak** is defined as an unexpected occurrence of mortality or disease. Not all outbreaks are infectious nor are they all fish health emergencies.

Event Management

A pro-active step in managing mortality events is preventing them by addressing potential causes before they happen. MCE fish culture practices and detailed management plans are developed to avoid abnormal events. The previous section provides information on event management plans, this section provides specific procedures for event management.

Event Identification

The FFA AAHD governs all processes to identify and respond to a reportable disease event. MCE follows the AAHD directions. However, in order to response efficiently and effectively, MCE has extensive internal processes developed from the MCE management plans approved by FFA.

The response to an event will be determined primarily by the cause of the event. However, the magnitude of the event including expected quantity of mortalities is also a deciding factor. The following definitions in Table 75 provide a guide to determine the potential scope of the event and the expected clean-up time for response planning.

Table 75 Elevated Mortality Classification

Class	Item	Scope	Clean up time frame
1	Pen	Event affecting 1-3 pens at a single site.	1-2 weeks
2	Farm	Event affecting majority of pens within a farm site.	2-4 weeks
3	Multiple-Farm	Multiple-Farm sites affected in a BMA.	4-8 weeks
4	Multi-Regional	Multiple farms in more than one BMA affected.	8+ weeks

The response to an event will be determined by the magnitude, the expected quantity of mortalities, and the cause. The cause of the event will be the primary decision factor in determining the response to the event. The following definitions are provided as a guide to determining the magnitude of expected losses due to an elevated mortality event. The approximate time to clean up will depend on the scale of the loss, time frames given are meant as a guide. Actual clean up time will depend on the resources mobilized to address the event.

The EMT will direct all activities in collaboration with the regulatory authorities. MCE will use

internal staff for environmental monitoring of Class 1 and 2 mortality events. MCE employs several qualified staff who will be responsible for working with the site staff to ensure fat/debris, should it occur, is immediately addressed before it leaves the site. Staff will also implement the Migratory Bird Response Plan if necessary.

In the event of a Class 3 or above event, external environmental monitoring agencies will be hired to monitor floating debris, effectiveness of clean up, address shoreline impacts should they occur, and participate in the Bird Response Plan.

All responses are undertaken in accordance with internal management processes, regulatory requirements, and the specific directions for the event.

Events at the Hatchery

The following operating procedures have been developed to manage incidents (abnormal mortality or associated with a reportable disease) at a land-based facility. The purpose is to contain the incident, dispose of mortalities, disinfect contaminated areas and equipment, complete reporting, and review of all management activities to improve incident management in the future efficiently and effectively.

Contingency Planning

- All permits are required to be in place for disposal of biological waste.
- Equipment, pump, and fish moving lines, are readily available to move the fish from the tank containing the mortalities to a dewatering table.
- Mortality holding containers available for the disposal of biological waste.

Mortality Removal and Disposal

- Mortalities are pumped from tank to a dewatering table.
- Live fish are removed and returned to clean water - original or an alternate tank.
- Sealed mortality tubs will be filled and stored at a central location for pickup.
- Tubs are transported by truck to New World Dairy for disposal or Gale’s Septic can pump mortalities from the tubs onto the hold truck to deliver to New World Dairy.

Ensilage at a Quarantined Site

If the site or part of the site is quarantined due to a reportable disease event, mortalities can be ensiled with the equipment in the same hot zone following all internal Standard Operating Procedures (SOPs).

- A “berm” will be created with sand around the ensiling area to contain material in the event of a spill.
- A large waterproof tarp will be placed on top of this to make this area waterproof.
- The ensiler will be placed on the flat area inside the sand “berms”.
- The ensiler will remain on site until Cleaning and Disinfection has occurred.
- A designated forklift will be placed inside the hot zone and will also remain there until quarantine has been lifted from the site.
- All equipment used will remain within the hot zone.

Decontamination

- After mortality removal is complete all equipment is cleaned and disinfected with a 1% J-12 solution (100ml and 9L water) and rinsed well to remove any residue
- A fish health staff member will test cleaned equipment with an ATP meter to ensure all equipment meets company standards (<500RLU).
- All tanks and mortality numbers are recorded.

Events at Saltwater Farms

Saltwater farms are not as fully contained as the hatchery culture systems. The processes developed for disposal of elevated number of mortalities, mortalities from a reportable disease or other event from farms aim to efficiently remove mortalities before they decompose, ensure all management measures are bio-secure so the cause of the event is not transmitted to other pens or the environment, and to meticulously disinfect the facilities and equipment used.

Advance Preparation

Equipment required for rapid removal of mortalities from saltwater farms includes the following.

- Air lift kits (four) – A portable air lift hose is connected to an air compressor and one end to the suction funnel to create a portable “air-lift” system. These will be tested annually and stored on pallets as complete kits capable of being moved where needed. Lifts consist of a hose, suction funnel, and dewatering box.
- Foover – mortality recovery system that improves response time and features a stainless-steel enclosed basket filled within the culture pen and closed prior to. A dedicated camera allows for management of the equipment and can identify any live fish that may get caught. (27) FOOVER – THE ROV MORTS RECOVERY SYSTEM | LinkedIn
- Air compressors and 1 m3 fish totes

- Containment Boom: Oil Containment Boom. Three hundred feet of 36’ round with 12” skirt, will be stored in Pools Cove and in Hermitage.
- Sweeper boom: A sweeper boom will be rigged to existing vessels to enable collection and retention of any fish oils that may escape the primary containment boom.
- Vacuum pumps for fish oils and debris.
- Vessels: MCE has vessels, seine or other type, that can participate in an elevated mortality event, approximately 20 in total.

Mortality Retrieval

The focus will be on fast response to enable quick removal of mortalities before they have a chance to spread disease to other sites or decompose and contribute to debris in the water.

- Portable Air Lift are part of normal mortality removal operations at MCE saltwater farms. This system will also be used for elevated mortality events.
- Mortalities will be retrieved via lift-up systems (on 140 m pens), Servi-Pump diverless mortality retrieval systems and airlift systems until seiners and well boats arrive.
- Mobilization of seiners and/or well boats for elevated mortality removal may take several days to a week depending on where they are located at the time of the event.
    - High volume removal will require seiners that can transport 40 mt to 170 mt material to the appropriate site for disposal.
    - Once a seiner is in place, the net will be shallowed, and the vessel pump utilized.
- The smolt transport vessel InterAtlantic can also be used as the primary volume remover.
    - The vacuum hose is secured to the bottom of the pen and mortalities drawn up through the hose across a dewatering table and directly into the vessel hold.
- Once capacity is reached, a top-side cleaning and disinfection is required before the vessel leaves the site.
- Divers will be used to remove mortality as a last resort.
- Should mortality retrieval extend beyond a Class 1 or 2 event, the Migratory Birds Response Plan will be initiated in conjunction with the Mass Mortality Contingency Plan.

Mortality Disposal

This Fish Disposal Plan includes all options available for mortality disposal. The planned mortality disposal is to ensile mortalities and transport silage to New World Dairy and/or send mortalities to the Burgeo rendering plant owned by the Barry Group. The capacity between the two options would accommodate a multiple site mortality event.

Ensiling procedures include the following.

- Mortalities in tubs are stored at the wharf in a separate area away from other activities prior to being transported for ensiling or composting.
- No material other than mortalities (i.e., kelp, plastic wrap, mussel, or other shells) are to be mixed with mortalities that are destined to be ensiled.
- All mort totes or boxes are thoroughly cleaned and disinfected before being returned to the site.
- Avoid transporting mortalities from one BMA to another. If mortalities must be moved, they should only move from a younger year class BMA to an older year class BMA, not vice versa.
- Mortalities are not moved from one site to another.

Trucking

- Every effort is made to avoid transporting mortalities from one BMA to another.
- Under no circumstance will mortalities be moved from one site/building to another collection area for disposal.
- A third-party transport truck will transport totes to disposal site.
- Trucks and totes will be cleaned and disinfected prior to returning to the wharf.

Follow-up and Decontamination

MCE is committed to managing the mortality event until every fish is disposed of and all reports are complete. MCE will decontaminate and disinfect all the wharves, company vessels, containers, and all other equipment used in the collection, removal, and transport of mortalities. All disinfectants conform to industry and relevant environmental standards. The choice of disinfectant will depend on weather conditions and the disease in the case of a reportable disease event.

Records and Reporting

Detailed records, including number of tubs removed, start/stop times, vessel, dive company, divers etc., will be maintained on site and submitted to the EMT by site management for reporting as per the Mass Mortality Contingency Plan.

External Reporting

MCE meets or exceeds all reporting requirements as determined by the Government of Newfoundland and Labrador. Please refer to section 4.3p Regulatory, Incident Management, and Public Reporting for full reporting requirements.

Internal MCE Reporting

Internal company reporting provides data to identify the cause of event to reduce the likelihood of the event recurring and to evaluate how the event was managed to improve future responses.

- *Tanks*: mortality exceeding **1%/day** is reportable to Fish Health staff and warrants a discussion.
- *Fish groups:* (such as a smolt group, a system of tanks, or a brood year class): mortality exceeding **1%/day** is reportable to Fish Health staff and warrants a discussion, which may be followed up by a visit at the Fish Health Director's discretion.
- *Hatchery*: mortality exceeding **1%/day** and/or elevated mortality events are reportable to Fish Health, Freshwater Production Director, and Sustainability Department within 24 hours.
- *Sudden changes in mortality numbers or classifications*: report to Fish Health staff and Freshwater Production Director.
- *Close calls of mortality or of support system failure*: report to Freshwater Production Director and Sustainability Department within 24 hours.

Disposal Sites

A list of waste management service providers is found in section 4.3i Waste Management Normal Operations. The list of companies who have the capacity and are licensed to accept mortalities is kept up to date and arrangements for disposal are discussed in advance.

Elevated mortalities will be disposed of at two locations depending on the scale of the event.

- Class 1 events can be managed via disposal at the New World Dairy (NWD) anerobic digestor.
- Higher scale events may also use NWD, especially in the early stage of removal when lift up pumps are used. NWD can accommodate 120 mt of material per week and has a Certificate of Approval from the Department of Environment and Climate Change to accept waste from aquaculture facilities.
- Barry Group rendering facility in Burgeo can accept up to 150 mt of material per day.

6d Farmed and Wild Atlantic Salmon Interactions Management

Guidelines: This should include identification of scheduled and non-scheduled Atlantic salmon bearing rivers near sea cages;

- *mitigations to prevent the potential transfer of pathogens between farmed and wild Atlantic salmon;*
- *potential ecological effects of interactions between escaped fish and wild salmon populations and mitigating activities; and*
- *measures that will be undertaken to support Fisheries and Oceans Canada efforts to monitor nearby rivers for escaped farmed salmon and signs of genetic introgression.*

Mowi Canada East Inc. (MCE) strives to sustainably produce healthy, nutritious, and affordable salmon. A healthy environment is essential, and MCE has a responsibility to grow salmon in a way that supports a healthy aquatic environment. Rearing practices are Stewardship of the environment is essential to achieve these goals and includes identifying and reducing risks to wild salmon.

Unless otherwise indicated, the information contained in this section pertains to the rearing of salmon at all MCE saltwater farms in the Province of Newfoundland and Labrador.

Mowi has an integrated sustainability strategy aligned with the United Nation's Sustainable Development Goals (SDGs). In this strategy, long-term goals have been established for all guiding principles. MCE has operating procedures that incorporate the strategy principles into all salmon rearing activities.

All MCE salmon harvested from the province are Best Aquaculture Practices (BAP) certified. BAP is a Global Seafood Sustainability Initiative (GSSI) recognized standard designed to reduce the impact of aquaculture on the environment and increase production efficacy through science and research. BAP standards provide the framework for ecological sustainability. Independent audits of each production site ensure MCE is doing everything they can to be ecologically sustainable. The four BAP pillars of sustainability are **environmental responsibility,** social responsibility, animal welfare, and food safety and traceability.

It is recognized that interactions between wild and farmed salmon can have unwanted negative effects. MCE has developed rigorous management processes and operating procedures that focus on reducing the potential for interaction. These procedures are developed using a wholistic approach and include knowledge of the environment; local salmon populations and

their life cycle; culture infrastructure reliability; and bio-secure culture practices.

This section provides information on the following topics.

- Identification of scheduled and non-scheduled salmon rivers
- Potential causes for decline in wild salmon populations.
- Measures that MCE uses to mitigate potential effects from ecological interactions between wild and farmed salmon.
- Measures undertaken to support Fisheries and Oceans Canada efforts to monitor nearby rivers for escaped farmed salmon and signs of genetic introgression.

While Mowi and MCE are pro-active in supporting the integrity of the aquatic environment through improved fish culture practices, they rely on research institutes to conduct the scientific investigations to provide peer reviewed data and regulatory agencies to determine when the body of science-based evidence supports new regulatory requirements.

Therefore, the potential ecological effects of interactions between escaped fish and wild salmon populations discussed in this section have been sourced from peer reviewed science publications and the list of these publications is provided at the end of the section.

Please refer to the following sections for information on escape management, site-specific farm design, and mitigation measures that manage the potential for disease transfer and impacts on the benthic environment.

- Section 4.3m Fish Containment Saltwater Farms
- Section 4.3n Recapture of Escaped Farmed Salmon
- Section 6b Mitigation Strategies to Limit Potential Pathogen Transmission
- Section 6e Protection of Wild Species and Benthic Habitat at Saltwater Farms

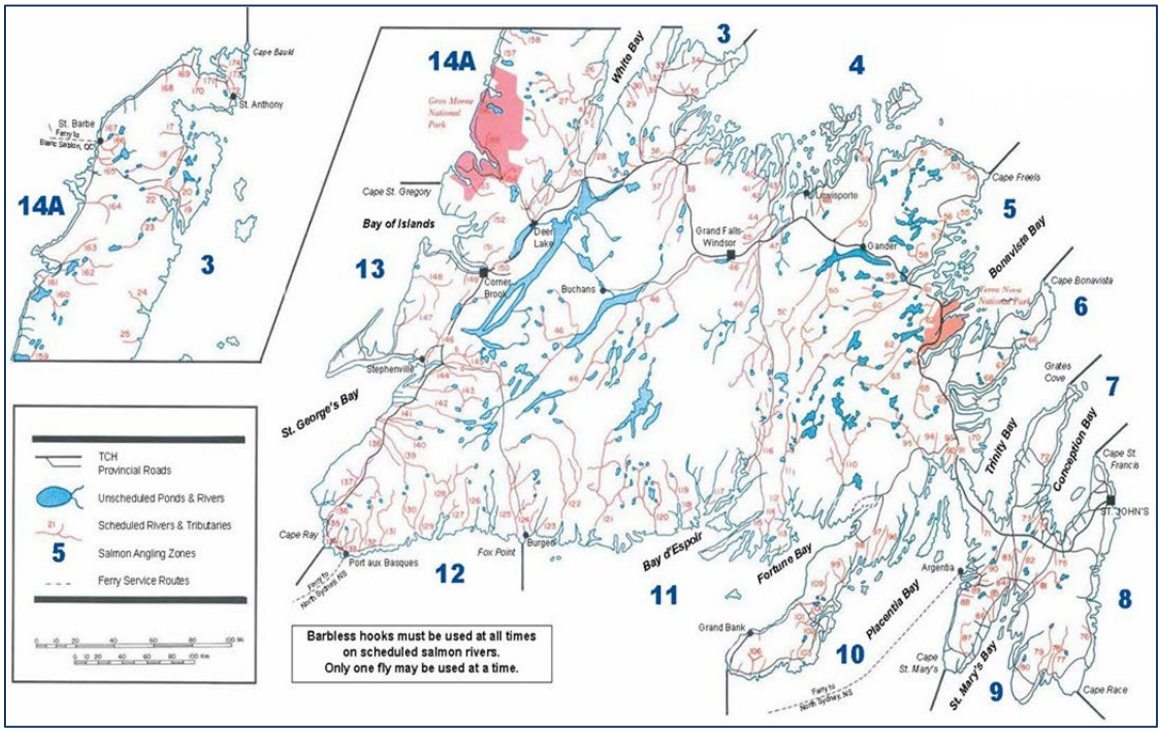
Atlantic Salmon Rivers

The latest publication of Province of Newfoundland and Labrador scheduled rivers by Department of Fisheries and Oceans indicates there are eight scheduled salmon rivers in the Bay Management Areas (BMAs) where MCE saltwater farms to receive Hatchery Expansion smolt are located, see Table 76 and Figure 51.

Table 76 Scheduled and Non-scheduled Salmon Rivers in the BMAs with MCE Farms

BMA	Salmon Rivers
BMA 1 Mal Bay	None
BMA 2 Rencontre East	None
BMA 3 Fortune Bay West	Simmons Brook, Bay du Nord, Southwest Brook
BMA 4 Great Bay de L'eau	Old Bay River, Taylor Bay, Salmonier Cove (unscheduled)
BMA 5 Harbour Breton Bay	None
BMA 10 Facheux Bay	Allen's Cove Brook, Bottom Brook
BMA 11 Hare Bay	Hare Bay Rivers
BMA 12 Rencontre West	None
BMA 13 Chaleur Bay	None

Figure 51 Province of Newfoundland and Labrador Scheduled Salmon Rivers



According to the Salmon Atlas [The Atlantic Salmon Rivers of Newfoundland, Canada - The Salmon Atlas] and personal communication with area residents, three non-scheduled salmon rivers are located in the BMAs with MCE saltwater farms.

- BMA 3 Fortune Bay East – Salmonier Cove River to Salmonier Pond (personal communication)
- BMA 11 Hare Bay – Morgan Creek and Dollard Brooke

Please note: There are two scheduled salmon rivers in BMA 11, indicated as Hare Bay Brooks #120. It has not been confirmed but they may actually be Morgan Creek and Dollard Brooke.

Decline in Wild Atlantic Salmon Population

The numbers of wild Atlantic salmon have declined globally and in the Province of Newfoundland and Labrador. A literature search produced the following causes for decline, however the relevance of any one factor is not determined.

- Low marine survival
- Illegal fishing
- Mixed stock fishing and fishing by-catch
- Changes to marine ecosystem
- Climate Change
- Competition for food
- Habitat loss
- Ecological interactions with farmed salmon
- Genetic interactions with farmed salmon

> *The greatest threat to the recovery of the South Atlantic salmon population is continued low marine survival. Factors influencing marine survival may include illegal fisheries, mixed-stock marine fisheries and by-catch, ecological and genetic interactions with escaped domestic Atlantic salmon, and changes in marine ecosystems. The degree of influence of each factor is unknown.*

From DFO. 2013. Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (Salmo salar) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007.

> *Marine survival is considered a major factor limiting the abundance of Atlantic Salmon in Newfoundland and Labrador, with adult returns in any given year determined primarily by marine survival rather than smolt production.*

From DFO. 2022. Stock Assessment of Newfoundland and Labrador Atlantic Salmon in 2020. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/031.

While there is agreement that the numbers of wild Atlantic salmon are in decline, there is uncertainty on the contributing factors and their relative importance.

- In Dadswell et all. 2022 in *The Decline and Impending Collapse of the Atlantic Salmon Populations in the North Atlantic Ocean* states that adult returns to river and hatchery stocks

with no local impacts have declined or collapsed since 1985. It goes on to say that studies suggest the low rate of return may be caused by factors such as climate change, salmon farming, food availability at sea, or marine predators but this is unsupported by the evidence of stocks which persist at near historic levels, loss of stocks from remote farm sites, a diverse marine prey field, and scarcity of offshore predators.

- In Gibson 2017 in *Salient Need for Conservation of Atlantic Salmon*, habitat degradation is seen as a primary cause and should be a primary factor for conservation and restoration.

Concerns over the potential impacts of aquaculture on local populations of wild salmon include escaped farmed salmon interbreeding with wild salmon and a loss of fitness of wild stock, competition for food and space, disruption of wild stock breeding behaviour, and transmission of disease and parasites.

While none of the studies reviewed implies that fish farming is the major contributing factor to Atlantic salmon decline, Mowi and MCE remain committed to having no farmed salmon escape to interact with wild salmon and are continually improving infrastructure and fish culture practices to reduce environmental affects in general and wild-farmed salmon interactions specifically.

The uncertainty in the contributing factors will eventually be resolved through science-based research and to that end, both Mowi and MCE are committed to supporting development of innovative salmon farming techniques as well as projects by other salmon farming companies, industry and fisheries associations, regulatory agencies, and researchers to improve our understanding of the issues and solutions.

Hybridization and Genetic Introgression

Recent genetic studies have documented hybridization between wild salmon and escaped farmed salmon in the Province of Newfoundland and Labrador. Farmed salmon interbreeding with wild salmon creates hybrids with potentially undesirable genetic traits. There is also the possibility that escaped farmed salmon might out compete salmon for food and habitat.

> … "*lipid and fatty acid profiles in juvenile salmon can change over just a short period of time even under favourable conditions in the wild and farmed fish may have genetic differences affecting energy acquisition and storage that could negatively impact their survival and fitness in the long term*."

Crowley et al. 2021. Differences in energy acquisition and storage of farm, wild, and hybrid Atlantic salmon competing in the wild. Can. J. Fish. Aquat. Sci. 80: 43–56 (2023) | dx.doi.org/10.1139/cjfas-2021-0326.

MCE has a no escapes policy. Keeping all fish contained within the farming structures is a priority for all operations.

> *"… evidence of European introgression into North American aquaculture salmon has accumulated in recent decades, even though the use of diploid European salmon has never been approved in Canada. The full extent of such introgression as well as the potential impacts on wild salmon in the Northwest Atlantic remains uncertain."*
>
> Bradbury et al. 2022 Genomic evidence of recent European introgression into North American farmed and wild Atlantic salmon. Evolutionary Applications. 2022; 15:1436–1448.

The only salmon Fisheries and Oceans Canada has approved for aquaculture use in the province is the Saint John River stock. DFO manages the species/stock of salmon cultured through the National Code of Introductions and Transfers of Organisms that requires permits for all fish movement within the province and between the Canadian maritime provinces in order to reduce potential effects of introducing a non-native species.

MCE only uses Fisheries and Oceans Canada approved Saint John River stock.

Measures to Reduce Risk

Mowi and MCE have established practices to reduce the risks to wild salmon from their farming operations. Table 77 and Table 78 provide current practices employed by MCE in the Province of Newfoundland and Labrador to reduce wild-farmed salmon interactions and to limit potential for concerns. Please refer to section 6e Protection of Wild Species and Benthic Habitat at Saltwater Farms for measures that reduce habitat change concerns.

Table 77 Wild Salmon Population Decline Factors and MCE Mitigation Measures

Population Decline Factors[1]	MCE Mitigation Measures
Low marine survival	Avoid changes to marine ecosystem Reduce potential for interactions between wild and farmed salmon Reduce potential for genetic interactions between wild and farmed salmon
Illegal fishing	Report illegal fishing, as per directions from Fisheries and Oceans Canada
Mixed stock fishing, by-catch	None
Freshwater habitat loss	Avoid changes to marine ecosystem
Competition for food	Avoid changes to marine ecosystem Reduce potential for interactions between wild and farmed salmon Reduce potential for genetic interactions between wild and farmed salmon

[1] From DFO 2013, Dadswell et al 2022, Gibson 2017, Bradbury 2022, Crowley et al 2021

Table 78 MCE Mitigation Measures in Detail

Avoid changes to marine ecosystem
Organic Deposition Management 1. Fish fed only to satiation only with feeding stopped when this point is reached, volume to feed is calculated in advance based on pen biomass 2. In-pen cameras determine when fish are no longer feeding and pellet distribution stops 3. Calculation of feed conversion ratio (FCR) confirms extra feed is not being provided 4. Farms only located where modelling has shown currents, bathymetry, water temperature etc. will widely disperse uneaten feed and fish wastes and not build up below the farm 5. See section 6e for additional deposition management
Micro- and Nano-plastics Use Reduction 1. Management practices and fish culture SOPs developed to meet Mowi Sustainability Strategy with following targets In 2023, all major plastic farming equipment (nets, ropes, pen collars) are either reused or stockpiled for recycling. By 2025, 100% of plastic packaging will be reusable, recyclable, or compostable. By 2025, at least 25% of plastic packaging will come from recycled plastic content. 2. Support global and local research projects for recycling and re-purposing of plastics.

Ecological interactions between wild and farmed salmon
Escape Reduction 1. No Escapes Policy - management plans and operational practices developed to this goal 2. Generational nets and in situ net cleaning eliminate transfer of fish from one pen to another 3. All fish handling practices meet or exceed Code of Containment 4. Escape prevention, recapture and reporting management plans revised annually and approved by FFA 5. See section 4.3n for detailed description of escape management
Infrastructure and Design Standards 1. Provincial Code of Containment 3rd party engineer certification ensures all infrastructure is designed for longevity and not break up in adverse environmental conditions. 2. Farm layout designed to protect farms from wind, storms, wave action etc. 3. Annual infrastructure audit and reporting, regular inspection and testing of all equipment 4. Scheduled net inspection, testing, inventory. 5. As of May '23, all MCE farms have extra strength HDPE netting. 6. See section 4.3m for containment methods.
Farm Siting 1. New farms located away from known wild salmon rivers. 2. Farms not located above sensitive habitat. 3. Farms only located where modelling shows currents, bathymetry, water temperature etc. will disperse uneaten feed and fish wastes and not cause habitat loss. 4. Farm Baseline Habitat Survey and annual surveys during production are used determine any habitat change and requirement for change in procedures. 5. FFA Bay Management Area principles limit number of farms in one area.
Ecological interactions between wild and farmed salmon
Reduction of Disease in Farmed Salmon 1. Comprehensive Fish Health Management Plan and Integrated Pest Management Plan reduce opportunities for disease in farmed fish, plans revised annually and approved by FFA. 2. Reporting all events with diseases of concern and all use of anti-microbial substances
FFA Bay Management Strategy 1. Bay Management Area principles and Aquaculture Policies dictate minimal distance between farms 2. Limiting number of farms in one area reduces potential for transmission between farms and potential for disease increase in an area
Research and Innovation 1. Cleaner fish being tested to determine potential use for sealice management 2. Innovative pest management treatments are being tested to improve efficacy and increase treatment options to avoid potential resistance.

Genetic interactions between wild and farmed salmon
Escape Reduction 1. No Escapes Policy - management plans and operational practices developed to this goal 2. Generational nets and *in situ* net cleaning keep fish in the same pen for full culture to harvest 3. All fish handling practices meet or exceed provincial Code of Containment 4. Escape prevention, recapture and reporting management plans are revised annually and approved by FFA. 5. See section 4.3n for detailed description of escape management.
Local Approved Genetic Stock (Broodstock) Only 1. MCE uses only the DFO approved Saint John River stock for broodstock.
Research 1. Support provided for research on genetic introgression to further define the issues and the causes in order to develop effective mitigations. 2. Collaboration with other farmers in the province to develop tools for Salmon Escape Monitoring and Traceability.

Managing Escapes

Today the reasons for farmed salmon escapes are better understood and as a result there are very few escape events. For Mowi and MCE, escape incidents rarely occur during a production cycle. The company has a target of zero escapes.

Escapes have the potential for ecological interactions and interbreeding with wild populations and they represent a financial loss. For these reasons, strict measures are in place to reduce the likelihood of fish escaping.

- Farm design and installation according to Code of Containment and Aquaculture Policies ensure the integrity of infrastructure even during the most challenging weather and reduce opportunity for fish to escape.
- Prevention of human errors through training including the identification of high-risk activities such as fish transfers and having detailed SOPs to reduce opportunities where human inattention or lack of skill can cause a situation where salmon can escape.
- Technological innovations that increase the robustness of farming equipment and reduce the need for fish to be moved around the farm, such as in situ net cleaning.
- Collaboration with wild fisheries associations and regulatory agencies on genetic introgression studies to better understand current levels of hybridization and determine impacts on wild populations, such as the Traceability Working Group and private projects with the Miawpukek First Nation.

Please refer to section 6b Mitigation Strategies to Limit Potential Pathogen Transmission for additional information on escape prevention and management.

Bio-diversity Projects

MCE supports the following research projects that provide science-based data that expands our knowledge on the interactions between wild and farmed salmon.

- In the Province of Newfoundland and Labrador, MCE is currently partnering with Fisheries and Oceans Canada (DFO) in a project entitled 'Validation of spatial benthic footprint predictions with monitoring of organic deposition'. This research will evaluate methods currently used for benthic assessment and is occurring in the Bays West region.
- Another DFO project collaboration in the province is entitled "Distribution and recapture success of farmed Atlantic salmon after experimental release from sea pens, and migration, residency time and survival of wild Atlantic salmon smolt from an adjacent river". MCE's provided sites and farmed fish for the study and enabled acoustic devices placed on mooring lines at various sites in Fortune Bay.
- MCE is also collaborating with DFO on the Aquaculture Monitoring and Modelling Program (AMMP) to assess aquaculture impacts in the far-field environment. The work is being carried out in Fortune Bay. MCE has helped via access to sites and assistance with deployment and retrieval of current meters.
- While not directly related to wild and farmed interactions, a project with Memorial University is developing important environmental management tools - effective eDNA tools for environmental monitoring at salmon aquaculture sites in Atlantic Canada. The project has completed the initial "proof of concept" and is exploring opportunities to continue to validate procedures through future projects.
- In New Brunswick, MCE participated in Fisheries and Oceans Canada (DFO) research related to tracking of wild smolt migrations into sea water "Migration of juvenile salmon and their interactions with aquaculture in Passamaquoddy Bay". The company provided access to and assistance with the placement and retrieval of acoustic sensors to track smolt movement.

Global Bio-diversity Projects

MCE is committed to salmon farming in the province and that includes supporting science-based research globally and developing industry tools to reduce the risks associated with wild-farmed salmon interactions. This is in line with Mowi's commitment globally. Many projects and significant Mowi support and/or collaboration further our knowledge on wild and farmed salmon interactions.

- In 2022 Mowi had 30 projects aimed at understanding and minimizing the company farms' potential impact on biodiversity.

- In Norway, projects include tracking nutrient levels and macroalgae patterns, migration patterns of wild trout and salmon smolts, investigation of sea lice infestation and dispersal on sea trout and research into migration of wild salmon from native river system and new technologies for collecting organic waste for re-use.
- In the Faroe Islands, continued collaboration with other fish farmers to develop a new biodiversity index and classification system of macrofauna plus two projects to better understand wild juvenile sea trout migrations and salmon louse populations around the salmon farms.
- In Ireland, a project to research the genetic and population ecology of wild wrasse continues with data to be used in the development of a sustainable fisheries management plan for wild caught cleanerfish, and a project for forecasting harmful jellyfish blooms and biofouling.
- In Chile, Mowi is part of an ongoing project to assess the risk of establishment of Atlantic salmon in Chile.
- In Scotland, several projects are ongoing to develop and validate eDNA tools for benthic monitoring, develop improved solutions for analyzing and monitoring hard seabeds, improved management sea lice dispersion models and interaction between wild and farmed fish, multi-trophic culture of salmon and shellfish, and the use of sea cucumbers as a seabed bioremediation tool.
- Also in Scotland, support is provided for Atlantic salmon enhancement long-term projects to restore self-sustaining wild Atlantic salmon populations, monitoring of juvenile populations in local rivers and a comprehensive multi-year wild fish monitoring study across 110 rivers in partnership with Fisheries Management Scotland.

Fisheries and Oceans Canada Monitoring Program

MCE supports the Department of Fisheries and Oceans Canada efforts to monitor nearby rivers for escaped farmed salmon and research into genetic introgression.

Traceability Working Group

MCE is an active partner in the Newfoundland Aquaculture Salmon Escape Traceability Working Group. The main objective of the Working Group is to facilitate a forum for the discussion and create an escaped farmed salmon traceability program which can be implemented by federal Fisheries and Oceans Canada, provincial Department of Fisheries, Forestry and Agriculture and the provincial aquaculture industry.

The following issues may be addressed.

- Positive identification of a farmed salmon vs wild salmon.

- Identification of potential tools to be considered for identifying and tracing back to origin of farmed salmon.
- Identify and review current science or scientific gaps related to escaped farmed salmon identification.

The Working Group activities include the following.

- Advise and provide recommendations to the Newfoundland Aquaculture Salmon Escape Monitoring and Traceability Oversight Committee with respect to the various tools available to trace escaped farmed salmon to their origin.
- Identify the current science available and the scientific knowledge gaps present for the identification of the origin of escaped farmed salmon.
- Facilitate an ongoing mechanism for consulting with experts and industry on the traceability of escaped farmed salmon and what is achievable in the short term and the long term.

Outcomes from this work will include recommendations regarding relevant scientific basis of escaped aquaculture fish tracing to origin within the Province of Newfoundland and Labrador. The purpose is to increase industry and public confidence that traceability is based on relevant scientific evidence and improve findings to address research gaps.

Newfoundland Aquaculture Salmon Escape Monitoring and Traceability Oversight Committee

The main objective of this committee is to create an escaped farmed salmon monitoring and traceability program to be implemented by DFO and the provincial salmon aquaculture industry to address the following issues.

- Tracking of escaped farm salmon.
- The positive identification of a farmed salmon vs wild salmon.
- Identification of potential tools to be considered for tracking and identifying farmed salmon.
- Identification and review of current science or scientific gaps related to salmon identification.

The outcomes are as follows.

- Advise and provide recommendations to the Minister of Fisheries and Oceans Canada on the creation, implementation, and management of an escaped farmed monitoring and traceability program.
- Advise and provide recommendations to the Minister of Fisheries and Oceans Canada with respect to the various tools available to identify detected salmon as farmed vs wild.
- Address direct issues or questions from the Minister, through stakeholders or Department staff, relating to the science of identifying farmed salmon on an ongoing basis.
- Identify relevant issues for discussion relating to general policy supporting scientific aspects of identifying farmed salmon.

Publications Used in This Section

Bradbury, I.R., Lehnert, S.J., Kess, T., Van Wyngaarden, M., Duffy, S., Messmer, A.M., Wringe, B., Karoliussen, S., Dempson, J., Fleming, I.A., Solberg, M.F., Glover, K.A., Bentzen, P. (2022) Genomic evidence of recent European introgression into North American farmed and wild Atlantic salmon. Evolutionary Applications. 2022; 15:1436–1448.

Crowley et al. (2021) Differences in energy acquisition and storage of farm, wild, and hybrid Atlantic salmon competing in the wild. Can. J. Fish. Aquat. Sci. 80: 43–56 (2023) | dx.doi.org/10.1139/cjfas-2021-0326.

Dadswell, M., Spares, A., Reader, J., McLean, M., McDermott, T., Samways, K., Lilly, J. (2022) The Decline and Impending Collapse of the Atlantic Salmon (*Salmo salar*) Population in the North Atlantic Ocean: A Review of Possible Causes. Rev. Fish. Sci. Aquac. 30, 215–258. https://doi.org/10.1080/23308249.2021.1937044

Fisheries and Oceans Canada. (2013). Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007.

Fisheries and Oceans Canada. (2022) Stock Assessment of Newfoundland and Labrador Atlantic Salmon in 2020. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/031.

Gibson, R.J. (2017) Salient Needs for Conservation of Atlantic Salmon. Fisheries 42, 163–174. https://doi.org/10.1080/03632415.2016.1276331

Mowi ASA Sustainability Strategy. Leading the Blue Revolution. 2019. The-Leading-the-Blue-Revolution-Plan.pdf (mowi.com)

Pardo, S.A., Bolstad, G.H., Dempson, J.B., April, J., Jones, R.A., Raab, D. Hutchings, J.A. (2021) Trends in Marine Survival of Atlantic salmon populations in eastern Canada. ICES J.Mar.Sci. 78, 2460-2473. https://doi.org/10.3354/fsab118.

Renkawitz, M.D., Sheehan, T.F., Dixon, H.J., Nygaard, R. (2015) Changing trophic structure and energy dynamics in the Northwest Atlantic: Implications for Atlantic salmon feeding at West Greenland. Mar. Ecol. Prog. Ser. 538, 197–211. https://doi.org/10.3354/meps11470

Russell, I.C., Aprahamian, M.W., Barry, J., Davidson, I.C., Fiske, P., Ibbotson, A.T., Kennedy, R.J., Maclean, J.C., Moore, A., Otero, J., Potter, T.E.C.E., Todd, C.D. (2012) Marine Survival. ICES J. Mar. Sci. 69, 1563–1573.

Soto, D.X., Trueman, C.N., Samways, K.M., Dadswell, M.J., Cunjak, R.A. (2018) Ocean warming cannot explain synchronous declines in North American Atlantic salmon populations. Mar. Ecol. Prog. Ser. 601, 203–213. https://doi.org/10.3354/meps12674

Verspoor, E., McGinnity, P., Bradbury, I., and Glebe, B. (2015) The potential direct and indirect genetic consequences for native Newfoundland Atlantic Salmon from interbreeding with European-origin farm escapes. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/030.

Westley, P.A.H., Ings, D.W., Fleming, I.A. (2011) A review and annotated bibliography of the impacts of invasive brown trout (Salmo trutta) on native salmonids, with an emphasis on Newfoundland waters Canadian Technical Report of Fisheries and Aquatic Sciences 2924 I+. Fisheries and Oceans Peches et Oceans Canada. III Canada.

6e Protection of Wild Species and Benthic Habitat at Saltwater Farms

Guidelines: Identify methods to protect fish and fish habitat beneath sea cage sites from the effects of deposits due to feed and fecal matter. Identify regulatory thresholds of benthic biochemical oxygen demand and proposed mitigations if thresholds are exceeded.

The following policies from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, ensure that MCE is protecting the benthic environment and wild species present beneath the salmon culture pens. Specific regulatory references are also included in the information provided in this section.

Table 79 Aquaculture Policies that Pertain to Section 6e

AP #	AP Title	Description
AP 7	Annual Reporting	Licensees are required to provide the following information on an annual basis for each licensed site: Net Cleaning and Disinfection Report
AP 16	Feedbag Handling	Licensees are required to ensure all feed bags are secured in such a way as to prevent loss at sea immediately after being emptied of feed.
AP 23	Fish Disposal	All farms will have a Fish Disposal Plan, outlined in a Waste Management Plan.
AP 26	Site Separation	Aquaculture licence applications (commercial and non-commercial) are reviewed to ensure that proposed sites meet the minimum site separation distances approved by the department.
AP 27	Site Fallowing	All finfish sites must be fallowed after each production cycle or when all cultured fish are removed from the site for any other purpose. The length of the fallow period will be in accordance with the minimum period specified by Bay Management Area principles

Marine finfish aquaculture has the potential to have an impact on the marine environment, including changes to fish habitat in the immediate vicinity of the farm. The extent of the impact is determined by the nature of the receiving environment and the farming practices, including the size of the farm.

In 2015, the Aquaculture Activities Regulations (AAR) was developed to enhance management of the effects of marine finfish aquaculture on the environment. This comprehensive set of regulations requires extensive surveys of potential sites and depositional modelling to determine

the potential impact of a future farm on the immediate environment.

This data is used to determine if an aquaculture licence will be approved and if the licence is approved it serves as the baseline, or original representation, of site prior to salmon farming. This baseline is used to compare with subsequent surveys conducted when the farm is in production.

Farming practices and site characteristics all factor into whether a site is appropriate for salmon farming. The volume of organic matter and the timing of deposition is largely controlled by farming practices. The dispersal of organic matter away from the farm is dependent on specific site environmental conditions such as the depth below the farm, water temperature, current velocity etc.

Organic matter, such as fish waste, uneaten fish feed and biofouling, falls through the net pen to settle on the seafloor. Oxygen in the benthic sediment breaks down the organic matter. If the deposition accumulates to the point where the oxygen demand exceeds supply, sediments become anoxic changing the nature of the substrate and the organisms present.

This section addresses how fish and fish habitat beneath the fish culture pens are protected from the effects of deposits and includes the following.

- Regulatory biochemical oxygen demand thresholds that determine when a negative impact might occur.
- Assessment of the immediate marine environment and sensitivity to organic matter deposition.
- Procedures and methods that specifically target benthic deposition reduction.

Unless otherwise indicated, the information in this section pertains to the rearing of salmon at all MCE saltwater farms in the Province of Newfoundland and Labrador.

Benthic Deposition Modelling and Monitoring

In the Province of Newfoundland and Labrador, aquaculture sites are predominantly hard bottomed. The hard bottom and deep-water make taking samples of deposits in the province challenging. For this reason, a remotely operated vehicle (ROV) is sent down to do a visual scan of the seafloor and provide a visual check on the status of the benthic environment and the species that inhabit the area.

- All areas within the footprint of the farm site are checked to make sure there is no buildup of deposits, such as faeces, and that there are no uneaten pellets of feed.
- ROV surveys are conducted regularly, and the survey and analysis methods and schedule conform to the standards of the AAR.

Prior to an aquaculture licence being granted, depositional modelling of the proposed site must show how particles will be dispersed at peak feeding rate and not to exceed the BOD threshold.

If regular surveys during operations organic matter is seen on the sea floor, adjustments to rearing procedures will be made to prevent this in the future. It is not in MCE's interest to have expensive uneaten feed pellets on the seafloor. Also, if BOD thresholds are exceeded, the farm may not be able to begin a new production cycle until a subsequent survey demonstrates benthic indicators are lower – another reason that benthic deposition is carefully managed. All modelling and monitoring are done in accordance with the AAR monitoring standards.

In addition to the benthic surveys, a Drug and Pesticide Deposit Report is submitted yearly according to AAR regulations.

Regulatory Benthic Biochemical Oxygen Demand Thresholds

The Aquaculture Activities Regulations (AAR) were registered on June 29, 2015, by DFO to address sections 35(3) and 36(5.2) of the *Fisheries Act*. The following sections of the AAR provide the BOD thresholds and notification requirements.

- **10 (1)** In the case of an aquaculture facility that is located over a soft bottom and cultivates finfish in tidal waters in or adjacent to Quebec, Nova Scotia, New Brunswick, British Columbia, Prince Edward Island or Newfoundland and Labrador, the owner or operator of the facility
    - **(b)** must take additional samples of the benthic substrate, in the manner and at the times and locations specified in the Monitoring Standard, if
        - **(i)** in the case of a facility located in tidal waters in or adjacent to Quebec, Nova Scotia, New Brunswick, Prince Edward Island or Newfoundland and Labrador, the mean concentration of free sulfide as calculated at the locations specified in the Monitoring Standard exceeds 3000 µM, and
    - **(c)** must not restock the facility if the concentrations of free sulfide exceed the applicable concentration limits set out in paragraph (b).
- **11 (1)** This section applies to aquaculture facilities that cultivate finfish in the waters referred to in subsection 10(1) but
    - **(a)** are not located over a soft bottom; or
    - **(b)** are located over a soft bottom in respect of which subsection 10(2) applies.

Monitoring and restocking

(2) The owner or operator of a facility referred to in subsection (1)

- **(a)** must conduct visual monitoring of the benthic substrate in the manner and at the times and locations specified in the Monitoring Standard.
- **(b)** must not, if the facility is located in tidal waters in or adjacent to Quebec, Nova Scotia, New Brunswick, Prince Edward Island or Newfoundland and Labrador,

restock the facility if the visual monitoring shows the presence of Beggiatoa species or similar bacteria, marine worms or barren substrate in more than 70% of the locations specified in the Monitoring Standard; and

Notification of Minister

- **12 (1)** The owner or operator of an aquaculture facility that cultivates finfish that is located in tidal waters in or adjacent to Quebec, Nova Scotia, New Brunswick, Prince Edward Island or Newfoundland and Labrador must notify the Minister if the following occurs:
    - **(a)** the concentration limits set out in subparagraph 10(1)(b)(i) are exceeded; or
    - **(b)** Beggiatoa species or similar bacteria, marine worms or barren substrate are present to the extent referred to in paragraph 11(2)(b).

Aquaculture Activities Regulations (justice.gc.ca)

Assessment of Immediate Marine Environment

Locating a salmon farm where the natural characteristics reduce the likelihood of a build-up of organic matter is a key strategy in protecting fish and fish habitat. The collection of relevant site data includes sediment type, current flow, site bathymetry, and depth below culture pens.

Outputs from comprehensive environmental surveys and modelling, completed before a licence is granted, are used to evaluate the site for suitability for salmon culture, to determine the environmental baseline to which regular assessments during farming are compared, and to design the farm to avoid organic deposition on the bottom.

Pre-farming Site Evaluations

1) completing a comprehensive survey of the site prior to farming to determine original state of the environment and suitability for salmon farming

2) modelling of depositions using site specific current, bathymetry, maximum fish culture density and feed rate and culture equipment

3) providing the survey data to DFO and FFA for an independent review of suitability of the benthic environment

Farm Baseline Report

The provincial Department of Fisheries, Forestry and Agriculture (FFA) is committed to sustainable development of the salmon farming industry and requires that significant data about the site and farming practices must be provided before an aquaculture license is approved. The site data includes detailed data on water temperatures, current velocity and directions, bathymetry and species present. Data analysis includes depositional modelling at peak biomass

and peak feeding rate. This information is included in the license application as the Baseline Environmental Assessment Report (baseline report).

The baseline report is one component of the aquaculture licence application and is prepared specifically for Fisheries and Oceans Canada (DFO) to evaluate the suitability of the site in relation to maintaining the natural environment.

Independent contractors with 10+ years of experience in oceanographic data collection for aquaculture are hired to collect high quality current data representative of the site for the purpose of depositional modelling.

The baseline report must include the following.

- The input parameters of the depositional model used.
- Unedited recorded images
- Observations recorded from the underwater survey(s)
- Map with the locations of transects and habitat information generated during these transects at an appropriate resolution (i.e., 1:5000 or finer); the bathymetry of the seabed at a resolution of 10 m contours; and the estimated footprint of deposition of BOD matter in 1, 5, and 10 grams of carbon per square metre per day (g C/m2/day) contours.

According to the AAR, the baseline survey will include fish habitat survey, site bathymetry evaluation, and particle depositional modelling. Providing current velocity data is not a requirement, however, it is included in MCE baseline reports to inform particle depositional modelling.

In high current sites, waste particles can be widely dispersed before settling on the bottom, reducing the demand for oxygen from the benthic sediments in the immediate area of the farm.

The purpose of depositional modelling is to provide a reasonable representation using accepted protocols and standards. The prescribed protocols have been tested through years of research and use and the prescribed data inputs have been verified to provide a reasonable representation of the environment during and after salmon farming.

Depositional Modelling
A requirement of the AAR is to model the potential rate of deposition of biochemical oxygen demanding (BOD) matter at peak biomass and peak feeding.

The following results are from a proposed salmon farm and are representative of modelling required for a licence application. As required by the AAR, the estimated footprint of deposition in 1, 5, and 10 g C/m2/day contours of predicted total organic carbon (TOC) rate of deposition or sediment TOC rate is provided. As such, the output provides a measure to which real data

from monitoring during production can be compared.

The results from Figure 52 and Figure 53 are as follows.

- The yellow shaded area represents the rate of TOC between 1 and 5 g C/m2/day, the orange area represents between 5 and 10 g C/m2/day and the red area represents greater than 10 g C/m2/day.
- At average feed rate, there is a 5 g C/m2/day footprint directly under the pens and between the pens. The 1 g C/m2/day footprint falls beneath the pen grid and extends equally outside the pen structure, from depths of 100 m to greater than 120 m.
- During average feed input, neither the 1 g C/m2/day nor the 5 g C/m2/day footprint extends to the 30 m depth, as indicated by the bold black contour line, see t maximum feed rate, the 10 g C/m2/day deposition is predicted to fall within waters of 110 m to greater than 120 m depths directly beneath the proposed pen structure, the 5 g C/m2/day deposition is 100 m to greater than 120 m depths beneath the proposed pen structure extending slightly beyond the edges of the pens. The 1 g C/m2/day footprint is predicted at depths from 90 m to greater than 120 m and will fall beneath the pen grid and extend beyond the pen structure uniformly. It is not predicted that the 10 g C /m2/day, 5 g C/m2/day nor the 1 g C/m2/day deposition will extend to the 30 m depth during maximum feed input.

Figure 52 Predicted Sediment Total Organic Carbon (TOC) Rate at Average Feeding. Example from a Saltwater Salmon Farm Licence Application

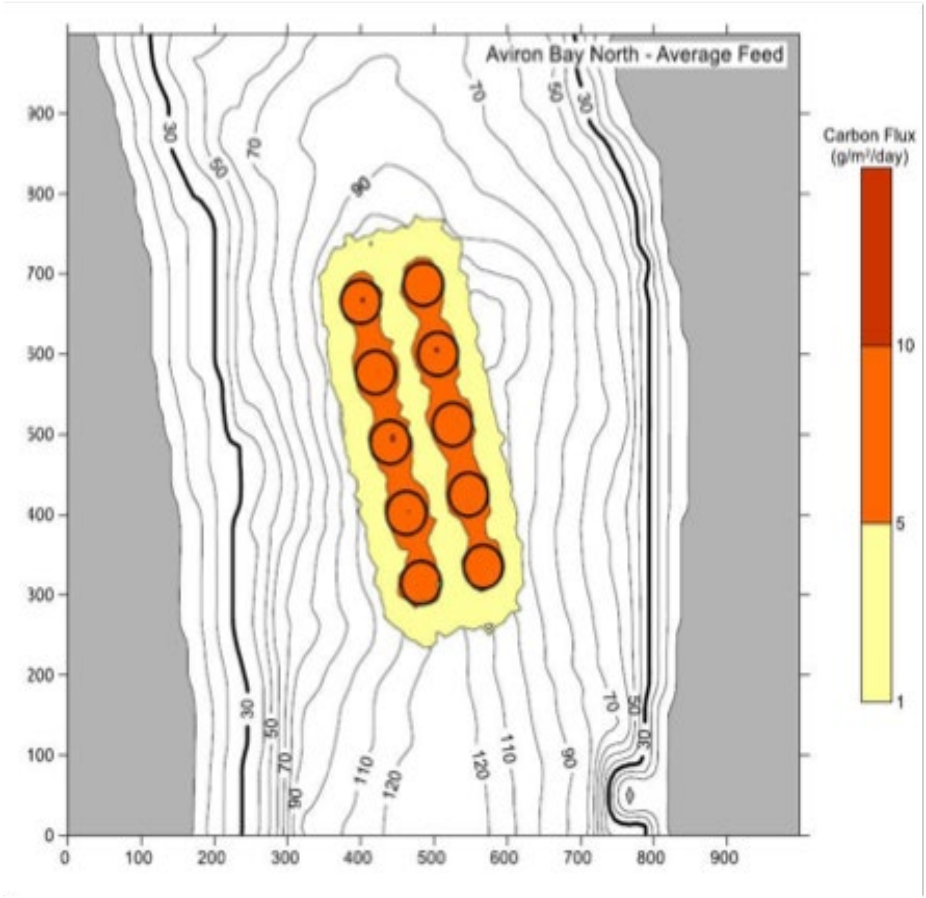
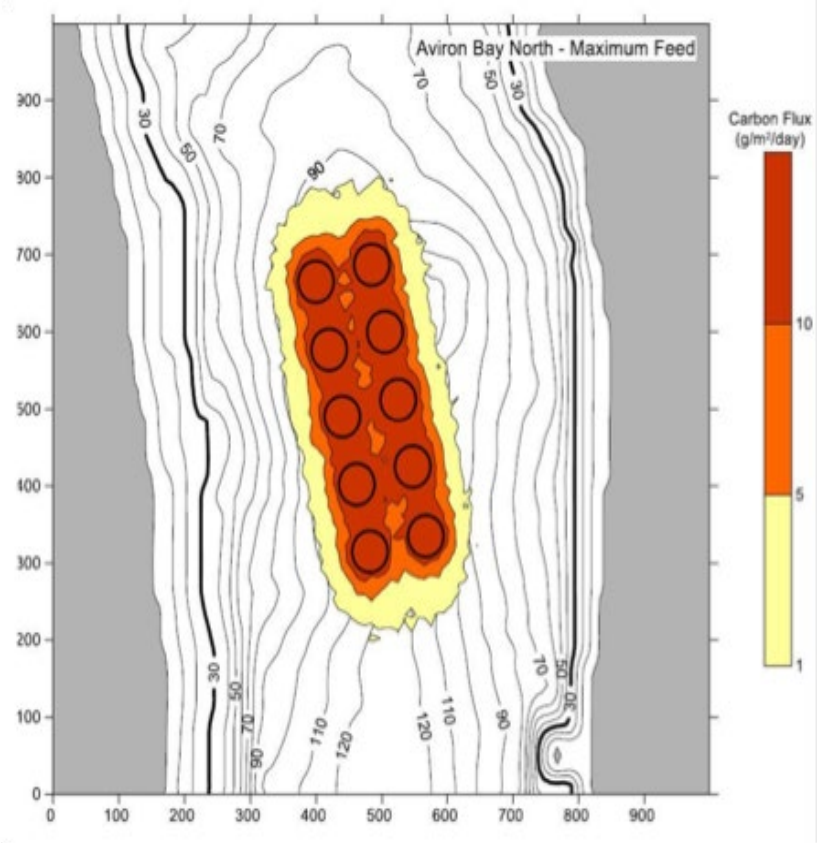


Figure 53 Predicted Sediment Total Organic Carbon (TOC) Rate at Maximum Feeding Rate. Example from a Saltwater Salmon Farm Licence Application



Mitigation Measures for Reducing Benthic Deposition

Bay Management Strategy

FFA has designated Bay Management Areas (BMAs) for salmon culture on the south coast of the province. The south coast has deep narrow bays with little water exchange with neighbouring BMAs. The BMA principles include the target of having only one company farming in one BMA. This reduces the density of salmon farms in one area which in turn reduces the opportunity for deposits to accumulate.

Best Aquaculture Practices Certification

All MCE salmon harvested in the Province of Newfoundland and Labrador are certified to Best Aquaculture Practices (BAP). The four BAP pillars of sustainability are **environmental responsibility**, social responsibility, animal welfare, and food safety and traceability.

Environmental responsibility is included in the following standards.

- Monitoring of sediment conditions at the time of peak feeding during the production cycle and conducted according to the requirements of the farm's operating permits or its own plan in countries or regions where sediment monitoring is not required, and as specified in the implementation requirements.
- Sediment sampling and analysis performed as part of the monitoring program and conducted according to methods generally accepted for such use in the region in which production is occurring.
- Results of sediment monitoring reported to and approved by the appropriate regulators. Where regulatory approval is conditional upon implementing a program of remedial action, this shall have been implemented and completed to show compliance.
- Documents from feed suppliers to be available that assure the traceability to source of marine protein and lipid ingredients present in feed at levels of 1% and non-marine ingredients at levels of 10% or greater.

Deposition Management Practices

This section provides the following information.

1. Waste volume and waste management.
2. Site selection and operating procedures to reduce deposition.
3. Feed development and feeding management to ensure all pellets are consumed.

Waste Volume and Management Practices

Table 77 and Table 78 in the previous section and Table 80 below provide the MCE management practices that have been developed to reduce the potential for organic deposition from fish culture

Table 80 Best Practices for Depositional Management

Activity	Standard Practice	Benefits
Local Site Selection	• Mandatory locating pens in water depths greater than 20 m • MCE locating pens in water depths greater than 40 m • Baseline assessment (as is required at time of licensing) that may include current measurements, carbon footprint modelling at 10m contour intervals, and the collection of visual and chemical data within the 1g/m^2/C footprint	• Avoidance of productive fisheries habitat (eelgrass, etc.) • Promote dispersion of particles • Establish baseline for comparison for future data and analyzes and evaluation of operations
Regional Site Selection	• 1 km company site separation • 5 km site separation between companies (for new sites, or agreement on established practices for older sites)	• Reduced deposition from any one site • Promote dispersion of particles from sites • Avoid accumulation of particles from several sites in one place • Fisheries protection
Fallowing	• Fallow period following a production cycle	• Breakdown of organics below the pens • Promotion of particle degeneration
Stock Density	• Mandatory maximum 18 kg/m^3 stocking density during growing season • MCE maximum 15 kg/m^3 stocking density during full growing season	• Capping production results in less feeding per site and uneaten feed deposition. • Caps number of fish and reduces volume of fecal material deposited
Feeding	• Avoid use of wet feed • Feed cameras monitor feed consumption • Feeding stopped at satiation	• Avoid of overfeeding • Reduction uneaten feed • Reduction in deposition of uneaten feed
Net cleaning	• HDPE nets more frequently cleaned in situ before they are visibly dirty reducing volume of material removed at any one time • Heavily fouled nylon nets are removed from site to a centralized net washing facility	• Prevent establishment of fouling organisms • Decrease volume of biofouling deposited from net cleaning

MCE has developed the following practices and protocols to safeguard the environment and minimize potential negative environmental consequences from waste products. These practices will be modified if the regular ROV survey indicates changes to the benthic environment.

Potential impacts on the environment include organic waste deposition and accumulation to the point that it has the potential for increased oxygen demand and increased algal growth and anoxic or anaerobic conditions. Table 81 provides the approximate volume of organic waste that uses oxygen for breakdown (BOD) and management practices.

Table 81 Waste Materials Generated by Site Operations, Approximate Volume, and Management Practices

Organic Waste	Approximate Volume* (MT annually)	Waste Management Practices
BOD (fish faeces, uneaten fish feed)	82[1]	**Reduce deposition:** The farm is oriented towards the current for optimal flushing (which also provides an optimal level of oxygen for the salmon) and is positioned in deep water to optimize dispersal of faeces. **Reduce deposition:** Fish are fed only to satiation only and observed at all times during feeding with the use of submerged feed cameras, that minimizes both fecal output and deposition of uneaten feed. Feed volume is calculated daily and compared to biomass requirements to check volume fed is appropriate. **Reduce feed waste:** Feed is rotated in the shed to ensure that it doesn't go out of date prior to use. **Residual:** Regular surveys will monitor the benthos for potential environmental impact due to organic input with data compared to baseline data for early identification of potential issues and development of mitigation methods.

Site Selection and Operating Procedures

MCE manages deposition of organic wastes by locating saltwater farms in areas with current, depth and other characteristics that ensure wastes are widely distributed and through operational waste management practices, as listed in Table 81 and in the bullets below, to reduce the volume of deposits.

- Sites were selected based on the depth below the net pens and the ability of the currents to disperse organic particles widely reducing the potential for organic build-up.
- The fish stocking density is 15 kg/m^3 or less for the full culture cycle, reducing the fish biomass reduces the waste generated. Having less biomass per pen means waste is distributed throughout the farm and deposition may occur over a wider area.
- Regular *in situ* net cleaning removes organisms routinely before they accumulate, reducing the size of the particles and the volume of waste produced from each cleaning.
- Cameras in the net pen identify mortality build-up so removal can be initiated. Mortalities are removed via automatic airlift daily, so they don't accumulate and decompose at the bottom of the pens. Mortalities are removed from the site and disposed of on-land or ensiled.
- The Bay Management Area principles ensure farms are located at a distance from each other to allow for distribution of organic particles reducing potential for build-up.

- All farms are fallowed for a minimum of four months for each production cycle to allow the deposits to be broken down and absorbed.
- Annual benthic surveys provide an up-to-date assessment of the lease and identify anoxic areas, uneaten pellets, and any changes from the baseline report.

Feed Management

Reducing uneaten fish feed is an important component for minimizing deposition from farming operations and ensuring no long-term changes to the environment below the saltwater farms, see Table 81 for waste management practices.

MCE has comprehensive Standard Operating Procedures (SOPs) to ensure fish are fed to satiation only when feeding is stopped to ensure excess/uneaten feed is minimized. The following is a recap of the SOPs.

- The feeding schedule, including the volume and size of pellets to be fed, is determined by experienced MCE production staff and is specific to the age and density of the fish and the rearing conditions.
- On the farm, the rearing environment is monitored daily and often hourly before feeding to identify any condition, such as high-water temperature, that would cause salmon to consume less feed. Managers are notified when such conditions occur, and the feeding schedule is modified.
- Under normal conditions, the feeding schedule is closely followed by trained farm staff and fish are continuously monitored during feeding to ensure that all fish are fed to satiation only and feed is not wasted.
- Each pen is equipped with a system of surface and subsurface cameras that can be rotated and moved throughout the pen to observe all areas.
- Evaluation parameters include the following.
    - Continuous visual assessment during feeding for behaviour through the use of underwater cameras
    - Regular calculation of volume of feed used compared to the fish growth (Feed Conversion Ration) with an expected production cycle goal of an FCR of 1.2.
- The Site Manager is responsible for administering the feeding program which includes maintaining records, calculating feed consumption on a daily basis and FCR to determine if all feed pellets are being consumed by the fish.
- A project at an MCE farm on the south coast is currently testing technology to detect uneaten food pellets. The technology was successful in Scotland but requires adaptation to the hard bottom characteristics of the south coast of the province.

In addition to MCE feed management processes, Skretting salmon feed is used exclusively on the saltwater farms in the province. Skretting, with parent company Nutreco, has been a member of the United Nations (UN) Global Compact, Sustainable Ocean Principles since 2015 and is committed to healthy and productive oceans for long term sustainability.
Skretting and Nutreco conduct extensive research into sourcing environmentally sustainable and highly digestible feed components, developing pellet sizes that best fits specific ages and sizes of the fish to increase consumption, and ensuring pellet sinking rates match salmon feeding behaviour for improved pellet capture. This research and the resulting products reduce the uneaten pellets and diminish deposition. For more information on Skretting's sustainable goals and practices please refer to: 12. Committed to the ocean - Skretting

Fallowing

As stated previously, regulations require a four-month fallow period in each culture cycle. Fallowing refers to the time when no fish are grown on the site, generally after harvest and before the next stocking. Prior to restocking the site is surveyed to determine that it meets regulatory standards for operation.

Net Cleaning

All MCE farms have *in situ* net cleaning which allows nets to be cleaned in the water and without having to remove them. This method also promotes more frequent net cleaning which results in less biofouling removed and less deposition at any individual cleaning. Heavily fouled nets are removed from the site to a centralized washing facility in Harbour Breton.

Micro and Nano Plastics in the Ocean

The occurrence of micro-plastic and nano-plastic particles in the oceans has become a global concern. Appropriate waste management systems are part of the solution as are a reduction in the world's production and use of plastic products.

Through the ONEMowi Operational Excellence Program a harmonized monitoring program identifies undesirable substances throughout culture and processing including heavy metals, pesticides, GMOs, mycotoxins and dioxins/dioxin-like PCBs. In recent years, a comprehensive monitoring program related to microplastics has also been implemented.

Through these programs, the following targets have been set and management strategies and operational procedures implemented to meet these goals.

- By 2025, 100% of plastic packaging will be reusable, recyclable, or compostable.

- By 2025, at least 25% of plastic packaging will come from recycled plastic content.
- By 2023, all plastic farming equipment (nets, ropes, feeding pipes) are reused or recycled.

Over the last several years, the focus on packaging materials has reduced the ecological impact of operations.

- Mowi processing plant in Belgium reduced the weight of MAP trays by 20%, which in turn reduced plastics consumption by 96 tonnes per year.
- The processing plant also switched from polystyrene boxes to Forest Stewardship Council approved cardboard boxes, further reducing plastics use by 7 tonnes per year.

Where the use of plastics is unavoidable, recycled plastic is encouraged and single-use plastics avoided.

Mowi employee and community initiatives regularly remove plastic waste and litter from the environment. Hundreds of Mowi colleagues, together with their families organize communal efforts to clean local beaches of plastics and other marine litter.

Food safety is a primary concern, and all products are tested for microplastics. Results show no plastic-related contaminants in Mowi salmon products.

For more information on efforts to reduce use of plastics, increase recycling and re-use, and manage seafood safety, please refer to the following.

https://mowi.com/blog/reduce-reuse-recycle-managing-plastic/
https://mowi.com/wp-content/uploads/2023/03/Mowi-Sustainability-Strategy_March_23.pdf

Sensitive Habitat

There is no known critical, limiting, or sensitive habitat below or near Mowi Canada East Inc. (MCE) saltwater farms. If information becomes available to the contrary, every possible effort will be made to relocate gear to maintain a buffer zone between the habitat and farm activities. Construction activities will avoid areas and be scheduled around sensitive periods of any SARA species in the area.

6f Chemotherapeutant Management

Guidelines: Describe the environmental concerns and controls used to manage chemotherapeutants. Describe potential impacts on, and mitigations for, non-target species.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, direct MCE's use of chemotherapeutants in salmon farming operations in the province. The APs are used in conjunction with Health Canada and Department of Environment and Climate Change regulations for safe use of chemical treatments that limits potential negative impacts on the environment while ensuring the drugs used and treatment processes will result in the desired fish health outcome. All policies and procedures are strictly adhered to.

Table 82 Aquaculture Policies that Pertain to Section 6f

AP #	AP Title	Description
AP 7	Annual Reporting	Licensees are required to provide the following information on an annual basis for each licensed site: f. Annual Aquatic Animal Health Report.
AP 17	Public Reporting	For all incident events, planned responses must be reviewed and approved by applicable agencies with jurisdictional authority and the department. Should planned responses vary from those outlined in the written report, all licensed finfish and shellfish operators must provide the department with an immediate verbal update in advance of implementation of the response measure followed by submission of an updated response plan for approval in writing within 24 hours.
AP 41	Emergency Chemotherapeutant Release	Emergency chemotherapeutant releases are approved by the Federal Government Chief Aquaculture Veterinarian must be notified of any Emergency Drug Release prior to their submission.

Anti-microbials are a broad group of substances used to kill microorganisms, such as bacteria or mold, or stop them from growing and causing disease. This group includes chemotherapeutants.

For this report, **chemotherapeutants** are defined as drugs prescribed by a veterinarian that are used to treat pathogens that adversely affect fish health.

Mowi AS and Mowi Canada East Inc. (MCE) continuously strive to reduce the need for chemotherapeutants. As a result, antibiotics have not been used for over two years on MCE salmon farms in the province. While this is a big achievement, the goal is to avoid all future situations where the use of chemotherapeutants is required.

The information provided in this section includes environmental concerns including resistance and effects on non-target species and the environment as well as management measures currently in place to reduce the likelihood of having to use chemotherapeutants and to reduce potential effects on the environment.

Unless otherwise indicated, the information provided in this section pertains to the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador including the rearing of the proposed Hatchery Expansion salmon.

Please refer to the following sections for additional information on the topic of chemotherapeutant use.

- Section 4.3d Purpose and Use of Anti-microbials for Mowi AS policy on anti-microbial use and anti-microbial substances used in the last two years on MCE saltwater farms and the Indian Head hatchery.
- Section 4.3l Integrated Pest Management Plan.

Mowi ASA Policy on Use of Anti-microbial Agents

The Mowi ASA *Policy on Use of Anti-microbial Agents* guides MCE's responsible use of licensed anti-microbials and ensures the application is in line with World Health Organization (WHO) guidelines developed to mitigate the risk of consequences related to development of anti-microbial resistant bacteria.

MCE has not used anti-microbial medications to treat fish diseases for the past two years in the province.

The Mowi policy provides direction on the use of licensed anti-microbials, residue control, managing anti-microbial resistance, meeting established global standards, and fostering a culture of continual improvement within the company. Mowi-Policy-on-use-of-anti-microbial-agents.pdf

Please refer to section 4.3d Purpose and Use of Anti-microbials for a full description of how the policy is applied in the use of anti-microbials in the Province of Newfoundland and Labrador.

Mowi Canada East Inc. (MCE) follows the comprehensive regulations and policies that govern the use of chemicals of any kind in food production in Canada, especially prescription chemotherapeutants. Management plans and operating best practices have been developed to exceed regulatory requirements, align with *Policy on Use of Anti-microbial Agents*, and maintain the high standards required for the Best Aquaculture Practices certification.

Environmental Concerns and Mitigations

Anti-microbial Resistance

Globally there is concern for the overuse of anti-microbials, including chemotherapeutants, which has led to pathogens becoming resistant to currently available treatments. Potential sources of drugs in the aquatic environment include direct emissions from drug manufacturing, human patient and animal excretion, aquafarming, disposal of unused or expired medicines, wastewater treatment plant effluent, and run-off associated with animal feeding operations.

Chemical treatments are used in specific situations required to maintain fish health and welfare and MCE has management strategies and procedures that are current to the latest research and used with the goal of reducing the need for chemical treatments and reducing the potential effect of treatments used on the environment.

Watts et al 2017 states:

> *The combination of high density and poor water quality increases the likelihood of pathogen outbreaks … An outcome of these higher disease rates in intensive farming is a reliance on antibiotics and other supplements …*

As stated in Murphy and Robinson 2022

> *"In the future, more research should be done assessing the temporal and spatial scales of antibiotic microbial resistance at the aquaculture farms, the surrounding environment, the food supply coming from the industry and from wild commercial species that are associated with point sources of antibiotic input into the environment through anthropogenic activities."*

The way to avoid resistance is to use each treatment option sparingly and only when needed. This requires a range of treatments to be available to use in the Fish Health Management Plan, both chemotherapeutants and non-chemical treatments. To this end, research is vitally important to identify new treatments and test their efficacy, especially non-chemical treatments.

Though the MCE veterinarian prescribes and directs the use of chemotherapeutants, all culture technicians and managers are responsible for ensuring fish health and welfare and thereby reducing the need for chemotherapeutant use.

- Good husbandry and culture management practices provide the best growing environment for strong robust fish.
- Effective biosecurity programs keep bacteria and other microbes out of the culture area and away from the fish.
- Detailed fish health management plans outline the best strategies at each stage of fish culture and for fish health events and include as a first response non-chemotherapeutant therapies.

Other management strategies are employed to support fish health and reduce the need for use of chemical treatments.

- FFA Bay Management Area principles and Aquaculture Policy (AP) 27 state requirements for fallowing periods to ensure the area allowing a site to sit vacant of fish for a specified period of time which allows for a break in the sea lice life cycle, thereby reducing the sea lice infection pressure in the area.
- The maximum fish culture density on MCE saltwater farms is 15 kg/m^3. This density allows the salmon room to move around in the pen and to swim continuously which is their normal condition. This density is lower than the mandated provincial level.
- **All smolt are vaccinated prior to being transferred to the saltwater farms** to enhance the fish's natural ability to overcome disease threats and reduce the need to treatments.

An effective Fish Health Management Plan has a variety of treatments that include non-chemotherapeutant options reducing the need for repeated use of one treatment. Management strategies below are best practices that focus on maintaining fish health using the tools in the Fish Health Plan to the best advantage.

- **Chemical treatments are used as a last resort** with greatest reliance on non-chemical treatments.
- **Prescription drugs are only used when other measures are not sufficient** or when fish welfare may be compromised.
    - In 2019, 68% of sea lice treatments were non-medicinal, compared with 12% in 2015, showing the significant reduction in the use of medicines to manage sea lice made possible by the increased use of non-medicinal tools.
- **For sea lice management, a rotation of treatments is employed**.
    - Cleaner fish, thermo-flushers, bath treatments, skirting, and good husbandry are

all important tools used in conjunction with chemical treatments, such as Salmosan and Ivermectin, to keep fish healthy and free from sea lice.

- **Dynamic use of various non-medicinal and chemotherapeutant tools allows for treatment decisions to be made according to the specific situation** – level of sea lice, size of fish, water temperature, thermocline, previous treatments, sensitivity of the lice to treatment etc. – all of which affects the efficacy of the treatment.
- **The chemotherapeutant is tested prior to application to ensure it is effective.** 90% effectiveness is the MCE standard to not promote resistance.

Non-target Species

Sea lice belong to the animal group of crustaceans which are common in the marine environment and medicine used to treat sea lice has the potential to affect other species.

- MCE only uses pesticides that have been extensively researched by Health Canada, Pest Management Regulatory Agency and have been determined to have minimal or no effect on non-target species when used as directed.
- Drug use best practices, also determined by regulatory agencies, ensure treatments are contained and prior to disposal are diluted to a non-harmful level. For more information, please refer to the following section on Management of the Pesticide Azamethiphos.
- MCE feed management practices reduce the potential for prescription medications in the feed to be eaten by other fish. Any fish able to pass through the culture pen mesh would be too small to consume the size of the salmon pellets of feed. Feeding only to satiety ensures little/no feed is left uneaten to be released to the environment.
- Birds are prevented from accessing treated farmed fish and medicated fish food by top nets that are installed over the pens. All feed is stored in closed secured containers.

*Effects on **Environment, Species at Risk and Sensitive Habitats***

MCE saltwater farms are located away from sensitive habitats and areas with species at risk activities. Also, MCE only uses chemotherapeutants approved by Health Canada for use in food production and follows the regulatory directions exactly to ensure treatment and disposal will not affect the surrounding environment.

MCE's goal is to reduce the use of medications, including medications in feed, and as a result no medicated feed has been used at the hatchery for the last 2 years.

The following practices reduce the number of pellets not eaten by the farmed salmon. Uneaten food becomes available for non-target species and/or can fall through the pens and be

deposited in the environment.

- Salmon are fed only to the point of satiation.
- Cameras are set up throughout the pens to monitor salmon behaviour and feeding is stopped as soon as feeding behaviour slows.
- Feed conversion ratio is calculated to ensure pellets are being eaten and converted to fish flesh.

Depositional modelling prior to salmon culture shows where uneaten pellets are expected to be deposited and build-up. Annual benthic surveys determine the status of the lease below the farms, specifically anerobic areas that indicate buildup of organic matter. To date these surveys have not shown any accumulation of feed or other organic waste.

MCE only uses chemotherapeutants licensed for use which have been thoroughly tested to determine how quickly they break down in the marine environment and their potential effect. Disposal processes ensure no active ingredients enter the environment.

Management Measures

There are four levels that control the use of chemotherapeutant products in Canada that include regulatory licensing and use oversight, salmonid culture standards and practices, MCE Management Plans and operating practices, and fish health management.

Control Level 1: Licensed Products and Strict Regulations

Health Canada

Health Canada determines which chemicals can be used during the production of food in Canada and has developed regulations that limit the chemotherapeutants available for use and how they are applied.

MCE adheres to all regulatory requirements when using chemotherapeutants and refines company best practices to reduce the reliance on chemicals on salmon farms.

- Chemotherapeutants available for use in Canada have been extensively researched prior to being made available and the application is highly regulated. A drug is only approved for use if it is effective in treating disease or health issues and only if it is safe. Therefore, the best way to safeguard the environment from the potential effects of chemotherapeutants is to follow the regulations and guidelines set forth by government agencies.
- Chemotherapeutants approved for food production have withdrawal thresholds, specific

to the animal and the chemical, developed by Health Canada and included in the directions for use. Withdrawal times determine when fish can be harvested – the point where the drug is no longer present in the fish flesh and/or is present at levels not harmful to humans.

Mowi also goes one step further and samples fish prior to harvest. Only if the results show no treatment residue is the harvest initiated.

Pest Management Regulatory Agency

The Pest Management Regulatory Agency (PMRA) carefully regulates use of pesticides in Canada through a program of premarket scientific assessment, enforcement, education, and information dissemination.

Regulators from federal, provincial/territorial, and municipal authorities, levels work together and are directed by various acts, regulations, guidelines, directives, and bylaws to protect Canadians from risks posed by pesticides and to ensure pest control products are effective.

The following are steps for review of a new pesticide registration in Canada.

- PMRA conducts extensive review of all data available on the pesticide to determine potential risks to human health and the environment as well as the pesticide's value. Risk assessments are conducted and conditions on use developed if appropriate as protective label statements.
- Considering data, risk assessments, and protective label statements, if there is reasonable certainty that no harm to human health or the environment will result from use or exposure to the product, the PMRA makes a proposed decision.
- PMRA publishes the proposed decision and a summary of its findings for a 45-day public consultation.
- PMRA consolidates and responds to comments prior to making a final decision.
- The decision and public comments are published, and anyone can file a notice of objection (based on scientific grounds) within 60 days.

Pesticide Operator Licence

In order to use pesticides for treatment of sea lice infections, a valid Pesticide Use Licence is required. MCE's licence allows for pesticide treatments with Salmosan Vet, Interox Paramov 50, and Aquaprox only. For azamethiphos, the active ingredient in Salmosan Vet, results of the PMRA decision process can be found at Registration Decision RD2017-13, Azamethiphos - Canada.ca and the comments and responses from this process are below.

The Pesticide Licence is administered by the provincial Department of Environment and Climate Change, Pesticide Control Section (PCS) and has the following conditions.

Failure to follow all conditions and all treatment directives will result in revocation of the licence.

- PSC must be notified at least seventy-two hours before commencing pesticide treatment.
- Records of all treatments are provided to PCS within seven days of treatment.
- Empty, non-refillable, plastic pesticide containers are triple rinsed, cleaned, and rendered unusable before being disposed of at an approved site.
- For all other empty containers, proper disposal methods must be strictly adhered to and the staff at PSC must be contacted prior to disposal.
- Contaminated materials will be disposed of according to the manufacturer's directions and in consultation with PSC.

Management of the Pesticide Azamethiphos

As an example of the rigorous process undertaken to approve a drug for use and to develop the specific treatment protocols, the following recap of PMRA responses to public comments on the use of Azamethiphos (Salmosan Vet) is provided. The full document is available at: https://publications.gc.ca/collections/collection_2017/sc-hc/H113-25/H113-25-2017-13-eng.pdf

Public Comment: What measures will be put in place to protect our lobsters and our economy?
PMRA Response: The PMRA has conducted a conservative risk assessment for the use of azamethiphos and has determined that no risks of concern are expected when the product is used according to the label directions. The PMRA has imposed many restrictions on the use of azamethiphos to protect lobster and the use in shallow areas.

The product will also be registered as a restricted-class product. This means that the product can only be applied by individuals who are provincially certified and trained.

Public Comment: Has the effect of azamethiphos on lobster near or under the salmon farms been considered?

PRMA Response: The effect of azamethiphos on lobster near or under the salmon farms was investigated by the PMRA and special risk mitigation statements have been added to the product label in order to mitigate the risk to lobster near and under salmon farms including farms located over migration routes. The following restrictions are required to mitigate the risk to lobster near and under salmon farms:

- "DO NOT apply to tarped net pens in water depths of 10 meters or less"

- “DO NOT flush treatment water from a well boat with a 45 degree or 90 degree angled flushing pipe in water depths of 20 meters or less.”

Additional details of the risk assessment and risk mitigation statements can be found on pages 23 and 24 of PRD2016-25.

Public Comment: What maximum allowable azamethiphos limits will be put in place?

PMRA Response: A maximum of 5 applications of azamethiphos is allowed per fish life cycle. The PMRA does not set maximum allowable levels of pesticides in the environment but rather sets conditions of use, including application rates, which are considered safe for the environment. The PMRA has established a maximum application rate of 0.1 mg/L. The maximum application rate of 0.15 mg/L cited in PRD2016-25 is no longer supported as the skirted treatment method was removed after PRD2016-25 was published.

Public Comment: How disposal of residual pesticides in the well boats will be managed is unclear.

PMRA Response: After the treatment period, residues of azamethiphos in the treated water are flushed from the well boat. This flushing process has been taken into account in the PMRA risk assessment.

Public Comment: A number of comments were received raising concerns about research conducted by the Department of Fisheries and Oceans that shows that azamethiphos is harmful to lobster. Azamethiphos is known to be lethal to all life stages of lobster. The following two recent studies published by DFO have shown that repeated sublethal exposure to azamethiphos causes mortality in adult male lobsters.

> Potential Exposure and Associated Biological Effects from Aquaculture Anti-Sea Lice Pesticides[iii]
>
> Estimates of the effects of sea lice chemical therapeutants on non-target organisms associated with releases of therapeutants from tarped net-pens and vessel bath treatments: a discussion paper.

PMRA Response: The PMRA agrees with the conclusions of the Department of Fisheries and Oceans research that azamethiphos is highly toxic to certain marine organisms including lobster. The two studies cited are very detailed and contain a significant amount of information on the lethal and sublethal effects of azamethiphos on lobster. The PMRA used all the information from the two cited studies in the risk assessment for azamethiphos, including

information on sublethal effects. PRD2016-25, Table 9 shows the degree of toxicity of azamethiphos to all the non-target aquatic organisms for which toxicity data was available.

As the PMRA is committed to protecting populations of lobster, the PMRA chose to conduct the risk assessment based on the concentration of azamethiphos where no sublethal effects (behaviour, molting and reproduction) were observed. This no adverse effects concentration was determined to be 1.0 µg/L. This value comes from the study quoted in the comment titled Potential Exposure and Associated Biological Effects from Aquaculture Anti-Sea Lice Pesticides.

The PMRA determined that when used according to the label, azamethiphos is not expected to pose risks of concern to non-target marine organisms, including lobster.

Public Comment: Several commenters raised concerns about the potential effects of azamethiphos on non-target organisms including non-target invertebrates (in water column or on sea floor) which are biologically similar to sea lice, mysid shrimp, herring and plankton and krill which are food sources for herring, eels, mackerel, squid, sand-nesting birds (piping plover), larger marine animals (whale, porpoise, seal and seas turtles).

PMRA Response: The PMRA's risk assessment determined that when used according to label directions, the use of azamethiphos is not expected to pose risks of concern to invertebrate communities in the water column or on the sea floor; fish, including eel, mackerel, herring and other fish species; all species of birds and all species of mammals.

Many toxicity studies were available for a variety of non-target invertebrate species and fish species. These are presented in PRD2016-25, Table 9. The PMRA does not receive studies for all organisms that could be potentially exposed. The PMRA uses the results of the studies received as surrogates for other similar species. In addition, an uncertainty factor of 10 fold is applied in order to account for potential differences between species.

During the risk assessment, a risk was identified for non-target invertebrates such as shrimp and lobster. The PMRA completed a full risk assessment on the impact of azamethiphos on non-target aquatic invertebrates and has required many risk mitigation measures and use restrictions in order to protect invertebrate communities including wild lobster larvae, wild adult lobster and adult lobster held in active lobster holding facilities which include active licensed lobster pounds and/or lobster tank houses as well as lobster cars/crates held within a designated harbour authority water lot. Details of the risk assessment on non-target invertebrates are outlined in PRD2016-25, pages 21 to 26.

Given the way azamethiphos is used and its fate properties, the PMRA concluded that exposure to azamethiphos would be limited for marine bird and mammal species. Azamethiphos dissipates quickly in the environment and is not expected to bioaccumulate in food sources. For

more information on the fate properties of azamethiphos, please see PRD2016-25, pages 18 and 47. Further explanation of the expected risk of azamethiphos to non-target marine birds and mammals is outlined in PRD2016-25, pages 19 and 24 respectively.

Public Comment: Concerns based on increasing density of fish farms in Atlantic Canada and toxicity levels of azamethiphos on lobster.

PMRA Response: The aquaculture industry is highly regulated and there are restrictions on the distance between fish farms in Canadian waters. While the PMRA does not consider forecasted increases in scale of use in its risk assessments, the PMRA implemented mitigation that is designed to protect non-target organisms, including lobsters. The PMRA completed a risk assessment that took into consideration the reported toxicity of azamethiphos to lobster which was published in the Burridge and Van Geest study cited in the comment. Details of the toxicity levels to lobster and the other organisms studied and used in the risk assessment can be found in PRD2016-25, Table 9 on pages 49 to 51.

Public Comment: Concerns were raised about insufficient reporting of pesticide use, unclear of benefits of Aquaculture Activity Regulations.
PMRA Response: All pesticide users are legally required to comply with the *Pest Control Products Act*. Pesticides may only be used in aquaculture settings with specific restrictions to avoid, minimize and mitigate any potential detriments to fish and fish habitat. The aquaculture industry is also subject to the requirements of the Aquaculture Activities Regulations (AAR). These regulations outline mandatory notification, reporting and monitoring requirements, including the requirement to notify Fisheries and Oceans Canada of intent to use of pest control products. The reporting requirements include sampling and monitoring and reporting of any adverse effects. This information will allow Fisheries and Oceans Canada, Environment and Climate Change Canada, and the PMRA to monitor use intensity and environmental conditions and take action to mitigate any risks that may emerge.
Details of the Aquaculture Activities Regulations can be found at the following address: http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-eng.htm.

Public Comment: Concerns were raised about salmosan residue along shoreline where communities live.
PMRA Response: The PMRA determined that azamethiphos breaks down quickly in water and is not expected to remain in the environment for long periods of time. Residues of Salmosan Vet along shorelines where communities live are not expected.

Public Comment: Concerns that anything released or dumped into the ocean, does not 'go away' and that dilution is not the solution.
PMRA Response: Prior to the registration of any pesticide the PMRA carefully considers how the pesticide breaks down in the environment. Although dilution does play a role in the rapid decrease in concentration of azamethiphos in the first few hours after it is released from an aquaculture farm site, the PMRA does not consider dilution when it determines how quickly or slowly a pesticide breaks down in the environment. Azamethiphos has been shown to break down rapidly in water and therefore azamethiphos is not expected to remain in the environment for very long.

Control Level 2: Culture Standards and Certifications

The following MCE salmon culture standards and practices ensure the use of chemotherapeutants follow all regulatory requirements and best aquaculture practices for safeguarding the environment.

Best Aquaculture Practices Certification

100% of the MCE salmon harvested in the Province of Newfoundland and Labrador are Best Aquaculture Practices (BAP) certified. The four BAP pillars of sustainability are environmental responsibility, social responsibility, animal welfare, and food safety and traceability.

Certification guides the use of chemotherapeutants in fish culture with the following standards.

- An accredited fish health professional oversees the Fish Health Management Plan, directing the diagnosis and treatment of fish diseases.
- Drug treatments are based on authorizations by the fish health professional, guided by the Fish Health Management Plan and principles of best practice for the veterinary profession.
- The health professional shall prescribe medicines only to treat diagnosed diseases in accordance with instructions on product labels and national regulations.
- All fish are reared without the use of prohibited medicines such as malachite green or other substances prohibited in food animals.
- No antibiotics or other drugs are present in non-medicated feed. Details of drugs or antibiotics in medicated feeds are documented. Levels of heavy metals and PCBs/ dioxins in feed are below limits set by Canada.
- Complete and accurate records are kept for the use of all antibiotics, pesticides, and other drugs.

Post-smolt Culture

A component of the proposed Hatchery Expansion is to produce salmon that are larger and saltwater acclimatized or post-smolt. Though normally larger than smolt, a post-smolt is at a physiological point in salmonid development and not a specific weight. In other salmon farming areas, stocking saltwater farms with post-smolt has proven the fish are more robust and better able to withstand the move to the marine environment with fewer health concerns.

Control Level 3: Management Plans and Operating Practices

Safeguarding the environment is a guiding principle for all aspects of salmon culture for Mowi Canada East Inc. (MCE) and reducing the need for prescription drugs is an important goal.

In addition to the strict Canadian regulations and conditions of use and BAP certification standards, Mowi Sustainability Strategy, and policy on use of anti-microbials form a framework upon which comprehensive management plans and Standard Operating Procedures (SOPs) have been developed.

Over time these good practices have resulted in a reduction in use of chemotherapeutants and it is expected this will continue.

- MCE uses anti-microbial medicines only when necessary – ***no anti-microbial treatment for disease has been necessary in the past 2 years in the province.***
- For Mowi globally, the number of prescriptions required peaked in 2014 and 2015, respectively 3,477 and 3,285, and have declined steadily since then. For 2018 the number of prescriptions was 501. Overall, this presents a ***significant reduction in the use of prescription drugs and enhanced management of a potential environmental risk*.**

MCE Fish Health and Environmental Management and Waste Management Plans detail the goals, responsibilities, standards, and practices for all aspects of salmon culture including the use of prescription drugs. These plans are revised annually and approved by the provincial government. The following is a recap of key practices that guides the use of chemotherapeutants at all sites.

Drug Use

- Licensed medicines can have a negative environmental impact, especially if used too frequently. Reducing the need to use chemotherapeutants is a priority and is achieved by keeping fish healthy, having robust biosecurity measures, and using non-chemotherapeutant treatments prior to chemical intervention.

- Diagnosis of health issues is by a licensed veterinarian. Any drug treatments will only be given after a prescription from the licensed veterinarian has been received. All prescriptions are signed and approved by certified veterinarians and the treatment directed by the designated veterinarian.
- Emphasis is on non-chemical treatment with chemotherapeutants used as a last resort. Medicines are only used when other measures are not sufficient or when fish welfare may be compromised. To not use anti-microbial medicines under such circumstances would be unacceptable from a fish health, well-being, and welfare perspective.
- Anti-microbials are not used for growth promotion, prevention of infectious diseases or for control of dissemination.
- Therapeutants used will be from credible and responsible sources and will only be used when it is necessary for proper fish health. All therapeutants will be approved by the Fish Health and Welfare Director prior to administration.
- When necessary to use chemical intervention, implementation is under close supervision of the licensed veterinarian and will follow veterinary instructions exactly.
    - The event is reported, and all chemical use is recorded.
    - The lowest effective doses and the minimal frequency are used to achieve the targeted result.
    - Only the exact amount of drug needed for the treatment is used.
    - Enclosed bath/tank or vessel treatments are used to avoid potential spillage to the environment.
- Medications are handled by specially trained staff, typically supervisors and management, wearing the appropriate personal protection.
- Medicated feed is only used as directed by the veterinarian. If there is excess medicated feed after the completion of the treatment, the veterinarian will be contacted to determine proper handling and disposal.
- For saltwater rearing, all smolt are vaccinated prior to leaving the hatchery to support the natural disease management processes of the fish.

Food Safety

- Withdrawal periods set by Health Canada are followed diligently.
- In addition to following withdrawal requirements, prior to harvest, appropriate residue testing will be performed by an accredited laboratory facility and clearance declarations will be obtained from the prescribing veterinarian.

Alternative Treatments

- Use of non-chemotherapeutant treatments for sea lice is a priority and are a first line defense to reduce the number of lice.
- Chemical intervention is only undertaken when necessary.
- Vaccinating all smolt for known diseases prior to transfer to saltwater to ensure fish's own immunity is enhanced.
- Freshwater flushes and pressure washes to remove sea lice.
- Use of lice skirts at 5-10 m depth around the net pens at all times puts a barrier between the salmon and sea lice present in the environment.
- Use of tarps for bath treatments.

Storage

- Disinfectants and chemicals are stored securely in clearly marked containers. Safety Data Sheets (SDS) for each chemical at the facility are on-site and readily accessible.
- Medicated feed is stored in clearly marked container, easily distinguishable from non-medicated feed. The prescription number for the medicated feed will be marked on each container. The medicated feed is inventoried and recorded daily as the feed is offered to the fish according to a prescription. A Safety Data Sheet (SDS) for all medications used at the facility will be on-site and readily accessible.

Disposal

- For land-based chemotherapeutant treatments, disposal is through the approved effluent treatment system. No treatments are disposed of through a domestic septic system nor directly released to the environment.
- All land-based chemical treatments are applied to a reduced volume of water approximately 1/10 of the fish culture volume. Once the treatment is complete the tank is filled, diluting the concentration of the treatment. The treatment water is further diluted through the waste treatment system, has organic particulates removed and is disinfected prior to discharge to a deep-water outfall offshore.
- For marine treatments, disposal conditions are determined by Health Canada, PMRA. (See above section: Management of Pesticide Azamethiphos)

Records and Reporting

- All drug use is publicly reported on the Fisheries and Oceans Canada website.

- The veterinarian keeps health records for each site, which includes all results from the surveillance visits, as well as results for any additional diagnostic testing for a fish health concern.
- Every application of a chemotherapeutant is documented in detail by the company's fish health team. Treatments are recorded in the fish health records including the date, compound used, reason for use, dose, withdrawal period, and harvest date.
- MCE provides the Fish Health and Biosecurity Plans and Integrated Pest Management Plan annually to the Government of Newfoundland and Labrador for review as part of the annual licence review.
- MCE records and reports all chemotherapeutant use plus all mortality and diseases to federal Fisheries and Oceans Canada and Department of Environment and the provincial Department of Fisheries, Forestry and Agriculture and Department of Environment and Climate Change throughout the year. Compliance is mandatory and an integral part of the licensing process.

Please refer to section 4.3p Regulatory, Incident Management, and Public Reporting for a full list of all reporting requirements.

Continuous Improvement – Research

- Mowi ASA has a division dedicated to researching innovative and non-chemical treatments to reduce sea lice numbers that are appropriate globally and for the east coast of Canada.
- MCE is currently testing other methods of sea lice management on farms in the province including the use of skirts, cleaner fish, and extended treatments. Please refer to section 4.3l Integrated Pest Management Plan for specific examples of innovative sea lice treatments.

Medicated Feed

- Occasionally medicated feed is the most effective treatment and medicine is added to the feed as an efficient transfer to the fish.
- The use of medicated feed has been reduced in past years. No medication in feed has been used at the hatchery for the last 2 years.
- In order to prevent the deposition of medicated feed under saltwater farms, only the required amount of chemical is added to the feed, treatment is administered by a licensed veterinarian, and the fish are monitored continuously to determine when they are satiated, and the distribution of pellets is to stop.

- Excess medicated feed is disposed of under direction of the licensed veterinarian following all regulations and guidelines.
- Detailed records of medicated feed administration are kept on-site for the entire time the fish are present. A copy of the treatment history will accompany the fish if they are moved.
- For fish treated with medicated feed, withdrawal conditions are strictly followed and when delivered to a processing plant, a harvest release by the attending veterinarian will accompany the fish.

Escaped Medicated Fish

- MCE is committed to zero escapes of fish - medicated or non-medicated.
- All farms are to have 3rd party engineer certified infrastructure design and construction to reduce possibilities for equipment wear or breakage that has the potential for fish to escape.
- Despite no occurrences to date, detailed management plans and risk mitigation procedures have been developed and are reviewed and revised annually. These measures are part of staff training and are readily available to be initiated immediately to reduce the potential for escapes.
- Please refer to section 4.3m Fish Containment Saltwater Farms for detailed information on keeping cultured fish within the farm.

Non-target Species

- All available pesticides have been researched by Health Canada to determine potential effects on non-target species. These effects are taken into consideration when deciding whether a chemotherapeutant should be licensed for use. This research also informs the often-strict conditions under which the chemotherapeutic can be used.
- All pesticide treatments are completed as per the PMRA regulations and conditions of use and require a licensed veterinarian prescription and surveillance.
- Bath treatments take place in a well boat.
- On-board purification systems are used remove the chemicals used in well boat-delivered bath treatments. The treatment water is released slowly while the boat is moving.

Sea Lice Management

All MCE smolt arrive at saltwater farms without sea lice. Sea lice, naturally occurring in the

marine environment, attach to the fish once they are at the saltwater farms.

Sea lice can affect the health of the salmon and sea lice on farmed salmon can transfer to wild species. The number of sea lice on cultured salmon is monitored continuously. Knowing the number of lice on fish enables planning for effective sea lice management, important for farmed salmon welfare and for protection of wild species.

Please refer to section 4.3l Integrated Pest Management Plan for current research in non-chemical treatment methods and the trials the MCE is conducting in the province.

Control Level 4: Fish Health Management

MCE's multi-level fish health management program and good husbandry practices are focused on keeping fish healthy and reducing the opportunity for disease which in turn reduces situations where chemotherapeutants are required.

Keeping fish healthy is a first line of defense in managing potential environmental interactions in using chemotherapeutants.

The Fish Health Management Plan outlines the processes for careful fish handling to avoid injury, requirements for fish welfare, biosecurity protocols to keep diseases away from fish, and multi-level health management and pest management protocols.

The Environmental Management and Waste Management Plan includes procedures for efficient removal of waste and mortalities, ensuring water quality parameters, and measures to reduce environmental impacts – all of which have an effect on fish health. These plans are revised annually and reviewed by the Government of Newfoundland and Labrador to ensure they comply with all regulatory requirements.

MCE vaccinates 100% of smolt prior to transfer to saltwater farms for the majority of bacterial and viral infections of salmon. Like human vaccines, salmon vaccines enhance the fish's natural ability to withstand diseases and health threats. The use of vaccines is a part of an integrated fish health management program and has greatly reduced the need for anti-microbial treatments. Vaccines are most often administered at the hatchery during freshwater culture and occasionally at sea sites The type of vaccine administered will be determined by the Fish Health and Welfare Director, in conjunction with the Freshwater Production Director.

Having a well-trained and knowledgeable staff and experienced contract vaccinators is essential for maintaining fish health. MCE is committed to training employees for the best practices on biosecurity, feed management, and fish behaviour. There is a recognition of staff being on the front line when it comes to combating disease and infection and ensuring appropriate protocols are used.

6g Species at Risk Management

Guidelines: Identify any Species at Risk in the area that may be impacted by hatchery and sea cage operations and provide mitigations for protection.

Mowi Canada East Inc. (MCE) has an effective program for managing interactions with Species at Risk that includes not locating saltwater farms in areas know to be frequented by such species, identifying potential species in the area and reporting sightings, and reducing the attractiveness of the site to wildlife in general.

Unless otherwise indicated, the information provided in this section pertains to the activities associated with the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador and the rearing of the proposed Hatchery Expansion salmon.

Regulations

Species identified by the Species Status Advisory Council (SSAC), Committee on the Status of Endangered Wildlife (COSEWIC) and the *Species at Risk Act* (SARA) are given a specific status based on their risk of extinction which includes special concern, vulnerable, threatened, endangered, or extirpated.

The provincial Department of Fisheries, Forestry and Agriculture (FFA) is responsible for managing and conserving biodiversity and wildlife resources in the province. The Province of Newfoundland and Labrador *Endangered Species Act* provides special protection for plant and animal species considered to be endangered, threatened, or vulnerable, under the National Accord for the Protection of Species at Risk.

All marine mammals are subject to the provisions of the Marine Mammal Regulations under the *Fisheries Act.* The recently amended Marine Mammal Regulations provides greater protection for marine mammals including Canada's at-risk whales.

Management Measures

MCE is committed to minimizing wildlife interactions through good husbandry, mindful standard operating procedures, and passive deterrence of the species when necessary.

There is no known critical, limiting, or sensitive habitat for SARA species below or near MCE saltwater farms. If such information becomes available, every effort will be made to maintain a

buffer zone between the farming activities and area and construction activities will be scheduled to avoid sensitive periods such as nesting.

Indian Head Hatchery

The Indian Head Hatchery is located on the western shore of the Island of Newfoundland in the area of Bay St. George and the Town of Stephenville. The following species, identified under the provincial legislation or the federal SSAC, COSEWIC and SARA, are suspected or known to have distribution ranges or migratory patterns that include the hatchery area.

- Birds: Piping Plover (*Charadrius melodus melodus*), Bobolink (*Dolichonyx oruzivorus*), Harlequin Duck (*Histrionicus histrionicus*), Barrow's Goldeneye (*Bucephala islandica*), Ivory Gull (*Pagophila eburnea*), and Banded Killifish (*Fundulus diaphanous)*
- Fish: American Eel (*Anguilla rostrate*), Atlantic Codfish (*Gadus morhua*
- Marine Mammals: Harbour Porpoise (*Phocoena phocoena*)
- Plants: Gmelin's Watercrowfoot (*Ranunculus gmelinii*), Low Northern Rockcress (*Braya humilis* or *Neotorularia humilis*), Tradescant's Aster (*Symphyotrichum tradescantii*), Wooly Arnica (*Arnica angustifolia* subsp. tomentosa)

Traditional Indigenous Knowledge

The Indian Head Hatchery is in an area where the Qalipu First Nation conducts research on local species. Jasmine Pinksen, Natural Resources Technician, Qalipu First Nation, reviewed the list provided. She also noted that though the Qalipu Natural Resources Department do not have records of most of the species listed being sighted, the Indian Head area has a high bird species diversity, and many birds have distribution ranges that include the area.

It is unlikely the Hatchery Expansion construction or operations will affect any of these species, however management measures have been developed to address potential interactions.

- Best Aquaculture Practices (BAP) certification requires the following.
    - 10.2: (6g) The facility shall maintain a list of species that occur within the vicinity of the hatchery that are classified as endangered or threatened under regional laws and/or the IUCN Red List.
    - 10.6: (4.3p, 6g) The applicant shall provide a list of relevant local laws and specific conditions of operating permits that apply to wildlife management and protection.
- Information on all SARA species that may be observed at the hatchery is readily accessible on site.
- Staff are trained to identify and report any suspected sightings to company management

who are responsible for reporting to Provincial and Federal agencies.

- The environment around the hatchery is kept free from waste and debris to reduce attractants for all species.

Saltwater Farms

MCE is committed to safeguarding species at risk that may migrate through or near the saltwater farm leases. All approved saltwater salmonid aquaculture licence applications have been reviewed and approved by Environment Canada (EC) for proximity to sensitive habitat and species at risk.

SARA species whose range may extend into the south coast regions include the following.

- Birds: Harlequin Duck (*Histrionicus histrionicus*), Ivory Gull (*Pagophila eburnea*), Piping Plover (*Charadrius melodus melodus*)
- Fish: Porbeagle (*Lamna nasus*), White shark (Carcharodon carcharias), Norther Wolffish (*Anarhichas denticulatus*), Spotted Wolffish (*Anarhichas minor*), Atlantic Wolffish (*Anarhichas lupus*), Atlantic Codfish (*Gadus morhua*)
- Marine Mammals: Blue Whale (*Balaenoptera musculus*), North Atlantic Right Whale (*Eubalaena glacialis*), Fin Whale (*Balaenoptera physalus*) Atlantic population, Grey Whale (*Eschrichtius robustus*) Atlantic Walrus (*Odobenus rosmarus rosmarus*) Northwest Atlantic population
- Turtles: Leatherback Sea Turtle (*Dermochelys coriacea*)

Management of interactions with species at risk begins with preventative measures. Staff awareness and training help in reducing the attractiveness of the site to wildlife. Observation and recording of sightings inform site SOPs and company policies, as well as increase the general knowledge of the species life cycle and life requirements including migratory patterns. Al of this information is reported to authorities and informs procedures for specific situations.

- Farms are not located over known sensitive habitat areas or near areas where species at risk are known to be active, such as nesting areas.
    - No sensitive habitat nor species at risk were identified in site benthic surveys completed prior to licence application.
    - Species at Risk data provided in licence application was reviewed by provincial Department of Fisheries, Forestry and Agriculture and federal Department of Fisheries and Oceans Canada for potential concerns.
    - Sensitive or critical habitat or species at risk have not been identified during farming operations nor during subsequent monitoring surveys.

- Best Aquaculture Practices (BAP) certification requires the following.
    - 10.2: (6g) The facility shall maintain a list of species that occur within the vicinity of the hatchery that are classified as endangered or threatened under regional laws and/or the IUCN Red List.
    - 10.6: (4.3p, 6g) The applicant shall provide a list of relevant local laws and specific conditions of operating permits that apply to wildlife management and protection.
    - 10.4: (4.3p, 6g) The facility shall record the species and numbers of all avian, mammalian and reptilian mortalities resulting from predator control actions and shall report them as required by local authorities.
- Staff are trained to identify species. Identification charts are placed in high visibility areas for all potential species.
- Continuous monitoring of the site for Species at Risk.
- Any species at risk siting is reported immediately and staff will follow regulatory agency instructions should the situation require action.
- Standard Operating Procedures for marine mammal interactions adhere to the Marine Mammal Regulations of the *Fisheries Act* and include reporting requirements, internal company incident recording, scheduled updating of information from the SARA and DFO websites, and regular review of the SOPs by all staff and operators to ensure they fully understand their role and responsibilities.
- SOPs have been developed and staff have been trained specifically for identifying and reporting marine mammals and sea turtles.
- Farm environment, both surface and sub-surface, is kept free from waste and debris to reduce attractants for all species. Standard Operating Procedures include material and waste management.
- Operational protocols, as well as net and gear types, such as HDPE nets, are selected to reduce the opportunity for marine mammals to breach nets and get caught inside a culture pen.
    - All culture pens are covered with nets that do not allow birds to access the salmon, removing the potential food source and reducing the visual attraction.
    - In the unlikely event access to the shore adjacent to the farm is required, all necessary precautions will be made to ensure minimal disturbance of breeding, nesting, and fledging birds.

Marine Mammals Siting and Reporting

Whales and other marine mammals are migratory therefore sightings may occur near the farms.

The following infographic provides instruction when siting a marine mammal and is laminated and available on all farms and in boats, see Figure 54.

Figure 54 Canada's Marine Mammal Regulations and Approach Distances

Prohibited Activities

- Feeding
- Swimming, diving, or interacting with the animal.
- Move, encircling. or entice the animals to move.
- Change directions quickly or park your boat in their path.
- Approach the animals when they're resting - the whale will look like it's not moving and

will be floating at the surface or near the surface.

- Separate a mammal from its group or go between it and a calf.
- Trap a marine mammal or a group either between a vessel and the shore, or between a vessel and other vessels.
- Approach them if there are already several boats present.
- Approach head on or from behind, as this will cut off their movements.
- Tag or mark them.
- Touch, feed or disturb an animal, even if it comes up to a wharf or the shoreline.
- Approach using aircraft.

Porpoises and Dolphins - if dolphins or porpoises ride the bow wave of your boat, avoid sudden course changes. Hold course and speed or reduce speed gradually. Do not drive through groups of porpoises or dolphins.

Seals and Sea Lions

- Reduce boat speed, minimize wake, wash, and noise, and then slowly pass without stopping.
    - 'wake' is the disturbed water caused by the motion of a boat's hull passing through the water.
    - 'wash' is the disturbed water caused by the propeller or jet drive.
    - avoid sudden changes of speed or direction.
    - move away slowly at the first sign of disturbance or agitation. If the animal starts to stare, fidget or dive into the water, you are too close.

Marine Mammal or Sea Turtle in Trouble - To report abuse or harassment (fisheries violation), contact the following 24-hours/day toll-free numbers: Crime Stoppers: 1-800-222-TIPS (8477), Marine VHF radio channel 16.

Sightings of Marine Mammals or Sea Turtles - Record the following to assist in identification or location of the animal.

- Date, time, and location (lat./long.) of animal
- Type of animal (species if possible)
- Sighting distance
- Description of key body parts, including color, tags, or unique markings
- Estimated length of the animal
- Behaviors of the animal observed (and your degree of confidence in the identification)
- Number of individuals

If possible, from a safe location and abiding by the *Marine Mammal Regulations*, take photographs and/or video of the animal, especially close-ups of the tail, flukes, flippers, entangling gear, and visible injuries. Newfoundland & Labrador Marine mammal: whalesighting@dfo-mpo.gc.ca

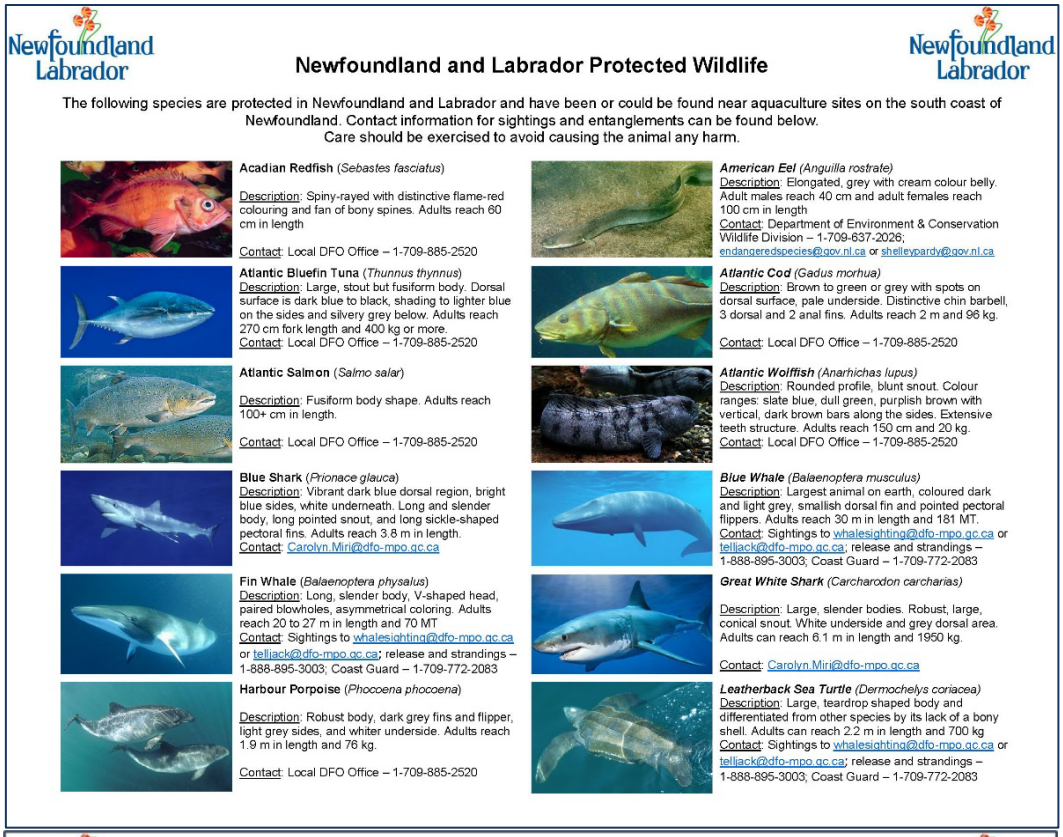
Accidental Contact - All accidental contact of a marine mammal with the site infrastructure is reported. Use Marine Mammal Interaction Reporting Form, available at http://www.dfo-mpo.gc.ca/species-especes/documents/mammals-mammiferes/report- rapport/Fish-Harvester-Form-Eng.pdf. Do not touch or move an animal.

Fisheries Violation - Polluting, poaching, damage to fish habitat and illegal fishing including fishing with the wrong gear, harvesting fish out of season, using fishing techniques that are banned are to be reported using the following 24 hours/day toll-free numbers. Canada wide: Crime Stoppers: 1-800-222-8477, Newfoundland and Labrador: (not toll-free nor 24-hour numbers), Stephenville (national): 709-643-8000 • St. John's (national): 709-772-5044.

Identification Charts

The following identification charts are provided by the Province of Newfoundland and Labrador and will be available at the hatchery, on saltwater farms, and in boats for ease of identification.

Figure 55 Protected Aquatic Wildlife in the Province of Newfoundland and Labrador



Newfoundland and Labrador Protected Wildlife

The following species are protected in Newfoundland and Labrador and have been or could be found near aquaculture sites on the south coast of Newfoundland. Contact information for sightings and entanglements can be found below.
Care should be exercised to avoid causing the animal any harm.

Acadian Redfish (*Sebastes fasciatus*)
Description: Spiny-rayed with distinctive flame-red colouring and fan of bony spines. Adults reach 60 cm in length
Contact: Local DFO Office – 1-709-885-2520

Atlantic Bluefin Tuna (*Thunnus thynnus*)
Description: Large, stout but fusiform body. Dorsal surface is dark blue to black, shading to lighter blue on the sides and silvery grey below. Adults reach 270 cm fork length and 400 kg or more.
Contact: Local DFO Office – 1-709-885-2520

Atlantic Salmon (*Salmo salar*)
Description: Fusiform body shape. Adults reach 100+ cm in length.
Contact: Local DFO Office – 1-709-885-2520

Blue Shark (*Prionace glauca*)
Description: Vibrant dark blue dorsal region, bright blue sides, white underneath. Long and slender body, long pointed snout, and long sickle-shaped pectoral fins. Adults reach 3.8 m in length.
Contact: Carolyn.Miri@dfo-mpo.gc.ca

Fin Whale (*Balaenoptera physalus*)
Description: Long, slender body, V-shaped head, paired blowholes, asymmetrical coloring. Adults reach 20 to 27 m in length and 70 MT
Contact: Sightings to whalesighting@dfo-mpo.gc.ca or telljack@dfo-mpo.gc.ca; release and strandings – 1-888-895-3003; Coast Guard – 1-709-772-2083

Harbour Porpoise (*Phocoena phocoena*)
Description: Robust body, dark grey fins and flipper, light grey sides, and whiter underside. Adults reach 1.9 m in length and 76 kg.
Contact: Local DFO Office – 1-709-885-2520

American Eel (*Anguilla rostrate*)
Description: Elongated, grey with cream colour belly. Adult males reach 40 cm and adult females reach 100 cm in length
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

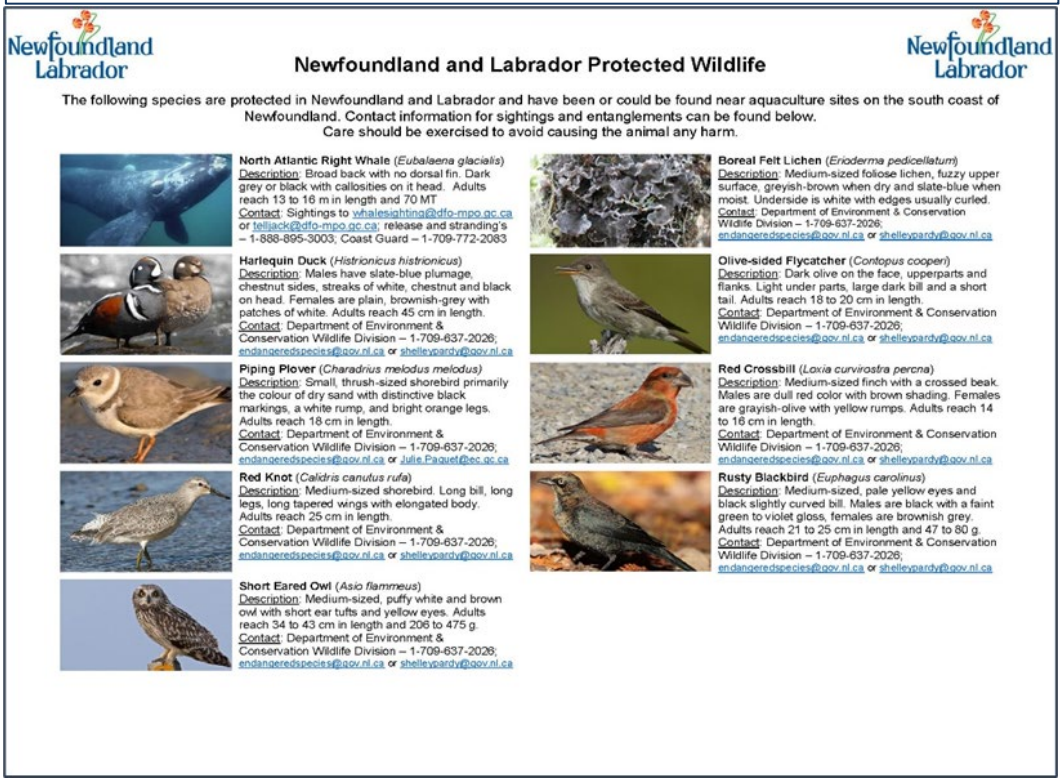
Atlantic Cod (*Gadus morhua*)
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbell, 3 dorsal and 2 anal fins. Adults reach 2 m and 96 kg.
Contact: Local DFO Office – 1-709-885-2520

Atlantic Wolffish (*Anarhichas lupus*)
Description: Rounded profile, blunt snout. Colour ranges: slate blue, dull green, purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure. Adults reach 150 cm and 20 kg.
Contact: Local DFO Office – 1-709-885-2520

Blue Whale (*Balaenoptera musculus*)
Description: Largest animal on earth, coloured dark and light grey, smallish dorsal fin and pointed pectoral flippers. Adults reach 30 m in length and 181 MT.
Contact: Sightings to whalesighting@dfo-mpo.gc.ca or telljack@dfo-mpo.gc.ca; release and strandings – 1-888-895-3003; Coast Guard – 1-709-772-2083

Great White Shark (*Carcharodon carcharias*)
Description: Large, slender bodies. Robust, large, conical snout. White underside and grey dorsal area. Adults can reach 6.1 m in length and 1950 kg.
Contact: Carolyn.Miri@dfo-mpo.gc.ca

Leatherback Sea Turtle (*Dermochelys coriacea*)
Description: Large, teardrop shaped body and differentiated from other species by its lack of a bony shell. Adults can reach 2.2 m in length and 700 kg
Contact: Sightings to whalesighting@dfo-mpo.gc.ca or telljack@dfo-mpo.gc.ca; release and strandings – 1-888-895-3003; Coast Guard – 1-709-772-2083



Newfoundland and Labrador Protected Wildlife

The following species are protected in Newfoundland and Labrador and have been or could be found near aquaculture sites on the south coast of Newfoundland. Contact information for sightings and entanglements can be found below.
Care should be exercised to avoid causing the animal any harm.

North Atlantic Right Whale (*Eubalaena glacialis*)
Description: Broad back with no dorsal fin. Dark grey or black with callosities on it head. Adults reach 13 to 16 m in length and 70 MT
Contact: Sightings to whalesighting@dfo-mpo.gc.ca or telljack@dfo-mpo.gc.ca; release and stranding's – 1-888-895-3003; Coast Guard – 1-709-772-2083

Harlequin Duck (*Histrionicus histrionicus*)
Description: Males have slate-blue plumage, chestnut sides, streaks of white, chestnut and black on head. Females are plain, brownish-grey with patches of white. Adults reach 45 cm in length.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Piping Plover (*Charadrius melodus melodus*)
Description: Small, thrush-sized shorebird primarily the colour of dry sand with distinctive black markings, a white rump, and bright orange legs. Adults reach 18 cm in length.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or Julie.Paquet@ec.gc.ca

Red Knot (*Calidris canutus rufa*)
Description: Medium-sized shorebird. Long bill, long legs, long tapered wings with elongated body. Adults reach 25 cm in length.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Short Eared Owl (*Asio flammeus*)
Description: Medium-sized, puffy white and brown owl with short ear tufts and yellow eyes. Adults reach 34 to 43 cm in length and 206 to 475 g.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Boreal Felt Lichen (*Erioderma pedicellatum*)
Description: Medium-sized foliose lichen, fuzzy upper surface, greyish-brown when dry and slate-blue when moist. Underside is white with edges usually curled.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Olive-sided Flycatcher (*Contopus cooperi*)
Description: Dark olive on the face, upperparts and flanks. Light under parts, large dark bill and a short tail. Adults reach 18 to 20 cm in length.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Red Crossbill (*Loxia curvirostra percna*)
Description: Medium-sized finch with a crossed beak. Males are dull red color with brown shading. Females are grayish-olive with yellow rumps. Adults reach 14 to 16 cm in length.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

Rusty Blackbird (*Euphagus carolinus*)
Description: Medium-sized, pale yellow eyes and black slightly curved bill. Males are black with a faint green to violet gloss, females are brownish grey. Adults reach 21 to 25 cm in length and 47 to 80 g.
Contact: Department of Environment & Conservation Wildlife Division – 1-709-637-2026; endangeredspecies@gov.nl.ca or shelleypardy@gov.nl.ca

6h Aquatic Invasive Species Management

Guidelines: Describe potential for proliferation of aquatic invasive species due to sea cage operation and due to hatchery effluent discharge.

Mowi Canada East Inc. (MCE) is aware of the dangers of invasive species and of the potential for proliferation from salmon farming activities. Therefore, all MCE staff are trained to identify and report aquatic invasive species in the areas where MCE farms and follow strict biosecurity procedures to reduce the risk of spreading invasive species.

Unless otherwise indicated, the information provided in this section pertains to the activities associated with the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador and the rearing of the proposed Hatchery Expansion salmon.

Aquatic Invasive Species (AIS) are plants, animals, aquatic life, and micro-organisms that can out-compete native species when introduced from outside of the aquatic environment. AIS are often difficult to control and can have higher rates of reproduction, fewer natural predators, and the ability to thrive in different environments.

AIS can negatively impact native species, habitats, or ecological structures and can damage site infrastructure, alter the water quality requiring changes in operating procedures, and/or create an unhealthy culture environment for salmon.

Regulations

The following regulations track the presence and movement of AIS and non-AIS aquaculture species. MCE complies with all regulatory requirements during all stages of salmon culture.

- **Aquatic Invasive Species Regulations,** federal *Fisheries Act*, prevents the introduction of aquatic invasive species (AIS) into Canadian waters and controls establishment and spread, once introduced. The Regulations complement existing federal and provincial authorities and enable Canada-wide AIS management activities.
- **Aquatic Organisms Risk Assessment Protocol** analyzes the effects of introducing or transferring aquatic species and examines measures to minimize harmful consequences before movement occurs.

- **The National Code on the Introductions and Transfers of Aquatic Organisms** provides science-based principles for management of intentional and legal introduction and transfer of aquatic organisms for aquaculture.

Species in the Area

Activities to manage AIS in the province have included mapping of confirmed presence, attempts to remove species, and measures to mitigate spread into new areas. The following AIS have been identified in the Province of Newfoundland and Labrador waters. A full list of invasive species, distribution in within the province, photos, and descriptions as well as regulations and other information can be found at: http://www.dfo-mpo.gc.ca/species-especes/ais-eae/regulations-reglements/index-eng.html.

- **Vase Tunicate** (*Ciona intestinalis)* is an invasive solitary tunicate first identified on September 19, 2012, in Placentia Bay. Follow-up surveys in October and November 2012 discovered vase tunicate was also present in Little Bay and Marystown.
- **Golden Star Tunicate** (*Botryllus schlosseri*) grows in colonies up to 10 cm in diameter and distinguished from other types of tunicates by the star-shaped arrangement of individuals within a clear, firm, coat or tunic in typically densely packed mat that covers the underlying surface. Colonies are arranged into a star or flower-shaped pattern. First reported in Bonne Bay around 1975 and confirmed at sites along the south coast of insular Newfoundland.
- **Violet Tunicate (***Botrylloides violaceus*) First identified in Belleoram in 2007 and as of 2010 had not spread beyond this area. A colonial tunicate, usually a single colour colony (purple, pink, yellow, white, or orange) of approximately 10 cm in diameter. Distinguished from other tunicate colonies by the random arrangement of individuals and distinct ridge or track-like patterns on the surface of their fleshy coat, the Violet tunicate has fewer colour patterns than the golden star tunicate and is typically evenly coloured in shades of orange, burgundy, dull pink, lavender or purple.
- **Coffin Box Bryozoan** (*Membranipora membranacea*) is a tiny invertebrate animal living together with others in large colonies. The coffin box feeds by filtering sea water through its body. First observed in Newfoundland and Labrador in 2002 and has become a prominent part of kelp beds throughout coastal areas of the island.
- **Compound Sea Squirt** (*Diplosoma listerianum*) forms dense colonies that are soft, gelatinous, and translucent with fragile crusts which are hard to remove without tearing. Most often darkish grey with white dots. In 2008, it was found in Atlantic Canadian waters for the first time, off the Magdalen Islands and impacts of the introduction and

establishment are widespread. Coastal ecosystems are particularly vulnerable as it may outcompete other organisms for food and space, thereby altering the natural community dynamics, in a short period of time. This species will increase the weight of the aquaculture cultivation gear, causing work to be more demanding as well as increasing the operating costs.

- **European Green Crab** *(Carcinus maenas)* has been identified in southern Newfoundland in sheltered areas, generally on muddy, sandy or pebble bottoms or in vegetation. Two different types of green crabs have been found in eastern Canada with one type being more hardy and able to thrive in colder water. Adults have up to 10 cm shell with three spines between the eyes and five on each side and two claws of different sizes. They are aggressive, territorial, and pose a serious threat to estuarine and marine ecosystems as voracious predators feeding on a variety of intertidal animals, including oysters, mussels, clams, and juvenile crabs.
- **Oyster Thief** (*Codium fragile*) is a large, green, spongy macroalga with thick, irregularly cylindrical branches usually 3 to 10 mm in diameter and 15 to 20 cm long and up to 90 cm in length. Discovered in Newfoundland waters on November 27, 2012, it grows on any hard surface including rocks, boulders, cobbles, wharves, boat hulls and shellfish in both intertidal and subtidal zones. It has been found on native mussels, scallops, and oysters. It excludes kelp from base substrates and fouls aquaculture nets.

Management Measures

The impacts of invasive species usually worsen over time as they reproduce and disperse, posing a major, long-term threat to the health of aquatic ecosystems causing reduced native biodiversity, and reduces the sustainability of the aquaculture industry. Early identification and reporting are key in reducing these impacts.

Management measures follow the federal guidelines on the Fisheries and Oceans Canada Invasive Species website: http://www.dfo-mpo.gc.ca/species-especes/ais-eae/identify- eng.html.

Prevention and Control

As attempts to eradicate invasive species once they have become established can be difficult, prevention of the introduction and controlling the spread of existing populations are priorities.

General

- Hatchery and farm sites have the AIS Identification Booklet for staff to recognize suspected organisms and current maps of locations where invasive species have been

identified.

- Staff at the hatchery and farm sites are trained to identify AIS and to be vigilant in looking for invasive species.
- Procedures to remove AIS from farm gear or boats and disposal of the organism(s) have been developed and will be followed to reduce the likelihood of spreading the species further during the removal process.
- No organisms or water will be moved from an area known to have invasive species into an area that does not.
- Non-native aquatic plants or animals will not be released into the natural environment or sewers.
- MCE biosecurity protocols include cleaning of boat hulls prior to moving from one BMA to another. Tunicates can be readily transferred via boat hulls from one area to another.

Biosecurity

- Preventing the spread of AIS is considered when developing biosecurity protocols and best practices.
- Using foot baths and regular cleaning and maintenance prevent potential build up on equipment or PPE or transfer of invasive species from one area to another.
- Hatchery and all farm sites clean and disinfect regularly to prevent the establishment and spread of AIS.
- At the farm sites, regular cleaning and maintenance of nets prevents organic build-up that might support AIS colonization.
- At the hatchery, effluent is disinfected, to kill organisms less than 37 microns in size not removed during filtration.

Nets and Farm Equipment

- During production, fouling organisms will be removed regularly with nets thoroughly cleaned with remotely operated onsite net cleaning equipment every 10-14 days in the summer, every 2 weeks through the spring and fall and as needed in the winter.
- Equipment will be cleaned, rinsed and whenever possible be allowed to dry between uses.
- Cleaning activities and examination for AIS will be documented.
- Any suspected or identified AIS will be reported as indicated below.

Boats and Gear

- Avoid transferring previously submerged gear from an area known or suspected to have invasives to an area that does not.
- When leaving an area with known invasive species, boat hulls and gear will be inspected and, if necessary, thoroughly cleaned and disinfected with bleach or vinegar and if possible dried before moving to other areas.
- Gear will be thoroughly dried before transfer whenever possible.
- Any organisms removed from boat hulls or gear will be disposed of on land. If pressure washing is necessary, it will only be done on land (not on the water) ensuring the out-flow does not go into the sea, as colonies can re-grow from small fragments.

Removed material will be disposed of in an appropriate compost or garbage bin.

- All water will be drained from the vessel when returning from areas with known invasive species present. Bilge water will be released on land or disinfected.
- When required, environment-friendly anti-fouling paint or products will be used on boat hulls.

Vessel Transport

Vessels used to transport fish from one site to another have the potential for carrying and distributing invasive species. All MCE vessels have self-cleaning holds and hulls, and the fish transport water is contained which significantly reduces the risk.

Hatchery Effluent

The hatchery effluent discharge does not have the potential to introduce invasive species and has limited potential to proliferate invasive species that may exist near the outfall.

- Culture systems are all enclosed RAS, designed to re-use up to 97% of fish production water with less than 5% of the volume of fish culture water discarded as effluent.
- Fish culture water is treated to reduce nutrients that may support aquatic species including removal of solid particles and dissolved organics.
- Effluent is triple screened and disinfected to remove pathogens and other organic microbes.
- Effluent is currently 100% freshwater and discharged into the marine environment therefore will not support the survival of marine invasive species that may be present near the outfall. When the Hatchery Expansion technology is fully operational, less than 30% of the volume of effluent will be saline.

Identification and Reporting

MCE staff follow the federal government identification and reporting procedures.

- Do not return the species to the water.
- Note the exact location (GPS coordinates) and the observation date.
- Take photos, note identifying features.
- Report it as an invasive species in Newfoundland and Labrador: 1-855-862-1815 or Email: AISEAE.XNFL@dfo-mpo.gc.ca.

6i Management of Extreme Environmental Conditions

Guidelines: Risks associated with extreme environmental conditions periodically observed at the hatchery and sea cage locations, including temperature events and low dissolved oxygen levels, and the operational measures that will be undertaken to mitigate the risk of abnormal mortality events.

Extreme environmental conditions can create challenges for salmon rearing, including damage to facilities and/or equipment and associated impacts to the health and welfare of the salmon. Environmental events considered in this section are those most likely to occur in the area of the Town of Stephenville where the hatchery is located and on the south coast of the Province of Newfoundland and Labrador where the saltwater farms to receive Hatchery Expansion smolt are situated.

Unless otherwise indicated, the information provided in this section pertains to the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador and the rearing of the proposed Hatchery Expansion salmon.

It is often difficult to predict with accuracy when an extreme environmental event might occur. Mowi Canada East Inc. (MCE) has the benefit of Mowi ASA's extensive experience with farming in remote and challenging environments, including the Faroe Islands, Iceland, Norway, and Scotland. Mowi has a depth of knowledge and comprehensive management strategies that are tested in tough conditions. MCE has used this knowledge to develop mitigation strategies to ensure the safety of farmed salmon during extreme conditions.

The location of the operation is critical and decisions on location require knowledge of the general area environmental conditions as well as local situations. Local intelligence allows for informed site development. Knowing what types of extreme weather has occurred historically is

the base for planning for extreme events in the future and having standard operating procedures ready to be activated should an event occur.

This is true for establishing both freshwater and saltwater culture facilities but takes on greater importance for the saltwater farms as there are fewer options for managing the effects of extreme weather in remote marine environments and protecting the salmon.

Hatchery

The Indian Head Hatchery is located in the Port of Stephenville Industrial Park on the shore of Port of Stephenville. The Port of Stephenville is a protected and almost enclosed bay on Bay St. George and provides natural protection from storm wave activity and high water.

Facilities and Site Access

The Port of Stephenville Industrial Park is managed by the Town of Stephenville who has the equipment to manage heavy snow removal, downed power lines, berms for high water management, fire response, and emergency evacuations. The Town of Stephenville also has emergency ambulance services and a hospital.

The hatchery has road access between all buildings for fire trucks or emergency vehicle access. Buildings are constructed to the latest building codes to withstand the cold and the Modular RAS Building has a laser fire alert system. Equipment has been selected to operate within the temperature range of the Stephenville area. There are block heaters on the generators for starting in extreme cold temperatures.

Fish Culture

All potential extreme conditions have been considered and operational practices to safeguard the fish are in place.

- The hatchery has staff on site at all times and designated off-site staff are available 24/7.
- Each culture building has a backup power system that can supply 100-200% of power required to run the water pumps, fish culture systems, and facilities. Diesel supply for 72 hours of power is available onsite at all times. The back-up systems can continue if additional diesel is provided.
- Fish culture units are independent and modular with each unit having its own computer linked to the central management system, backup power supply, influent water, and effluent lines.
    - In case of power outage, each culture unit can be managed individually.

    - In case of broken water or effluent lines, the culture units can be isolated to strategically protect the fish.
- Nine weeks of fish feed is on site at all times to maintain the fish if site access is an issue.
- 30 days of oxygen supply is on site (when the oxygen tanks are full). This can be supplied directly to specific fish culture tanks.
- Fish culture systems have emergency oxygen supply.

Wastewater Treatment

All effluent lines are underground and unlikely to be affected by extreme events. The Waste Management Buildings are constructed to the latest building code. Should a disruption occur, the hatchery has two separate effluent treatment systems that are connected and can be used independently. Also, the volume of wastewater can be reduced in the recirculating aquaculture systems (RAS) by extending the turnover time and adding oxygen if required.

Staff Safety

- Buildings are constructed to the latest building code.
- Emergency procedures are posted and reviewed regularly.
- One week of bottled water is available at all times.
- The office building has back-up power and emergency oxygen is available on site.

Hurricane Force Winds; Heavy Rains; and Extreme Cold Events

Climatic events include storms that occur year-round, high winds, and extreme cold events. All of these can result in structural damage and power outages at the hatchery, which can cause disruption to operations.

Frequency: Any time of the year, with stronger, more severe storms occurring in fall, winter, and spring.
Duration: Variable
Mitigation Strategies:

- Hatchery staff are onsite 24 hours a day, 7 days a week. There is always a minimum complement of staff on site to service the facility.
- Back-up power generators can run for 72 hours to service the boilers that could be used to top up the main generator tanks.
    - The buildings are built to the latest construction standards and steel framing, steel siding and steel roofs are more resilient to storm damage.

    - Block heaters are installed on generators for starting in extreme cold temperatures.
- Nine weeks of fish feed is available on site at all times to maintain the fish.
- 30 days of oxygen is available on site (when oxygen tanks are full).
- The Hatchery site has natural slope and drainage to facilitate removal of heavy rains and reduce water buildup near the buildings and flooding.
- Staff are trained in site inspection protocols and in site preparation for potential storm events.

Wildfires

Wildfires are an infrequent event in the Province of Newfoundland and Labrador. Potential effects could be loss of power, poor air quality and/or visibility, or lack of access to the site.

Frequency: Unlikely. Depending on environmental and climatic conditions, it could occur at any time of the year with more severe fires likely occurring in the spring and fall.
Duration: Variable, depending on the size of the wildfire and wind conditions and availability of emergency resources.
Mitigation Strategies

- The hatchery is located in a cleared industrial park that provides a natural fire break and the Town of Stephenville provides fire management.
- The Modular RAS Building has a laser fire protection system installed.
- Staff Availability at Site: Hatchery staff are onsite 24 hours a day, 7 days a week. There is always a minimum complement of staff on site to service the facility.
- Infrastructure: The hatchery site has backup generators that supply 100-200% of the power requirements for 72 hours in the event of a power outage and there is supplemental fuel on site.
- The buildings are constructed to the latest building code and standards with steel framing, steel siding, and steel roofs.

Tsunamis

Tsunamis are a rare event in the province (last recorded on the Burin Peninsula in 1929). The effects of Tsunamis are dependent on wave impact and height. Small waves (2 m height or less) would be absorbed by land above the normal tide line. Higher waves would potentially affect infrastructure further inland.

Frequency: Unknown, no tsunamis have occurred on the west coast of the Island of Newfoundland.

Duration: Variable
Mitigation Strategies:

- Design and Construction: The Modular RAS Building is designed and built to withstand extreme weather including tsunamis.
- Site Selection: Part of the initial site selection for the Stephenville Hatchery included the evaluation of the impact of large wave/extreme high tide events. The hatchery was constructed at an elevation that is safe from these events. However, tsunamis may have tide/wave impacts that are greater than expected during the initial site selection.
- The Hatchery site is on the shore of the Port of Stephenville, which is an enclosed harbor, with a small access channel, high ground emergency plan will take the staff to the northeast of the hatchery.

Saltwater Farms

Mowi only farms salmon in areas where salmon will thrive. The south coast of the province is one such area, but it is open to storms and weather from the north Atlantic Ocean. Extreme environmental conditions can create stress for fish, damage to equipment, and increase the potential for escape. The following describes the measures taken to manage adverse environmental conditions for the MCE farm sites and to mitigate potential risks to the project.

Site Selection and Infrastructure Engineering

Due to the history of storms on the south coast, selecting an optimal sheltered site is a key component in managing the effects of extreme weather. MCE does not knowingly farm salmon in an area with extreme conditions.

A site assessment and research, including collected data on weather, tides, currents bathymetry and depth below the culture nets, benthic characteristics, natural species present, other marine users of the area and their activities, is conducted prior to making the decision to farm in a location. Local knowledge, obtained from local fishers and recreational users, is used for planning the farm layout to position pens and other infrastructure to avoid ice and orient fish pens for good water flow and protection from storms.

The site data is also used to develop site specific layout, engineer the farm design, and select equipment that will withstand storms and adverse events.

- **Site specific design** to avoid conditions that are detrimental or unsafe, such as using anchors appropriate for the specific benthos, and to take advantage of conditions that enhance productivity and disperse faeces and uneaten food, such as orienting pens to the prevailing currents.

- **Infrastructure design and construction** according to The Code and Aquaculture Policy 2 which requires ISO certification for design or having a **t**hird-party engineering approval and installation according to the engineered site layout for all fish culture system components. This ensures moorings, anchors lines, pens, and nets can withstand the exposed environments and reduce the potential risk of escaped salmon from technical failure and human error.
- **Mitigating operational procedures and technology** applications that have been proven to mitigate adverse environmental conditions in other areas.

Fish Culture

The following general mitigations to protect the salmon from the effects of extreme environmental conditions are standard operating practise.

- All farms have 10 days of feed on site.
- Real-time water temperature, salinity, and oxygen data from each fish culture pen at 3 depths are available continuously remotely.
- Cameras in the pens provide 360 degrees view of the fish from the control room and can be moved to check at all levels, including the bottom of the pen to evaluate mortalities.
- Air stones are available for each pen.

Table 83 provides a list of potential extreme environmental events, the potential impact on farmed salmon, and the management processes in place to mitigate harmful effects.

Table 83 Extreme Environmental Events, Impacts on Salmon, and Mitigation Measures

Event	Frequency/Duration	Impact(s)	Mitigation Measures
High water temperatures	Frequency: seasonal in the summer Duration: variable	High temperatures can reduce oxygen levels and negatively affect fish health and appetite	Farms have been located at a site with significant temperature stratification with colder water at depth that can be used to mitigate high water temperature nearer to the surface. Site design includes pens oriented for maximum water flow. Routine monitoring and recording of water quality parameters will ensure optimal fish health including dissolved oxygen, water clarity, and temperature. Infrastructure includes pens that are minimum 20 m deep with low stocking levels of 2.0 smolt/m^3 and a maximum density of 15kg/m^3 at harvest, to allow the entire population to occupy more optimal depths to respond to different environmental conditions. At higher temperatures, feeding and other site activities may be reduced or suspended to improve fish health. An aeration system, installed in each pen, will move cooler water from depth and circulate the water within the pen. Due to thermal stratification within the water column, circulating cooler water from different depths with surface water will moderate high temperatures. Feeding technology may be available to feed fish at lower cooler water depths, reducing exposure to high temperatures.

Event	Frequency/Duration	Impact(s)	Mitigation Measures
Low dissolved oxygen levels	Frequency: seasonal in summer and/or variable if specific events Duration: variable Dissolved oxygen levels can vary as a result of a number of environmental factors such as seasonally when water temperature rises, or with reduction of water flow due to fouling of nets, or specific environmental conditions such as algal blooms.	Low oxygen levels cause stress to fish, can negatively affect fish health and in extreme situations cause die offs.	Routine monitoring and recording of water quality parameters will ensure optimal fish health including dissolved oxygen, water clarity, and temperature. HDPE nets will be cleaned regularly to reduce fouling and allow water flow. Nylon nets will be removed and cleaned at a land-based facility prior to heavy fouling occurring. Water samples will be taken on site and at designated stations to assess the presence of plankton and to predict potential incoming events. As of May 2022, all nets are minimum 20 m deep, with low stocking levels of 2.0 smolt/m^3. This will allow the entire population to occupy optimal depths within the pen to respond to different environmental conditions. During seasonal periods of low dissolved oxygen, feeding and other site activities may be reduced or suspended to improve fish health An aeration system will be installed in each pen to move cooler, more oxygenated water from depths and circulate the water within the pen, improving dissolved oxygen levels. Feeding technology may be available to feed fish at lower depths, reducing exposure to higher surface temperatures.

Event	Frequency/Duration	Impact(s)	Mitigation Measures
Heavy waves and high currents	Frequency: during storms and/or seasonal Duration: variable	Heavy waves, swell conditions and/or high currents can result in net deflection which reduces pen volume and impact fish health in the form of sores/lesions due to net abrasion.	Extensive data has been collected on weather, waves and storms. All nets and pens will be engineered to maintain pen volume on a continual basis through periods of waves and current. This will be done through the selection of net materials with reduced drag, maintaining clean nets and proper net weighting and tensioning. All pens will be inspected daily to monitor and address any net/pen concerns. The low stocking density of 2.0 smolt/m^3 will reduce the impact of any net deflection.
Ice flow and gear damage	Frequency: annual Duration: winter months	Ice can damage pens, nets, and infrastructure. If ice is permitted to build up in large flows, the weight can cause strain on pens and moorings. Any situations that stress fish containment systems creates the potential for fish escapes, equipment loss and staff safety issues	To prevent ice from encroaching on the site, onsite workboat(s) may also be utilized to break up the ice flows. Breaking the ice close to the source and ice tarps will minimalize the impact of ice flows.

Event	Frequency/Duration	Impact(s)	Mitigation Measures
Adverse weather	Frequency: seasonal in the winter, variable at other times of the year Duration: variable	Potential damage to the infrastructure of a marine site as a result of high wind and wave events are known to occur in the waters of the province.	The sea pen systems are designed to a 3rd party engineer certified standard that ensures it will not break up or be damaged during storms or other weather events in the province. Continual evaluation of net and pen condition will occur at the surface. Underwater inspection of all nets and pens every month as well as after large storm events or any other on-site events. Any concerns will be immediately addressed.
Plankton (algal) blooms	Frequency: not often reported in waters of the province Duration: variable	The rapid increase in the number of plankton in the net pens requires dissolved oxygen thus rapidly reducing the dissolved oxygen available for the fish.	Routine monitoring and recording of water quality parameters will ensure optimal fish health including dissolved oxygen, water clarity, and temperature. To assess plankton levels and predict events, water samples will be evaluated and at designated stations at the site. Low stocking levels of 2.0 smolt/m^3 allow the entire population to occupy optimal depths within the pen for different environmental conditions. During periods of algal blooms, feeding and other site activities may be reduced or suspended. An aeration system in each pen to move cooler water from deeper depths and circulate the water within the pen. Algal blooms are often near the surface and water at depth can be unaffected by an algal bloom providing fish with fully oxygenated water.

Event	Frequency/Duration	Impact(s)	Mitigation Measures
Superchill (< 1˚C)	Frequency: during the winter, February to April Duration: variable		Low stocking levels of 2.0 smolt/m^3. This will allow the entire population to occupy optimal depths for different environmental conditions. Onsite activity including feeding will be reduced or suspended. Lower stocking densities for the first winter; followed by thinning in the second winter. Maintaining lower densities can improve fish health and welfare and allow the fish to move to depths where water temperature may be slightly warmer.

6j Avoiding Interference with Other Legitimate Marine Users

Guidelines: Identify how the project avoids interference with the rights of other legitimate landowners/users, including, but not limited to: other fisheries including commercial, Indigenous or recreational fisheries; and tourism or recreational activities.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide requirements to Mowi Canada East Inc. (MCE) for public consultations. These events provide stakeholders with the opportunity to advise MCE on activities in the area of salmon farms and discuss collaborative use of the area.

Table 84 Aquaculture Policies that Pertain to Section 6j

AP #	AP Title	Description
AP 5	Public Consultation	All new licence applications must be advertised in accordance with standards and procedures outlined by the department. Applications to amend site boundaries will also be advertised. Species Add-on and Change in Ownership Amendment applications that do not impact approved production schedules are not required to be advertised.
AP 13	Lobster Fisheries and Aquaculture Facilities	The Minister may make adherence to this policy a condition of licence. A condition of licence will be added where there has been a traditional lobster fishery, as determined by FLR and Fisheries and Oceans Canada (DFO), where the aquaculture gear proposed will not be affected, and an access agreement is established with the Licensee.

This section provides information on the many ways the areas around salmon saltwater farms remain available to legitimate users. MCE's commitment to the province and salmon farming policies have ensured a history of collaboration with other marine users. This includes the public engagement processes required for this EPR that provide opportunities for discussions with stakeholders.

The good neighbour policy and public engagement information provided in this section applies to both the hatchery and saltwater farms, the information on other users pertains to saltwater

farming.

Unless otherwise indicated, the information provided in this section pertains to the activities associated with the rearing of all MCE salmon currently licensed in the Province of Newfoundland and Labrador including the rearing of the proposed Hatchery Expansion salmon.

Good Neighbour Policy

It is standard policy that Mowi Canada East inc. (MCE) avoids interference with other legitimate users. MCE practices being a good neighbour and an important contributor to the communities where the company farms salmon.

Being a good neighbour means understanding how the shared marine resources are used by others and collaborating for the benefit of all users. A key part is having an open-door policy and valuing the knowledge shared during informal discussions as well as being pro-active in arranging meetings and other events that provide an opportunity to better understand others.

Indian Head Hatchery

The Indian Head Hatchery is located in the Port of Stephenville Industrial Park which is managed by the Town of Stephenville through municipal bylaws. MCE also shares the use of the waters and facilities of the Port of Stephenville under contract. The hatchery land is either privately owned or leased by MCE, please refer to section 4.1f Ownership and Zoning for ownership details.

MCE follows the good neighbour policy with the other users of the industrial park and abides by all municipal regulations. There are no tourism activities nor commercial, recreational, or Indigenous fishing activities on the land owned or leased by the hatchery and access to the surrounding area is provided by the Town of Stephenville. The hatchery has been operating since 2011 and there have been no concerns raised by other users.

Saltwater Farms

The saltwater farms currently owned by MCE have been licensed during the years spanning from 2002 to the present. During this time, MCE and MCE employees have worked and lived in the local communities and collaborated with and developed relationships with other residents. MCE staff know the other users of the marine areas where the salmon farms are located and there have been no issues to date. Specifically for lobster fishing, a long-standing MCE policy is to allow lobster traps within the lease area and near to the farm.

Letters of Support for MCE development of the farms on the south coast were provided in licence applications as were the comments provided during public engagements – which were largely supportive.

Each time a new site is proposed, MCE engages with the public at events where stakeholders are provided the opportunity to obtain information, discuss their concerns, and have their questions answered. Local knowledge is invaluable when building a salmon farming business unit on the south coast of the province.

A full list of other users and activities in the areas where MCE is farming salmon is provided in Table 85 and maps with the MCE farms and known activities of others are provided in Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Activities the Bay Management Area.

Public Engagement

Connecting with the other resource users in the area is an integral part of MCE's good neighbour policy. In addition to the licence application requirements described below, activities around established farms are discussed at informal and organized meetings with First Nations, businesses, other residents, and MCE employees.

Organizing public engagement events and recording public comments has been a requirement for every salmon aquaculture licence application since 2010. This includes applications for new licences and changes to existing licences. Please refer to section 9 Public Engagement for specific events and public responses to this project.

Engagement events are advertised in advance and in-person events held in local communities as much as possible. Attendees have included Town Mayors and Councilors, fish harvesters, FFAW members, businesses, other interested parties, First Nations, and community representatives. Anyone not able to attend a scheduled event is encouraged to contact MCE directly.

For other users of the area, these events provide the opportunity to identify potential conflicts in advance of the approval, discuss options with MCE to resolve the issues, and have their concerns officially recorded for review by the Transport Canada, Fisheries and Oceans Canada, Environment Canada, Department of Environment and Climate Change and the Department of Fisheries, Forestry and Agriculture.

Indian Head Hatchery

- Prior to submitting the Environmental Registration for both initial construction in 2010 and the 2018 Hatchery Expansion, events were organized for the public to provide project information, answer questions, and provide opportunity for the public to comment on the project. Public in-person meetings were held in Stephenville with reports included

in the registrations.

- As part of the preparation of the Environmental Preview Report (EPR), the public were provided three different engagement options where project information was provided, with the opportunity to ask questions and receive MCE responses, and to record their comments on the project. A full report is provided in Section 9.

Saltwater Farms Licencing

- Prior to submitting an application for an aquaculture licence, the public were provided several in-person and on-line engagement opportunities with full reports from these events plus Letters of Support included in the licence application.
- During licence application review, the Department of Fisheries, Forestry and Agriculture (FFA) requires the proponent to advertise the opportunity for project concerns to be provided directly and confidentially to FFA with these comments being considered during the licence application review.
- Also, during licence application review, Transport Canada (TC) requires the proponent to advertise that project concerns can be made directly and confidentially to TC. Responses are used in the licence application review and to determine if the proposed farm and activities allow for other legitimate use of the area.

Regulatory Management

Several levels of federal and provincial regulatory management ensure access to navigable waters, protection for marine habitat, and control of farming, fishing, and other activities.

Regulatory agencies conserve and protect navigable waters for all legitimate users, manage recreational, commercial and fisheries activities, and safeguard marine habitat. These agencies have the right to refuse an aquaculture farm licence if the farm or associated activities contravene the regulations and policies and/or adversely affect legitimate activities of other marine users.

Department of Fisheries, Forestry and Agriculture

Aquaculture Policy and Procedures Aquaculture Policy 9 states FFA will review applications for a proposed development if there is a licensed aquaculture site in the vicinity. The review is to determine whether there is potential interference between the existing licensed farm and the proposed development. For municipal sewage outfall developments located less than 500 meters from the existing aquaculture operation, FFA will not recommend approval.

Bay Management Principles and the Aquaculture Policy and Procedures Policy 26 establish distances between farming activities to ensure sustainable culture practices, safeguard the

environment, and provide safe access around the farm infrastructure and between farms. Though established farms can maintain current site separation, new sites operated by different companies in one BMA must be greater than 5 km apart and new sites operated by the same company must be greater than 1 km apart.

Boat access to the general area is not restricted. A minimum 40 m navigation channel between farm infrastructure and the shoreline with 10+ m depth is a requirement of all newly developed aquaculture farms. For all farms, aids to navigation such as buoys, day beacons, lights etc. are installed as required by Transport Canada. Aquaculture Policy 14 states all infrastructure, surface, and sub-surface, is to be within the boundaries of the aquaculture lease and moorings marked for the safety of marine and land-based resource users.

Transport Canada

For all farms, aids to navigation such as buoys, day beacons, lights etc. are installed as required by Transport Canada (TC), under the authority of the *Navigable Waters Protection Act*, reviews all salmon aquaculture licence applications to ensure protection of the waters on which the public has the right to travel (navigable waters). Specifically, the proposed farm infrastructure and layout are scrutinized to identify risks that interfere with use of area. The application approval requires the company to install navigational buoys, as determined by TC, to ensure safe boating in the area. *Canadian Navigable Waters Act (justice.gc.ca)*

Fisheries and Ocean Canada

Marine fisheries are managed by Fisheries and Oceans Canada (DFO). All salmon aquaculture licence applications are reviewed by DFO to ensure the proposed culture activities comply with the *Fisheries Act* and do not impede legitimate use of the area, specifically fishing rights.

> "… (DFO) *seeks to conserve and protect fish habitat that supports Canada's fisheries resources through application of the fisheries protection provisions of the Fisheries Act. A key provision of the Act is subsection 35 which prohibits the carrying on of work, undertaking or activity that results in serious harm to fish that are part of or support a commercial, recreational, or Indigenous fishery without an authorization from the Minister."* *Fisheries Act (justice.gc.ca)*

Other Marine Users and Specific Practices

Other legitimate users include marine tourism, recreational boaters, First Nations, and commercial and recreational fishers. MCE saltwater farms are located on the water only and do not affect the use of cabins or other land-based activities. Therefore, this section only addresses

marine activities only.

The following information on other users was determined from research using community, tourism and government websites and personal communication with representatives, from public meetings, and during discussions with First Nations, Fish, Food, and Allied Workers Union (FFAW), local individuals, and commercial and recreational fishers.

Table 85 provides a list of the BMAs with MCE farms, the communities within the BMAs, commercial, recreational, and Indigenous fishing activities; recreational activities; as well as businesses and other facilities such as wharfs, and natural salmon rivers that have seasonal users.

Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Activities the Bay Management Area provides similar information in a map format.

To date all issues have been resolved through discussion with other marine users of the marine environment near MCE saltwater farms to date.

Table 85 BMAs with MCE Saltwater Farms, Local Towns, Fishing and Recreation Activities, Facilities/Businesses, and Scheduled Salmon Rivers

BMAs	Towns within the BMA	Fishing Activities	Recreational Activities	Facilities/Businesses	Scheduled Rivers
BMA 1 Mal Bay		Cod, Trout, Herring, Lobster	Boating, Kayaking, Rental Properties, Cabins		
BMA 2 Rencontre East	Rencontre East	Lobster, Cod, Herring, Trout	Rencontre East Vacation Homes, Boating, Kayaking, Cabins	Harbour Authority Wharf (ferry)	
BMA 3 Fortune Bay West	Belloram, Pools cove	Lobster, Snow Crab, Cod, Tuna, Trout, Herring	Cabins, Rental Properties	Septic Fields, Lumpfish Hatchery, Harbour Authority Wharf, Government Wharf,	Simmons Brook, Bay du Nord, Southwest Brook
BMA 4 Great Bay de L'eau	Coombs Cove, Wreck Cove	Trout, Mackerel, Scallops, Snow Crab, Lobster	Cabins, Berry Picking, Hunting	Town of Wreck Cove septic, Harbour Authority Wharf, Fish Processing	Old Bay River, Taylor Bay, Salmonier Cove (unscheduled)
BMA 5 Harbour Breton Bay	Harbour Breton	Lobster, Snow Crab, Cod, Trout, Scallops	Cabins, Boating, Whale Watching	Town Sewer, Processing Plant, Government Wharf, Recreational Floating Wharf	
BMA 10 Facheux Bay		Mackerel, Lobster, Cod, Salmon, Trout	Cabins, Boating, Sailing	Wharf (McCallum), Ferry	Allen's Cove Brook, Bottom Brook
BMA 11 Hare Bay		Mackerel, Salmon, Trout, Salmon	Cabins, Sailing, Boating	Wharf	Hare Bay Rivers
BMA 12 Rencontre West		Cod	Cabins, Boating, Hiking, Rental Properties, Cruise Ship Route, Sailing, Rock Climbing		
BMA 13 Chaleur Bay		Scallop, Trout, Lobster	Sailing, Cruise Ship Route, Hiking, Boating, Rental Properties, Cabins		

Commercial, Indigenous, and Recreational Fishing

Lobster and Crab

Some MCE farms are in waters traditionally fished for lobster - Lobster Fishing Area (LFA) 11 is a seasonally active fishing area and includes Fortune Bay where BMAs 1, 2 and 3 are located. Other areas through Bays East and Bays West are targeted for lobster fishing.

In-person meetings were held with fish harvesters from Miapukek First Nation, Francois, McCallum, Harbour Breton, Hermitage/Sandyville and the FFAW to determine fishing details.

MCE and lobster fishers have operated in the same area without conflict since 2010. MCE and the Miawpekuk First Nation of Conne River, the First Nation located in the south coast area, collaborate on several projects. This relationship provides an avenue for the Nation to contact MCE at any time to discuss issues with their access to traditional harvesting. No issues with fishing have been communicated to date.

Lobster fishing is not restricted by farm infrastructure and MCE has a longstanding arrangement with lobster fishers to harvest within the lease boundaries and no issues have arisen to date.

Scallop, Cod, Salmon, Trout, Mackerel

Recreational fishing for scallop, cod, salmon, trout, and mackerel occurs throughout the Bays East area with less activity in Bays West. For Bays East, the fishing and farming activities are well established and coincide collaboratively in the same areas. Any issues have been resolved through discussions to date.

In Bays West, fishing activities and recreational activities were identified and discussed at public meetings. It was arranged that farm construction and operations would avoid specific areas and that nearby communities would be advised when major construction was scheduled.

Tourism, Other Recreational Activities

MCE saltwater farms are only accessible by water therefore the areas are used mainly by recreational boaters, divers, and fishers. There are small communities in four BMAs, with tourism and rental properties in two BMAs, and cabins scattered throughout, see Table 85 and Appendix D: Mowi Canada East Inc. Saltwater Farms and Other Activities in the Bay Management Area. for maps of these activities. As discussed previously, the farm infrastructure and layout are designed to not impede other users.

Aquaculture and Other Uses

As discussed previously, the Bay Management principles and AP 13 establish minimum distance between farms of two companies located in the same area. MCE policy is to farm in areas separate from other companies to avoid interference. This was not always the objective for salmon farming on the south coast and separating individual companies into areas is a work in progress. Until this is achieved, Bay Management principles require a minimum of 5 km between site boundaries on all newly licensed farms and 1 km between existing sites owned by different companies or have an agreement between the companies to plan activities to avoid issues.

Collaboration between companies allows for designated use of facilities such as wharves, to avoid conflict. For transport of smolt from the hatchery, the Port of Stephenville is privately owned and manages access to the wharves and other facilities under contract.

7.0 DECOMMISSIONING AND SITE RESTORATION

Describe all aspects of the decommissioning and rehabilitation plans for the project, assuming the eventual need to eliminate the entire project footprint from the landscape.

The following Aquaculture Policies (AP), from the Department of Fisheries, Forestry and Agriculture, Aquaculture Policies and Procedures Manual 2019, provide regulatory guidance to MCE for site decommissioning and restoration should it be required. Additional APs and other regulatory references are also included where appropriate with the information in this section.

Table 86 Aquaculture Policies that Pertain to Section 7.0

AP #	AP Title	Description
AP 6	Aquaculture Licence Renewal	License holders that do not intend to renew a licence are required to notify the department in order to commence the site decommissioning processes.
AP 11	Aquaculture Inspections Program	Aquaculture Inspectors conduct site decommissioning inspections as per authority provided in Section 6 of the *Aquaculture Act*
AP 29	Aquatic Animal Health Surveillance	An aquaculture site is deemed active if at least one fish culture pen is on site and has been stocked with fish for thirty days.

This section provides information on the decommissioning and restoration processes for both freshwater and saltwater facilities in the province should there be a requirement to cease culture activities and return the site to the pre-aquaculture state.

Unless otherwise indicated, the information in the section pertains to all MCE licensed sites in the Province of Newfoundland and Labrador including the Hatchery Expansion facilities.

Please refer to the following section for additional information on how the design and construction can facilitate the deconstruction and removal of infrastructure.

- Section 4.2e Construction for Site Decommissioning and Restoration

7a Hatchery

The Indian Head Hatchery is an integral component of the Mowi Canada East Inc. (MCE) business plan for next 20+ years and represents a long-term commitment to the province, the Town of Stephenville, and the people of the area. There is no plan to abandon this facility.

Decommissioning

Should decommissioning be required, the first step would be to prepare a comprehensive decommissioning and restoration work plan in collaboration with provincial and federal agencies to ensure all regulatory and environmental requirements are addressed. The following are considerations for this plan.

- MCE will preferentially arrange with local service suppliers for the removal of infrastructure and equipment.
- All structures, including buildings, culture systems and sub-surface pipelines, will be removed from the site as per direction of the regulatory agencies.
- Fisheries and Oceans Canada (DFO) and the Department of Environment and Climate Change (ECC) will be consulted to provide specific direction on removal of the effluent discharge outlet located in Bay St. George.
- Salmon culture systems are independent, and deconstruction of each system can be accomplished without affecting other systems. Therefore, if required a staged or partial decommissioning can be completed. Egg incubation has four independent culture units, fry rearing has 2 units, smolt rearing has six independent culture systems in three buildings, and post-smolt has four independent modules.
- Each of the five production buildings – incubation/fry, smolt 1-2-3, and Modular RAS (post-smolt) – were constructed with dedicated freshwater lines, independent water treatment systems, dedicated power and back-up power supply, and effluent lines. These buildings can be isolated and dismantled separately after the fish culture systems have been removed.
- The sub-surface water and effluent lines have been installed in the same trench whenever possible which facilitates locating and removing the lines.
- Equipment in good condition, such as fish culture tanks, pumps, vaccination and grading, RAS technology, and site tools, will be used at other MCE facilities, sold to other companies, or recycled.
- Buildings intact or dismantled and in pieces, such as steel supports, doors, roofs etc.,

will be used at other MCE facilities or sold.

- Equipment and building infrastructure that is not re-used or sold will be recycled and if required the residual will be disposed of responsibly through the Central Newfoundland Waste Authority.

Site Restoration

The Indian Head Hatchery site was previously used as an industrial air force base and large areas of overburden had been removed before the hatchery development. Prior to starting the Hatchery Expansion, an extensive survey of the soil and groundwater was commissioned for the area proposed for the expansion. This survey provides the pre-existing conditions for site restoration.

- The main hatchery site, including the adjacent area for Hatchery Expansion development, has old, buried fuel and potable water lines and one area is impacted with hydrocarbons. Laboratory analysis identified trace levels of hydrocarbons indicative of previous industrial activities and hydrocarbons dissolved in the groundwater of the site. Please note no hydrocarbons or other contaminants were found in the groundwater of the aquifer.
- The area was partially cleared prior to the hatchery development.
- For the property located across Connecticut Drive from the hatchery, no environmental issues were recorded during the soil and groundwater survey. This information is documented and would be used if restoration of the site to pre-hatchery conditions was required.

As this was a site with previous industrial activities, required changes to the site during the initial construction of the hatchery and during Hatchery Expansion construction were minimal and only included subsurface drainage to stabilize the area, some leveling of areas for building stability, and excavations for building foundations. Soil removed during construction remains on the site and would be used for filling excavations and ground levelling etc. during site restoration.

7b Saltwater Farms

A Site Restoration Plan is a component of saltwater licence applications and as such is assessed in the application review process. Decommissioning policies and procedures are also included in the MCE Environmental Management and Waste Management Plan (EMWMP)

which is reviewed annually by the Department of Fisheries, Forestry and Agriculture (FFA).

Site Restoration Plan (2023)

For all operational licensed salmon farms, a site-specific Site Restoration Plan is required that includes the details as outlined in the Site Restoration Plan and Financial Assurance Requirements Guidance Document 2022.

The plans will be submitted to FFA by the fall of 2023 and include the following components.

1. Site and Company Background Information
2. Decommissioning and Restoration Work Plan
3. Decommissioning and Restoration Cost Estimate
4. Financial Assurance Proposal

The 2023 site-specific plans are currently in preparation. The following are general requirements and considerations and have been used in the development of the plans.

Decommissioning

Saltwater farms have been designed and constructed so the equipment and infrastructure can be easily accessed for inspection, cleaning, and repair. This access also allows for deconstruction and equipment removal if required.

Section 4.3e describes the design and construction of saltwater farms that allow the infrastructure to be accessed, dismantled, and removed from the site.

The following are considerations.

- The Site Restoration Plan (2023) will be reviewed with FFA to determine additional work required, regulatory agencies involved and their roles and responsibilities, inspection and reporting requirements and other aspects that need to be addressed.
- From the activity above, schedules for work, inspections, and reporting will be developed.
- Reports will be provided to regulatory agencies as required.

Infrastructure Removal

- MCE will preferentially make arrangements with local service suppliers for the removal

of infrastructure from the farm site.

- The site will be dismantled, and infrastructure removed during Spring-Fall, weather permitting.
- Transport Canada (TC) will be consulted to provide specific direction on navigation alerts during deconstruction and removal of farm anchors and navigational buoys.
- Removal and removal methods for structures, including surface and floating equipment and subsurface equipment and lines, to be approved by regulatory agencies.
- The barges will be towed from the site and either sold or moved to another lease.
- The pens will be deconstructed with components removed, used on other MCE sites, sold, or recycled.
- The grid, moorings, buoys, navigational aids will be removed under the direction of Fisheries and Oceans Canada (DFO), FFA, and Transport Canada (TC).
- An ROV inspection of the sea floor will be undertaken to ensure equipment is removed as directed.
- Equipment in good condition, such as pen structures, accommodation facilities, feed and storage barges, lines, and tools, will be used on other MCE sites, sold to other companies, or recycled.
- Large plastics that are not re-used will be stockpiled until a recycling option is available or disposed of responsibly through the Central Newfoundland Waste Authority.
- Other equipment that is no longer usable and cannot be recycled will be disposed of through the Central Newfoundland Waste Authority. Currently, trucking to the Central Newfoundland Waste Management Authority is the most likely option.

Removal of large infrastructure, such as barges and fish culture pens, has specific requirements, please refer to Table 87.

Table 87 Large Infrastructure Removal

Infrastructure	Actions and Measures to Restore the Area	Details
Barges	All barges would be removed from the lease. These assets would either be sold or removed to another lease/tenure for repurpose. It is not expected that barges will have altered the environment. An ROV sweep of the area below the barge will identify any equipment or refuse that may require retrieval and disposal.	Local service suppliers will be contracted to tow and remove barges from site. Timing: Preferably, towing will be done during the Spring or Summer months when weather conditions are favorable.
Pens (collars)	All pens are removed from the lease. These assets would either be sold or removed to another lease/tenure for repurpose. In the event the pens are not repurposed, or recycled, an option for disposal exists in the province. It is not expected that pens will have altered the environment. An ROV sweep of the area below will identify any equipment or refuse that requires retrieval and disposal.	Local service supply companies will be contracted to tow and remove pens from site. Timing: Preferably, towing will be done during the Spring or Summer months when weather conditions are favorable.
Grid, Moorings, Buoys and Anchors	DFO and FFA will determine which shore pins, moorings, and associated components will be removed from the site. All useable components will be resold or repurposed. The lease is assessed with a ROV survey to verify all farm-associated materials/equipment have been removed.	Local service and supply companies will be contracted to remove all mooring components. Timing: The removal of the grid, moorings, and buoys can be completed any time of the year weather permitting. See note below on disposal of large plastics.
Nets	All nets will be removed from the lease and sent to a local net loft for reuse, resale or to be recycled. Nets that are kept clean during the production cycle will have minimal effect on the natural surroundings. An ROV sweep of the area below the nets will identify any equipment or refuse that requires retrieval and disposal.	Local service supply companies will be contracted to remove all nets from the site and send them to a local net loft for reuse, resale or to be recycled. Timing: The removal and recycling of the nets could be completed any time of the year weather permitting. See note below on disposal of large plastics.

Recycling of Large Plastics

As outlined in the publicly available 2022 Annual Report, Mowi globally does not send large plastics, such as culture nets, bird nets, and pen collars, to land fill as of 2023. These materials are currently being stockpiled within the province until a recycling option is available. This is a company decision to meet corporate environmental improvement targets. Options do exist for disposal of large plastics in the province.

Site Restoration

The federal Aquaculture Activities Regulations (AAR) are designed to protect the environment from potential negative effects. A baseline survey is completed for every farm site prior to an aquaculture licence being granted that includes site bathymetry, bottom type, wild species present on the site, current flow, and temperature throughout the water column. This data provides the “baseline”, or state of the site prior to salmon farming, and is used to compare with surveys conducted while the farm is operating.

The baseline survey also documents the natural state of the site and is used to confirm no lasting detrimental effects after the site has been decommissioned and restored.

8.0 BIBLIOGRAPHY

Guidelines: Provide a bibliography of all project-related documents already generated by or for the project (e.g., feasibility study, engineering reports, etc).

The following is a list of existing information prepared for the Hatchery Expansion and/or used as a source of information in the preparation of the Environmental Preview Report.

Baskett, M.L., Burgess, S.C., Waples, R.S. (2013). Assessing Strategies to Minimize Unintended Fitness Consequences of Aquaculture on Wild Populations. Evol Appl. 2013 Nov;6(7):1090-108. doi: 10.1111/eva.12089. Epub 2013 Oct 9. PMID: 24187590; PMCID: PMC3804241.

Best Fishes Fidra. Image of Salmon Life Cycle.: https://www.bestfishes.org.uk/scottish-salmon-farming/#life.

Bjørndal, T. & Tusvik, A. (2019). Economic Analysis of Land Based Farming of Salmon, Aquaculture Economics & Management, 23:4, 449-475, DOI: 10.1080/13657305.2019.1654558.

Blewett, E., Chen, S., & Roth, M. (2022). RAS Salmon Farming in British Columbia: Economic Analysis & Strategic Considerations. Government of British Columbia website: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/fisheries-and-aquaculture/aquaculture-reports/ras_salmon_farming_in_bc_-_economic_analysis__strategic_considerations.pdf

Bradbury, I. R., Lehnert, S., Kess, T., Van Wyngaarden, M., Duffy, S., Messmer, A., Wringe, B., Karoliussen, S., Dempson, B. J., Fleming, I. A., Bentzen, P. (2022). Genomic Evidence of Recent European Introgression into North American Farmed and Wild Atlantic Salmon. Retrieved from the 2022 WAS conference.

Bradbury, I.R., Lehnert, S.J., Kess, T., Van Wyngaarden, M., Duffy, S., Messmer, A.M., Wringe, B., Karoliussen, S., Dempson, J., Fleming, I.A., Solberg, M.F., Glover, K.A., Bentzen, P. (2022) Genomic Evidence of Recent European Introgression into North American Farmed and Wild Atlantic Salmon. Evolutionary Applications. 2022; 15:1436–1448. https://onlinelibrary.wiley.com/doi/full/10.1111/eva.13454.

CAIA. (2023). Our National Salmon Farming Commitments to Canadians. Love Salmon website: https://assets.nationbuilder.com/lovesalmon/pages/83/attachments/original/1677075584/Love_Salmon_National_Salmon_Farming_Commitments_to_Canadians_Brochure_2023.pdf?1677075584.

Canadian Aquaculture Industry Alliance. (2021). Code of Practice: For the Care and Handling of Farmed Salmon. National Farm Animal Care Council website: https://www.nfacc.ca/codes-of-practice/farmed-salmonids.

Canadian Food Inspection Agency. (2018). Therapeutant Use in Aquaculture -– Questions and Answers. Canadian Food Inspection Agency website: https://inspection.canada.ca/preventive-controls/fish/questions-and-answers/eng/1515419238749/1515419275328.

Canadian Food Inspection Agency. (2019) Federally Reportable Diseases. https://inspection.gc.ca/animal-health/aquatic-animals/diseases/reportable-diseases/eng/1322940971192/1322941111904.

Chen S. (2018). Removing the Blinders on Land-based Aquaculture - Aquaculture North America. Aquaculture North America website: Removing the blinders on land-based aquaculture - Aquaculture North America.

Cherry, D. (2020). $2 Billion Doesn't Buy You Much Fish in the Land-based Aquaculture World. IntraFish website: $2 billion doesn''t buy you much fish in the land-based aquaculture world |

IntraFish.com.

Crowley, S.E, Bradbury, I. R., Messmer, A.M., Duffy, S.J., Parrish, C.C., Islam, S.S., Fleming, I.A. (2021). Differences in Energy Acquisition and Storage of Farm, Wild, and Hybrid Atlantic Salmon Competing in the Wild. Can. J. Fish. Aquat. Sci. 80: 43–56 (2023) dx.doi.org/10.1139/cjfas-2021-0326.

Dadswell, M., Spares, A., Reader, J., McLean, M., McDermott, T., Samways, K., Lilly, J. (2012). The Decline and Impending Collapse of the Atlantic Salmon (*Salmo salar*) Population in the North Atlantic Ocean: A Review of Possible Causes. Rev. Fish. Sci. Aquac. 30, 215–258. https://doi.org/10.1080/23308249.2021.1937044.

Dai, Y., Yang, S., Zhao, D. *et al*. (2023). Coastal Phytoplankton Blooms Expand and Intensify in the 21st Century. Nature 615, 280-284. https://doi.org/10.1038/s41586-023-05760-y.

Davis, B.D. Minister. (2021). Guidelines for Environmental Preview Report for the Indian Head Hatchery Expansion Project. Department of Environment and Climate Change, Government of Newfoundland and Labrador DOC/2021/06724. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ecc/files/env_assessment_y2021_1975-EPR-Guidelines.pdf.

Department of Environment and Climate Change. (2002). Guide to the *Environmental Protection Act*. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ecc/files/env-assessment-guide-to-epa.pdf.

Department of Environment and Climate Change. (2002). Guide to the *Water Resources Act*. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ecc/files/pdf-guide-water-resources-act.pdf.

Department of Environment and Climate Change (2018). Indian Head Hatchery Expansion Project - Registration 1975. Decision Letter September 4, 2018. https://www.gov.nl.ca/ecc/files/env-assessment-projects-y2018-1975-1975-min-decision-letter2018.pdf.

Department of Fisheries, Forestry and Agriculture. (2010). Coastal and Ocean Management Strategy and Policy Framework. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/publications-pdf-oceansdiscussionpaper.pdf.

Department of Fisheries, Forestry and Agriculture. (2013). Bay Management Areas Agreement for the South Coast of NL.

Department of Fisheries, Forestry and Agriculture. (2017). Review of Bays West of McCallum for Farming Suitability of Atlantic Salmon. The Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/.

Department of Fisheries, Forestry and Agriculture. (2019). Applicant Guidance Document - Environmental Information Reviews. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Applicant-Guidance-Document-Environmental-Information-Reviews.pdf

Department of Fisheries, Forestry and Agriculture. (2020). Atlantic Salmon Surveillance Plan. Government of Newfoundland website: https://www.gov.nl.ca/ffa/files/Newfoundland-and-Labrador-Fisheries-Forestry-and-Agriculture-Cultured-Atlantic-salmon-Surveillance-Plan.pdf

Department of Fisheries, Forestry and Agriculture. (2020). Biosecurity Audit Plan Aquatic Animal Health Division Guidelines. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Aquatic-Animal-Health-Division-Biosecurity-Audit-Plan-September-2020.pdf

Department of Fisheries, Forestry and Agriculture. (2020). Newfoundland and Labrador Aquatic Animal Reportable and Notifiable Diseases. Government of Newfoundland Website: https://www.gov.nl.ca/ffa/files/Newfoundland-and-Labrador-Aquatic-Animal-Reportable-and-Notifiable-Diseases-September-2020.pdf.

Department of Fisheries, Forestry and Agriculture. (2021). The Code of Containment for the Culture of Salmonids in Newfoundland and Labrador. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/DOC-2022-04405-Salmonid-Code-of-Containment-Updated-

October-20222.pdfhttps://www.gov.nl.ca/ffa/files/Salmonid-Code-of-Containment-Updated-July-2021.pdf.

Department of Fisheries, Forestry and Agriculture. (2022). 2020-2021 Annual Report. Government of Newfoundland and Labrador website: https://www.assembly.nl.ca/business/electronicdocuments/FFAAnnualReport2021-22.pdf

Department of Fisheries, Forestry and Agriculture. (2022). Site Restoration Plan and Financial Assurance Requirements Document.

Department of Fisheries, Forestry and Agriculture Aquaculture Development Division. (2022). Environmental and Waste Management Plan Guidelines. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/DOC-2022-00210-Aquaculture-application-guidance-document-Environmental-and-Waste-Management-Plan-Guidelines-2022.pdf.

Department of Fisheries, Forestry and Agriculture Aquaculture Development Division. (2022) Code of Containment for the Culture of Salmonids in Newfoundland and Labrador. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/DOC-2022-04405-Salmonid-Code-of-Containment-Updated-October-20222.pdf.

Department of Fisheries, Forestry and Agriculture. (2018). National Accord for the Protection of Species at Risk. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/wildlife-endangeredspecies-accord.pdf

Department of Fisheries, Forestry and Agriculture. (2019). Aquaculture Policies and Procedures Manual. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/licensing-pdf-aquaculture-policy-procedures-manual.pdf.

Department of Fisheries, Forestry and Agriculture. (2020) Biosecurity Audit Plan Aquatic Animal Health Division Guidelines. https://www.gov.nl.ca/ffa/files/Aquatic-Animal-Health-Division-Biosecurity-Audit-Plan-September-2020.pdf.

Department of Fisheries, Forestry and Agriculture. (2020). Cleaner Fish Surveillance Plan. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Newfoundland-and-Labrador-Fisheries-Forestry-and-Agriculture-Cleaner-Fish-Surveillance-Plan.pdf.

Department of Fisheries, Forestry and Agriculture. (2020). Sea Lice Integrated Pest Management Plan. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Newfoundland-and-Labrador-Sea-Lice-Integrated-Pest-Mangement-Plan.pdf.

Department of Fisheries, Forestry and Agriculture. (2020). Viral Management of Infectious Salmon Anaemia Virus Contingency Plan Guidelines. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Viral-Managment-of-ISAv-Contingency-Plan-Guidelines-for-Newfoundland-and-Labrador.pdf.

Department of Fisheries, Forestry and Agriculture. (2021). Aquaculture Operator Incident Reporting Guidelines. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/21055-Aquaculture-Incident-Reporting-March-25.pdf.

Department of Fisheries, Forestry and Agriculture. (2022). Aquaculture Licensing—Once Licensed: What to Expect. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Aquaculture-Licensing-Once-Licensed-What-to-Expect-May-2022-Version-1.0.pdf.

Department of Fisheries, Forestry and Agriculture. (2022). Aquaculture Licencing Guide. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/files/Aquaculture-Licensing-Guide-May-2022-Version-1.0.pdf

Department of Fisheries, Forestry and Agriculture. Conditions of Licence. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ffa/programs-and-funding/fisheries-and-aquaculture/support/.

Department of Fisheries, Forestry and Agriculture: Aquaculture Development Division. (2022). Aquaculture Licencing Guide. Government of Newfoundland and Labrador website:

https://www.gov.nl.ca/ffa/files/-Licensing-Guide-May-2022-Version-1.0.pdf.

Environment and Natural Resources Canada. (2019). Disposal at Sea Legislation and Regulations. Government of Canada website: https://www.canada.ca/en/environment-climate-change/services/disposal-at-sea/legislation-regulations.html#cepa.

Environment Canada. (2016). National Marine Weather Guide Atlantic Regional Guide. Government of Canada website: https://publications.gc.ca/collections/collection_2017/eccc/En56-259-2016-1-eng.pdf

Evans, J. (2022). Market Continues to Punish Land-based Salmon Farming Stocks. IntraFish website: Market continues to punish land-based salmon farming stocks | IntraFish.com.

FAIRR - A Coller Initiative. (2022). Coller FAIRR Protein Producer Index. FAIRR a Coller Initiative website: https://www.fairr.org/resources/reports/index-2022.

Fisheries and Marine Institute of Memorial University of Newfoundland. (2020). A Review of the 2019 Newfoundland and Labrador South Coast Cultured Atlantic Salmon Mortality Event. Publications-pdf-2019-salmon-review-final-report.pdf (gov.nl.ca).

Fisheries and Oceans Canada. (2012). Canada Invasive Species. Government of Canada website: http://www.dfo-mpo.gc.ca/oceans/publications/soto-rceo/2012/page06-eng.html .

Fisheries and Oceans Canada. (2013). Aquatic Invasive Species Identification Booklet—Wanted. Government of Canada website: https://waves-vagues.dfo-mpo.gc.ca/Library/365586.pdf.

Fisheries and Oceans Canada. (2013). Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/007. Government of Canada website: https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40573412.pdf.

Fisheries and Oceans Canada. (2014). Oceanographic conditions of salmon farming areas with attention to those factors that may influence the biology and ecology of sea lice, *Lepeoptherius salmonis* and *Caligus* spp., and their control. Department of Fisheries and Oceans website: https://publications.gc.ca/collections/collection_2015/mpo-dfo/Fs70-5-2014-048-eng.pdf

Fisheries and Oceans Canada. (2015). Aquaculture Activities Regulations. Government of Canada website: https://laws.justice.gc.ca/eng/regulations/SOR-2015-177/page-1.html#h-820176.

Fisheries and Oceans Canada. (2017). National Code on Introductions and Transfers of Aquatic Organisms. (2017) Fisheries and Oceans Canada June 28, 2017. Ottawa, Ontario K1A 0E6 DFO/2017-1997 Fs49-10/2017E-PDF 978-0-660-08597-5. The Government of Canada website: https://www.dfo-mpo.gc.ca/aquaculture/management-gestion/it-code-eng.htm

Fisheries and Oceans Canada. (2018). AAR Monitoring Standard. Government of Canada website: https://www.dfo-mpo.gc.ca/aquaculture/management-gestion/doc/AAR-Monitoring-Standard-2018-eng.pdf.

Fisheries and Oceans Canada. (2018). Canada's Oceans Now: Atlantic Ecosystems. Government of Canada website: https://www.dfo-mpo.gc.ca/oceans/publications/soto-rceo/2018/ebook/index-eng.html.

Fisheries and Oceans Canada. (2019). Salmonid Alternative Production Technologies Technical Working Group Report and Recommendations. Government of Canada website: Salmonid alternative production technologies technical working group report and recommendations (dfo-mpo.gc.ca).

Fisheries and Oceans Canada. (2019). State of Salmon Aquaculture Technologies. Government of Canada website: State of Salmon Aquaculture Technologies, 2019 (dfo-mpo.gc.ca).

Fisheries and Oceans Canada. (2022). Review of the Marine Harvest Atlantic Canada Inc. Aquaculture Siting Baseline Assessments for the South Coast of Newfoundland. Can. Sci. Advis. Sec. Newfoundland and Labrador Region Science Advisory Rep. 2022/002. Government of Canada website: https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/41078421.pdf.

Fisheries and Oceans Canada. (2022). Stock Assessment of Newfoundland and Labrador Atlantic Salmon in 2020. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/031. Government of Canada website: https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/41073629.pdf.

Fracflow Consultants Inc. (2018). Final Report Environmental Screening (Phase 1 & 2) Proposed Fish Hatchery Location Marine Harvest Atlantic Canada Stephenville, NL.

Fracflow Consultants Inc. (2018). Site Selection and Evaluation Report Potential Fish Hatchery/Aquaculture Locations Western and Central Newfoundland.

Fracflow Consultants Inc. (2020). Draft Well Field and Aquifer Monitoring June 2020 Annual Sampling Event Norther Harvest Smolt Ltd. Stephenville, NL.

Fracflow Consultants Inc. (2021). Final Report Hydrogeology and Predicted Response of the Northern Harvest Smolt Ltd. Freshwater Aquifer to Long Term Withdrawals Stephenville, NL.

Fracflow Consultants Inc. (2022). Well Field and Aquifer Monitoring, September 2022 Quarterly Sampling Event, Fracflow Consultants Inc.

Fracflow Consultants Inc. (2023). 3D Model Predications of the Worst-case Response of the Mowi Canada East – Northern Harvest Smolt Ltd. Freshwater Aquifer to Long Term Withdrawals, Stephenville NL.

Gibson, R.J. (2017). Salient Needs for Conservation of Atlantic Salmon. Fisheries 42, 163–174. American Fisheries Society website: https://doi.org/10.1080/03632415.2016.1276331.

Global Seafood Alliance Best Aquaculture Practices. (2023). Aquaculture Facility Certification—Salmon Farms. Best Aquaculture Practices Certification website: https://www.bapcertification.org/Downloadables/pdf/GSA%20-%20Salmon%20Farm%20Standard%20-%20Issue%202.4%20-%2007-February-2023.pdf.

Global Seafood Alliance Best Aquaculture Practices. (2023). Hatchery Standards. Best Aquaculture Practices Certification website: https://www.bapcertification.org/Downloadables/pdf/GSA%20-%20Hatchery%20Standard%20-%20Issue%202.1%20-%2030-January-2023.pdf.

Global Sustainable Seafood Initiative (GSSI). Global Sustainable Seafood Initiative website: https://www.ourgssi.org/.

Goodwin, S.C., Fast, M.D., Kuparinen, A., Medcalf, K.E., and Hutchings, J.A. (2020). Increasing Temperatures Accentuates Negative Fitness Consequences of a Marine Parasite. The website Nature: https://www.nature.com/articles/s41598-020-74948-3.

Government of Newfoundland and Labrador. (2006). Private Sewage Disposal and Water Supply Standards. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/dgsnl/files/publications-private-sewage-disposal-and-water-supply-standards.pdf.

Government of Newfoundland and Labrador. (2011). *Fish Inspection Act* (Chapter F-12) and Regulations. Newfoundland and Labrador House of Assembly website: https://www.assembly.nl.ca/legislation/sr/statutes/f12.htm.

Government of Newfoundland and Labrador. (2014). *Crown Lands in Accordance with the Lands Act* Chapter 36 (subsections 4(1), (5) and (7)). Newfoundland and Labrador House of Assembly website: https://www.assembly.nl.ca/legislation/sr/statutes/a13.htm#4.

Government of Newfoundland and Labrador. (2017). *Crown Lands in accordance with the Lands Act* Chapter 36. Newfoundland and Labrador House of Assembly website: https://www.assembly.nl.ca/legislation/sr/statutes/l3691.htm#3.

Government of Newfoundland and Labrador. (2022). Atlantic Salmon Rivers. Salmon Atlas website: The Atlantic Salmon Rivers of Newfoundland, Canada -– The Salmon Atlas.

Health Canada Pest Management Regulatory Agency. (2003). Fact Sheet on The Regulation of Pesticides in Canada. Office of the Auditor General of Canada website: https://www.oag-bvg.gc.ca/internet/docs/fs_pestreg-e.pdf.

Health Canada Pest Management Regulatory Agency. (2017). Registration Decision RD2017-13, Azamethiphos. Government of Canada website: https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/decisions-updates/registration-decision/2017/azamethiphos-2017-13.html.

Health Canada Pest Management Regulatory Agency. (2017). Registration Decision: Azamethiphos.

Government of Canada website: https://publications.gc.ca/collections/collection_2017/sc-hc/H113-25/H113-25-2017-13-eng.pdf.

Health Canada. (2010). Drugs in Aquaculture. The Government of Canada Website: https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/legislation-guidelines/policies/sale-use-drugs-aquaculture-policies-veterinary-drugs.html.

International Maritime Organization. (2019). International Convention for the Prevention of Pollution from Ships (MARPOL). International Maritime Organization website: https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx.

Intership AS. (2009). NSK 142-101-094-A-Model-3 Docking Plan.

Intership AS. (2015). Garbage Management Plan.

Intership AS. (2016). 72.20m Livefish Carrier Designed by NSK. NSK website: https://www.nsk-aquaculture.com/nsk-live-fish-carrier-2200

Intership AS. (2019). Inter NSK 5103-101-001_C1 General Arrangements.

Intership AS. Emergency Response Manual Shipboard.

Intership AS. Form and Checklist Manual 15 FCM-07-04-03 H202 Treatment.

Intership AS. Main Operation Manual MOM-08 Fish Handling Operations.

Intership AS. Main Operation Manual MOM-09 Safety Procedures.

Mowi ASA. (2020). Policy on Salmon Welfare. Mowi ASA website: https://mowi.com/it/wp-content/uploads/2020/08/Mowi-Salmon-Welfare-Policy-1.pdf

Mowi ASA. (2020). Policy on use of Antimicrobial Agents. Mowi ASA website: https://mowi.com/wp-content/uploads/2020/03/Mowi-Policy-on-use-of-antimicrobial-agents.pdf.

Mowi ASA. (2022). Policy on Climate Change and Energy Use. Mowi ASA website: https://mowi.com/wp-content/uploads/2020/02/Mowi-Climate-Change-and-Energy-Use-Policy.pdf

Mowi ASA. (2022). Policy on Freshwater Use and Wastewater Discharge. Mowi ASA website: https://mowi.com/wp-content/uploads/2022/07/220713-Mowi-Freshwater-use-Policy.pdf

Mowi ASA. (2022). Policy on Integrated Pest Management (IPM) for Sea Lice Control. Mowi ASA website: https://mowi.com/wp-content/uploads/2022/06/220619-Mowi-Policy-on-Integrated-Pest-Management.pdf

Mowi ASA. (2023). Salmon Farming Industry Handbook 2023 2023. Mowi ASA website: Salmon Farming Industry Handbook 2019 (mowi.com)

Mowi ASA. (2023). Sustainability Strategy. Leading the Blue Revolution 2023. Mowi ASA website: (2023) https://mowi.com/wp-content/uploads/2023/03/Mowi-Sustainability-Strategy_March_23.pdf.

Mowi Canada East Inc. (2018). Environmental Registration for Northern Harvest Smolt Ltd., Stephenville, NL. Government of Newfoundland and Labrador website: https://www.gov.nl.ca/ecc/files/env-assessment-projects-y2018-1975-1975-indian-head-reg-doc.pdf.

Mowi Canada East Inc. (2023). Environmental Management and Waste Management Plan

Mowi Canada East Inc. (2023). Re: Letter of Support for License Application- Solvtrans.

Mowi Canada East Inc. (2023). Salmonid Fish Health Management Plan.

Mowi Canada East Inc. (2023). Integrated Pest Management Plan in the Salmonid Fish Health Management Plan.

Mowi Canada East Inc. (2023). Standard Safe Operating Practices for Truck Drivers.

Murphy, G. M. and Robinson, S. M. C. (2022). Review of Antibiotic Resistance Genes (ARGs) in Salmon Aquaculture and Empirical Date on Spatial and Seasonal Trends in the Bay of Fundy. Government of Canada website: https://publications.gc.ca/collections/collection_2023/mpo-dfo/fs70-5/Fs70-5-2022-061-eng.pdf.

Naylor, R.L., Hardy, R.W., Buschmann, A.H. *et al.* (2021). A 20-year Retrospective Review of Global Aquaculture. Nature 591, 551-563. https://doi.org/10.1038/s41586-021-03308-6

Norsk Fisketransport AS. (2012). Ballast Water Management Plan.

Nutreco. (2021). Nutreco Sustainability Roadmap 2025. Nutreco website: https://www.nutreco.com/siteassets/nutrecocorp-documents/legal-docs--sustainability-docs/sustainability/roadmap-2025-brochure.pdf?v=48ffb4

Oxyguard. (2014). Oxyguard® Commander Dissolved Oxygen and Water Quality Metering Control and Monitoring System. The Oxyguard website: https://www.dropbox.com/sh/ruia151ag5myzha/AAB40hVoIy2frXVbkTNlKTnna?dl=0&preview=C01+Commander+manual+all+gb+2014+03.pdf.

Pardo, S.A., Bolstad, G.H., Dempson, J.B., April, J., Jones, R.A., Raab, D. Hutchings, J.A. (2021). Trends in Marine Survival of Atlantic Salmon Populations in Eastern Canada. ICES J. Mar. Sci. 78, 2460-2473. https://doi.org/10.1093/icesjms/fsab118https://doi.org/10.3354/fsab118.

Renkawitz, M.D., Sheehan, T.F., Dixon, H.J., Nygaard, R. (2015). Changing Trophic Structure and Energy Dynamics in the Northwest Atlantic: Implications for Atlantic Salmon Feeding at West Greenland. Mar. Ecol. Prog. Ser. 538, 197–211. https://doi.org/10.3354/meps11470.

Russell, I.C., Aprahamian, M.W., Barry, J., Davidson, I.C., Fiske, P., Ibbotson, A.T., Kennedy, R.J., Maclean, J.C., Moore, A., Otero, J., Potter, T.E.C.E., Todd, C.D. (2012). The Influence of the Freshwater Environment and the Biological Characteristics of Atlantic Salmon Smolts on their Subsequent Marine Survival. Marine Survival. ICES J. Mar. Sci. 69, 1563–1573.

Skretting. (2019). Committed to the Ocean. Skretting website: https://www.skretting.com/en-ca/sustainability/sustainability-reporting/sustainability-report-2019/12.-committed-to-the-ocean/.

Soto, D.X., Trueman, C.N., Samways, K.M., Dadswell, M.J., Cunjak, R.A. (2018). Ocean Warming Cannot Explain Synchronous Declines in North American Atlantic Salmon Populations. Mar. Ecol. Prog. Ser. 601, 203–213. https://doi.org/10.3354/meps12674.

Thomas, H. (2019.) Recirculating Aquaculture System-based Salmon Farming, Field Actions Science Reports Special Issue 20. https://journals.openedition.org/factsreports/5766.https://journals.openedition.org/factsreports/576.

Town of Stephenville. (2014). Development Regulations, Schedule C of the Town of Stephenville Development Regulations as supplied by the Department of Municipal Affairs. The Government of Newfoundland and Labrador website: http://www.mae.gov.nl.ca/registry/community/stephenville/files/DR.pdf.

United Nations Foundation. (2015). United Nations Sustainable Development Goals (SDGs). The United Nations Foundation website: https://unfoundation.org/what-we-do/issues/sustainable-development-goals/.

Verspoor, E., McGinnity, P., Bradbury, I., and Glebe, B. (2015). The Potential Direct and Indirect Genetic Consequences for Native Newfoundland Atlantic Salmon from Interbreeding with European-origin Farm Escapes. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/030. viii + 36 p. https://publications.gc.ca/collections/collection_2015/mpo-dfo/Fs70-5-2015-030-eng.pdf.

Watts, J. E. M., Schreier, H. J., Lanska, L., & Hale, M. S. (2017). The Rising Tide of Antimicrobial Resistance in Aquaculture: Sources, Sinks and Solutions. Marine Drugs, 15(6), 158. https://doi.org/10.3390/md15060158.

Westley, P.A.H., Ings, D.W., Fleming, I.A. (2011). A Review and Annotated Bibliography of the Impacts of Invasive Brown Trout (Salmo trutta) on Native Salmonids, with an Emphasis on Newfoundland Waters. Canadian Technical Report of Fisheries and Aquatic Sciences 2924 I+. Fisheries and Oceans Peches et Oceans Canada. III Canada. The Government of Canada website: https://publications.gc.ca/site/eng/470348/publication.html

9.0 PUBLIC ENGAGEMENT

Guidelines: An Open House Public Information Session shall be held at a place adjacent to or in the geographical area of the undertaking, or as the Minister may determine, in order to:

- *provide information concerning the undertaking to the people whose environment may be affected by the undertaking;*
- *record and respond to the concerns of the local community regarding the environmental effects of the undertaking; and,*
- *present the information gathered to fulfill the requirements of Section 5 of these guidelines.*

The purpose of this session is to describe all aspects of the proposed project, to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns. You are required to notify the Minister and the public of the scheduled meeting not fewer than 7 days before that meeting. Public concerns shall be addressed in a separate section of the EPR.

As per the directions in the Environmental Preview Report (EPR) Guidelines, public engagement events were organized for the purpose of providing project information and an opportunity for all interested persons to request more information and/or state their concerns or support for the project.

These events included an Open House in-person public information session held in the Town of Stephenville, in the geographical area of the Hatchery Expansion, a project website with a Comment Forum, and a virtual live Question and Answer Session. This section provides the details of these events and public responses.

A fourth method of public engagement - focused events – was organized for individual groups to engage privately and have discussions specific to their interests. These events are also included as they provide an indication of public interest in the project.

9a Public Engagement Plan

A Public Engagement Plan was prepared that included the format, schedule, and other details of the proposed information sessions. The draft plan was presented to the Minister, via the Environmental Assessment Committee (EAC) on Mar 14, 2023, and was approved Mar 29,

2023.

The approved plan included an in-person Open House at the Town of Stephenville, a dedicated website for project information with a comment forum, and a virtual live question and answer session.

Not included in the approved plan, a radio interview with the CBC Newfoundland Morning Show and one print release with the Canadian Press Weekly News advertised the project and engagement events to a wide audience.

In addition to the events in the approved plan, focused events for specific groups were also arranged in response to requests received at the Open House. Table 88 provides the project information events and dates.

Table 88 Project Information Events and Dates

Date(s)	Information Event
April 19, 2023	Radio Interview, CBC Newfoundland Morning Show
April 20, 2023	Public In-person Open House, Town of Stephenville
April 20, 2023	Print Media, Canadian Press Weekly News
April 20, 2023 & ongoing	Focused Events
April 20-June 1, 2023	IndianHeadProject.ca website and Comment Forum
May 11, 2023	Public Virtual Live Q & A Session

Advertising

Public events were advertised in newspapers and social media sites as per the specifications provided in Appendix A of the EPR Guidelines. Public events were also advertised during radio and print interviews, on the project website, and through personal communication.

Table 89 provides the public engagement event information with advertising dates, methods, and other details. Appendix E: Public Engagement Notifications provides the advertising requirements and a copy of the notifications.

Table 89 Public Engagement Events and Advertising Information

Public Engagement	Event Date(s)	Advertising Method	Date(s)	Advertising Details
In-person Open House, Stephenville, NL	Apr 20, 2023	Print Media, Newspaper	April 8, Apr 14-15, Apr 18-19-20, 2023	The Telegram, distributed throughout the Island of Newfoundland
		Personal Communications	April 8-20, 2023	Emails, phone calls, personal discussions: ECC Minister Davis, FFA Minister Loveless, ADM Roberts, EAC, MHA Wakeham, Stephenville Mayor & Council, Qalipu First Nation, Miawpukek First Nation, Port of Stephenville, Stephenville Airport, local businesses
		Radio Interview	April 19, 2023	CBC Newfoundland Morning Show - project history and description and invitation to attend the Open House
		Social Media	Apr 5-May 11, 2023	Town of Stephenville Crossing Bulletin Facebook page Town of Stephenville Facebook page Mowi Canada East Inc. Facebook page
IndianHeadProject.ca and **Comment Forum**	Website: Apr 21-ongoing Comment Forum: Apr 21-Jun 1, 2023	Personal Communications	Apr 20-June 1, 2023	During Open House: Discussions and website demonstration Email, phone calls, responses to queries
		Print Media	April 20, 2023	Bookmarks with URL and QR code provided at In-person Open House
		Social Media	Apr 5-May 11, 2023	Town of Stephenville Crossing Bulletin Facebook page Town of Stephenville Facebook page Mowi Canada East Inc. Facebook page
Virtual Live Q&A Session	May 11, 2023	Personal Communications	Apr 20-June 1, 2023	During Open House: Discussions and website demonstration Website & Comment Forum: Online responses to queries and personal assistance with site use Email, phone calls, personal communications
		Print Media	April 20, 2023	Bookmarks with URL and QR code handed out to participants at Public In-person Open House
		Social Media	Apr 5-May 11, 2023	Town of Stephenville Crossing Bulletin Facebook page Town of Stephenville Facebook page Mowi Canada East Inc. Facebook page
		Print Media	April 20, 2023	Canadian Press Weekly News Interview - project history and description and invitation to access the website and comment forum and attend virtual live Q & A Session
		Project website	Apr 21-May 11, 2023	Invitation to join Q&A session displayed on first page of the website, link to join the session via website

9b Public Engagement Events and Results

Three opportunities were organized for the public to learn more about the project and provide their comments – an in-person open house in Stephenville, a project website with a comments section, and a virtual live Q&A session. This section provides the event information and the results of the public comments.

Engagement Results Recap

Table 90 provides a recap of the public information events. The Open-House and the IndianHeadProject.ca website and Comment Forum had the greatest participation and highest numbers of questions and comments. Full details of the questions and comments and MCE responses are provided in the individual event sections below.

Table 90 Recap of Public Engagement Participation and Hatchery Expansion Support

Event	Attendees or Website Access*	Public Questions and Comments		
		Questions and MCE Responses+	Comments Supporting the Project	Comments Not Supporting the Project
In-person Open House	60	15	13	0
Website and Comment Forum	273	7	9	2
Virtual Live Q & A Session	6	2	1	0
Totals	**339**	**24**	**23**	**2**

*Not including MCE representatives or web administration

+Questions are included in the Questions column numbers not in Comments columns.

1. In-person Open House

Time/Date: 6:30-8:45pm April 20, 2023

Location: Days Inn, Stephenville, Province of Newfoundland and Labrador

The Open House displayed detailed project information through a series of large banners and a project video showing the Indian Head Hatchery technology. Attendees progressed through the project information at their own pace and MCE representatives were stationed at the banners to answer questions and provide additional information.

Attendees engaged Mowi Canada East Inc. (MCE) representatives and could pose their questions and discuss their interests and/or concerns. Attendees were encouraged to discuss

the project as a group, individually, or in private with MCE representatives. For individuals and groups that requested additional information, MCE made a commitment to provide the information and offered to arrange a future meeting, and/or a hatchery tour.

Attendees

The Open House had approximately sixty people attending, not including MCE representatives. Forty-nine attendees voluntarily registered and at least ten others attended but did not fill out the register. Attendees included the following.

- Stephenville-Port au Port MHA attended and engaged with MCE representatives.
- The Town of Stephenville Deputy Mayor, three councilors, and Chief Administrative Officer were in attendance.
- The Qalipu First Nation, Indian Head First Nation, and Port au Port Mi'kmaq Band also sent representatives.
- Local residents, business owners, and stakeholders attended from the Town of Stephenville, Stephenville Crossing, Kippens, West Bay, Piccadilly, Point au Mal, Noels Pond, and Corner Brook.

Questions and Comments

Attendees were provided three opportunities to provide their opinion of the project:

1) directly to MCE representatives during discussions and/or
2) privately complete a written comment form and/or
3) provide comments online at project website.

Most opted to provide comments verbally, 14 written comments forms were received, and no online comments were recorded during the Open House event. The following recaps the discussions and submitted comments. The details are also provided below.

Public Comments Recap

- All attendees supported the project. No negative opinions or concerns were expressed.
- The format of the Open House with information banners and direct communication with MCE representatives was well received.
- The Open House continued to ensure all questions about the project were answered to the satisfaction of the attendees.
- Attendees felt heard and enjoyed engaging directly with MCE representatives.
- Several requests for Focused Events were received as were invitations to provide more information to specific groups.

Written Comments

A prepared form with a series of questions and a general comment section was made available at the event and a total of fourteen (14) forms were completed. The following provides the questions and verbatim answers as provided in the submissions. Please note not all the questions were answered in all submissions.

1. Question: Do you feel this is a positive project for the area?

- Yes 13
- Neutral 1
- No 0

2. Question: Please explain your answer in the previous question.

- Yes responses from previous question
    - Brings lots of opportunity to the area.
    - Answered all my questions.
    - This project will eliminate risks of groundwater contamination during shipping and loading (of fish being transported).
    - It brings in a lot of jobs to the area.
- Neutral response from previous question
    - I can see the benefits but would like greater understanding.

3. **Question: Is the environment where you live affected by the project?**

- Yes 1
- Not really 2
- No 11

4. **Question: How does the project affect the environment you live in?**

- Yes response from previous question.
    - There is always an environmental affect.
- Not really and No responses from previous question
    - Improves the economy.
    - Improves the economy.
    - Improves the economy.
    - Economy will improve.
    - I feel that fish farming will allow the natural stocks to recover.
    - Affects the environment in a positive way.
    - Absolutely nothing negative.
    - It doesn't affect at all environmentally.
    - No negative effect to be seen. Very clean location around the buildings.

5. **Question: Were all your questions answered at the information session?**

- Yes 13
- No 0

6. **Question: Do you need to know more information about the project?**

- Yes 1
- No 13

7. **Question: Do you have other comments?**

- I support the project.
- I absolutely support this project.
- Yes, I support the project.
- Yes to the project.
- This project has my full support.
- I support this project.
- I support this project 100%.
- Great Initiative.
- Positive all around, employment, sustainable food etc.
- Excellent for the community and province. Lots of advanced technology.
- Its great for the area! It should be supported more.
- I support the project.

Verbal Questions and Mowi Responses

The following provides some of the questions directed to Mowi representatives during the event and the responses that were provided.

1. **Question: How do we know the aquifer will not run dry from the hatchery use? Some communities run out of water already in summer.**

Response: Several surveys of the aquifer were done that included modelling the water use over 10 years to see how quickly the water level in the aquifer can come back after water is used. These surveys showed there is ample water for the hatchery and for other users. The Water Use Division of the Department of Environment and Climate Change manages the hatchery water use with real-time data from the wells and regular reports from the hatchery.

2. **Question: I saw the pipes laying on the ground. Are they going to stay there? I'm referring to the black pipes currently stored (on the hatchery site) that can see from the road.**

Response: The pipes you can see from the road are for the remaining part of the project that has not been completed. Once the project can proceed, the pipes will be used to complete the project and will no longer be laying on the ground.

3. **Question: When will the project start? When will the project be finished**?

Response 1: The project has started, and construction is partially complete. The project started when we received the release in 2019 from the Minister of Department of Environment and Climate Change. In 2021 the Minister determined the project construction could not be completed until an Environmental Preview Review was submitted. We are currently preparing the Environmental Preview Review and plan to submit it in June or July.

Response 2: If the project is released from further environmental review in September 2023, the construction will start immediately on fish culture buildings modules 3 and 4. Weather depending, the construction will be completed in December 2024.

4. **Question: What size are the fish when they go to sea?**

Response: Salmon are around 120 plus grams when they go to sea.

5. **Question: What is a well-boat used for?**

Response: Well-boats are used to move the salmon from the hatchery to the sea farms. They are also used to treat the fish for sea lice. Well-boats can remove lice from fish and remove the lice from the environment.

6. **Question: The fish transport line (from the hatchery to the well-boat at the port which is part of the project) is not finished – are you going to finish it? Why don't you continue to truck the fish to the boat like you do now?**

Response: Yes, the fish transport line will be completed. The transport line is more efficient with fewer environmental concerns. The line is fully enclosed with no opportunity for fish or fish culture water to escape into the environment. It is efficient and easy on the fish and the well-boat can be filled in much less time. The fish culture water from the hatchery used to move the fish along the line can be returned to the hatchery.

8. **Question: Hatchery had a big fish die off. Is the hatchery still under quarantine? How do we know this won't happen again?**

Response: Last year fish had to be culled in accordance with government fish health regulation due to the detection of ISA Infectious Salmon Anaemia, a natural pathogen that affects fish. We are working to make sure this doesn't happen again. The hatchery is still under quarantine, but we are expecting the quarantine to be lifted once the results of the most recent swab tests are complete. (Please Note: the hatchery is no longer under quarantine)

9. **Question: Do diseases go into the environment from the hatchery?**

Response: All fish culture water leaving the hatchery is screened to ensure no fish leave the hatchery, also the particles like fish faeces and scales down to a very small size 37 microns are removed, and all the water is UV disinfected to remove all pathogens before being discharged.

10. **Question: Will there be jobs for local people? Will local people be hired for the rest of the construction? I'm working away out of the province right now and need work closer to home.**

Response: Local people and local service companies are preferentially hired. Currently the staff at the hatchery in Stephenville live in the area.

11. **Question: I worked on original project construction and need more work. When will the construction start?**

Response: We expect to hear from the Department of Environment and Climate Change by September 2023 that the project is released and can go ahead. Construction will start shortly after that.

12. **Question: How many staff will be required for growing the additional fish?**

Response: The full culture cycle, egg to harvest, requires a ratio of about 15 staff to 1 million smolt, therefore the 2 million project fish would require 30 extra staff business-wide, approximately 10 of the additional staff would be at the hatchery.

13. **Question: Where can we send an application?**

Response: Contact information was provided for applications. (Note one CV was received that evening)

14. **Question: Will additional services, like the airport, be required once the project is complete?**

Response: Mowi plans to use Stephenville Airport to transport fertilized eggs to the hatchery for rearing.

15. **Question: This session was very good, are you planning to provide more information in future?**

Responses:

- Arrangements are being discussed with representatives of two new Bands in the area to meet and provide more details.
- Future presentations will be provided to the Stephenville Chamber of Commerce at their regular meetings to keep the members up to date on the project and the hatchery work.
- Quarterly updates will be provided to the Town of Stephenville Mayor and Council.

- Discussions were initiated with representatives of the College of North Atlantic in Stephenville for presentations at the institute.
- Hatchery tours were offered, and contact information provided to those who may be interested in future tours.

Verbal Comments

The following are statements made by session attendees to Mowi representatives at the event.

- The more services the hatchery will use is a very good thing for the area.
- More sessions like this would be great to continue to educate us on the hatchery and salmon growing.
- I'm very supportive of the project.
- This style of event is good, much better than a formal presentation where everyone has to sit down and listen.

2. Project Website and Comment Forum

URL: IndianHeadHatchery.ca

Launched: April 20, 2023

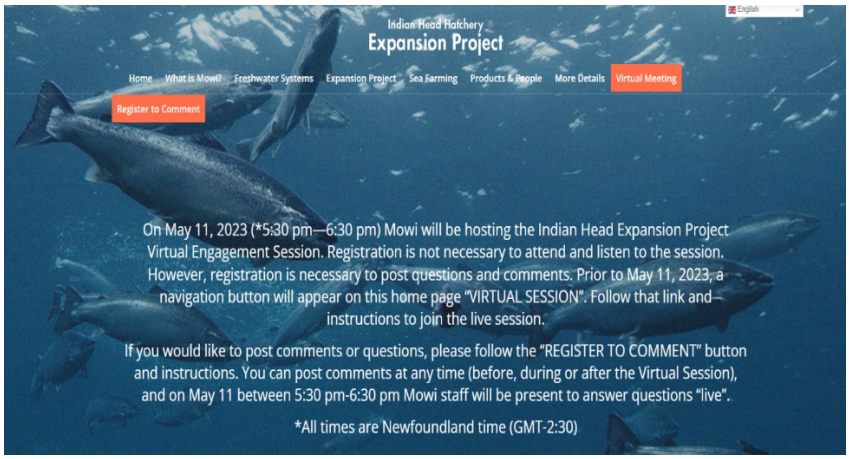
The IndianHeadProject.ca website was developed to engage a wider public audience throughout the province and globally. The website provided project information and housed the Comment Forum where the public could ask questions and provide comments. The website also provided advertisements for the Virtual Live Question and Answer Session and was the access point for the event.

Project information was provided as a series of web pages accessible through tabs at the top of the page. A Hatchery Expansion video link on the home page provided information on salmonid freshwater culture processes, technology, MCE goals, and the Hatchery Expansion rationale.

The website also houses the Comment Forum where the public was invited to post comments or questions from April 20 to June 1, 2023, and have MCE respond directly to their queries. All entries, including MCE responses, are available for public viewing through the website until September 30, 2023, and can be accessed at Indian Head Project | Indian Head Hatchery Expansion Project.

Figure 55 shows the top section of the IndianHeadProject.ca home page with information and links to the Comment Forum and the live Virtual Q & A Session and shows the tabs along the top that link to project information by topic.

Figure 55 IndianHeadProject.ca Home Page Section



Website Activity

The purpose of the website was to provide easy access to project information. The website was live on April 20, 2023, and as of June 1 (7 weeks) 273 individuals visited the website 303 times for project information for a total of 1,188 visits to various project information web pages, see Table 91. These numbers do not include website management or MCE project team activity.

Table 91 IndianHeadProject.ca Project Summary of Visitors by Week

Week	New Visitors	Total Visitors	Page Views
Apr 17- 23	53	53	209
Apr 24-30	57	60	304
May 1-7	93	103	392
May 8-14	42	53	186
May 15-21	5	6	23
May 22-28	13	16	29
May 29-Jun 1	10	12	45
Totals	273	303	1188

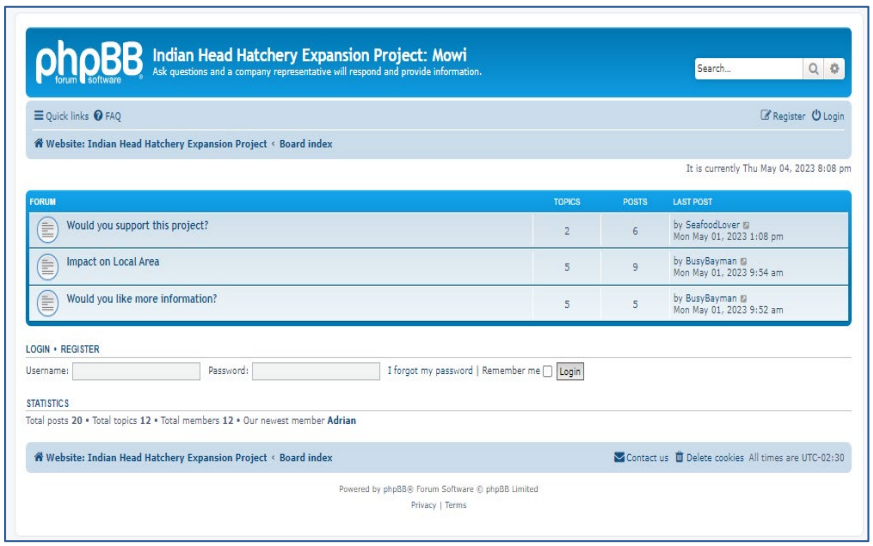
Comment Forum Activity

The purpose of the Comment Forum was to provide an accessible method to post project questions and comments and receive timely responses from MCE.

The Comment Forum was accessed via clearly marked buttons on the IndianHeadProject.ca website. Everyone could read all posts and those wishing to ask a question or send a comment to MCE were asked to set up an account.

MCE provided questions in three areas that registrants could respond to plus there was the option to post other questions and comments, see Figure 56.

Figure 56 IndianHeadProject.ca Comment Forum



Questions, Responses and Comments

A total of 17 individuals entered 32 questions or comments in the three areas as listed in Figure 56. The posts covered 14 topics and MCE provided responses to six questions.

The questions and comments posted prior to the May 11th Virtual Live Q & A Session are provided below. Comments and questions received during the Q & A Session are provided in the next section.

All comments, questions and responses were visible to the public. Anyone could post to the Comment Forum by signing in. The Comment Forum was open for posting questions and comments from April 21 to June 1. No new posts were entered after the Q & A Session responses were posted.

Area 1: Would you support the project?

Topic 1: Do you support this project and want it to succeed?

by Dean Bailey Sat Apr 29, 2023 10:55 am

Our company, Bailey's Marine Service LTD is in support of this expansion project. As a local provider of professional diving services, we employ between 5-10 local employees throughout the year and have been doing so for 30 years. We look forward to any opportunities this expansion will create not only for our employees but for the Bay ST George region as a whole.

By BusyBayman Mon May 01, 2023 9:49 am

I fully support this capital investment in our province. Having a reputable company such as MOWI wanting to invest in our province and its people is amazing. This investment will create jobs and business opportunities throughout the supply chain from egg-to-plate. Aquaculture is the most environmentally friendly form of protein farming on earth.

By SeafoodLover Mon May 01, 2023 1:08 pm

I fully support this project. Rural communities are thriving where aquaculture exists, and farming is the most reliable and sensible way to provide good healthy food as our populations grow. Newfoundland is lucky to be in an area where this activity can grow and prosper. It's good for people, good for the environment (I don't listen to belligerent activists, I can see and read and think for myself thanks), and good for the province. A solid fishery combined with a solid aquaculture industry are going to be a key part of any success we have here in NL.

By Jmaye Fri May 05, 2023 8:28 am

Yes I support this project.

By Trevor Ryan Thu May 11, 2023 6:08 pm. Posted during the Virtual Live Q & A Session, please see this comment in the next section.

By Millions-of-Morts Tue Apr 25, 2023 2:10 pm

Why even pretend this is ethical, and not ecocidal? It's like the tobacco industry suggesting smoking doesn't cause cancer. People are sick of company spin doctors and employees destroying the planet and our health. Externalizing pollution, feed, etc costs onto Nature and the public domain is 1900s thinking. Besides, "biologcal factors" now exceed feed costs. When will Mowi learn this method is not in tune with how salmon evolved and live in Nature AND that the constant fish health issues being amplified by Mowi cannot and should not be made the ecosystem/everyone's problem?

How's the salmon and trout fishing this year near Mowi's net pens? How many parasites and diseases are being amplified in the tanks and pens and dumped into the ecosystem on struggling wild fish populations?

Get it contained and made at least a little sustainable and maybe people will be more accepting. Stop buying cheap netting and start pouring more concrete and get the tank effluent

issues solved.

Question 1: Look at what Sustainable Blue is doing in NS. Why has Mowi not bought a license to use their technology? Profits, is of course, the answer. It's cheaper to pollute and destroy, always has been.

Response By Mowi Canada East: by admin Thu May 11, 2023 3:08 pm

Mowi does not have access to recreational fishing data. Feedback on wild catch received during public information sessions and on the online feedback forum will be included in the Environmental Preview Report submitted to the Newfoundland government.

Healthy fish are vital to Mowi's success, and fish health is managed by licensed veterinarians and fish health professionals. Each salmon is vaccinated to help guard against disease challenges endemic to the region.

Area 2: Impact on the area

Topic 2: Do you feel this is a positive project for the area? Yes/No/Neutral?

by BusyBayman Mon May 01, 2023 5:24 am

Yes. This capital investment and ongoing employment during operations will be a great benefit for the area. As well, the increased production of sustainable seafood for here at home and tables around the world helps to alleviate the increasing issue of food insecurity.

by Jmaye Fri May 05, 2023 4:00 am

Yes.

Topic 3: How are you affected by the project?

by Jmaye Fri May 05, 2023 4:02 am

Any job created in this province is good for all in the province.

Topic 4: Is the environment you live in affected by the project?

by Dean Bailey Sat Apr 29, 2023 6:28 am

No, I have not seen any indication of negative effect to the environment in the area. As a lifelong resident, I spend a lot of time in and around Port Harmon both for work and recreation and I can say I have seen no negative environmental impact from the hatchery operation.

by Jmaye Fri May 05, 2023 4:03 am

No.

Topic 5: How many metric tons of microplastics per net pen site per year

by Millions-of-Morts Tue Apr 25, 2023 9:28 am

Question 2: Hi; Can someone from Mowi estimate the number of metric tons of microplastics that enter the ocean from each net pen site? A recent study suggested it was a LOT of metric tons. https://www.sciencedirect.com/science/a ... 6X22004763

Response by Mowi Canada East by admin Thu May 11, 2023 10:41 am

Mowi was not party to the study you link to, so we cannot comment on its methodology nor accuracy. More information about microplastics, Mowi's efforts to reduce use and increase reuse, and potential effect on seafood safety is provided at https://mowi.com/blog/the-blue-revolution-plan/ and https://mowi.com/blog/reduce-reuse-recy ... g-plastic/ .

Topic 6: Can Mowi verify 1.5 metric tons/site plastics figure?

by Millions-of-Morts Tue Apr 25, 2023 10:04 am

Question 3: Hi Folks; Can someone from mowi verify the 1.5MT estimate figure? https://www.youtube.com/watch?v=K_ILVd2dxZY Also, is there any independent proof of a lack of microplastics in the NL Mowi salmon's flesh? And what about it's interaction with disease? https://www.sciencedaily.com/releases/2 ... 151532.htm.

Response by Mowi Canada East by admin Thu May 11, 2023 10:40 am

We cannot verify the results referred to in the YouTube link provided. The Food and Agricultural Organization of the United Nations (FAO) reports that while trace amounts of microplastics can be found in the gastrointestinal tract of fish, the research concludes that "no particular concern should arise from the consumption of microplastic-contaminated fish, since most of the microplastics will be removed when the animal is eviscerated (except in small fish, which are typically eaten whole)". The gastrointestinal tract (gut) of our salmon is removed before being sold in the market.

We continue to closely monitor microplastics in our products and results monitoring show no plastic-related contaminants in our salmon products.

More information about microplastics, Mowi's efforts to reduce use and increase reuse, and potential effect on seafood safety is provided at The Blue Revolution Plan - Mowi Company Website and Reduce, Reuse, Recycle: Managing plastic - Mowi Company Website.

Area 3: Would you like more Information?

Topic 7: Environmental Benefits

by Trevor Ryan Thu May 11, 2023 1:14 pm. Posted during the Virtual Live Q & A Session, please see the question and MCE response in the next section.

Topic 8: Importance of NLFD

by Trevor Ryan Thu May 11, 2023 1:21 pm. Posted during the Virtual Live Q & A Session, please see the question and MCE response in the next section.

Topic 9: Employment and Business Opportunities

by BusyBayman Mon May 01, 2023 5:22 am

Question 4: Can you provide statistics such as:

1. Number of jobs by currently

2. Estimated number of jobs as a result of the expansion at the hatchery, sites and throughout the supply chain?

3. What business opportunities will arise from the expansion?

4. What is the estimated economic benefit to Stephenville and surrounding area through taxation etc?

Response by Mowi Canada East by admin Thu May 11, 2023 10:55 am

1. Number of jobs by currently?

> The Indian Head Hatchery employs 25 people, fulltime. Our saltwater farms in NL employ 69 full-time staff which we expect to increase to 100 full-time staff in the coming months due to work volume.

2. Estimated number of jobs as a result of the expansion at the hatchery, sites and throughout the supply chain?

> The full culture cycle for Atlantic salmon, egg to harvest, requires a ratio of about 15 farming staff to 1 million smolt produced, therefore the project 2.2 million fish would require 30 additional staff throughout freshwater and saltwater farming.
>
> This expansion would also require additional administrative/office staff at Mowi, as well as increased business throughout the supply chain (transport, maintenance, processing

etc).

3. What business opportunities will arise from the expansion?

The Hatchery Expansion will require building contractors, fish culture systems contractors, site preparation including excavation and pipe laying and site finishing, waste management etc. To date, approximately $86 million has been invested in the hatchery buildings and equipment and the additional smolt produced at the hatchery will create additional business for operational services such as Stephenville Airport for egg transport, Gale Septic for fish waste removal, Port of Stephenville for smolt transport etc. Operational costs for 2022 were approximately $7 million and this will increase once the project has been completed.

At our saltwater farms, local service and supply contracts are a critical part of our company's success in NL. Examples of services that will benefit from this proposed expansion are research facilities, divers, net washers, fish movers, trucking, environmental consultants, wharves, offices, maintenance, and transportation services.

There are 7 communities that maintain long-standing arrangements to provide wharf use and services. 4. What is the estimated economic benefit to Stephenville and surrounding area through taxation etc?

In 2022, the Indian Head Hatchery property, water and sewer, and business taxes were approximately $206,000.

Topic 10: Plastic biofiltration balls dumped in bay via effluent?

by Millions-of-Morts Tue Apr 25, 2023 8:53 am

Question 5: Hi Folks; Not long ago (may 2020), what must have been ?millions? of plastic biofitration tubes about 1.5 inches by 1 inch were discovered in the estuary in front of the hatchery? Can someone from mowi explain how this happened and why they were left to blow around for weeks in the water? Also, how many cubic meters of these filters were lost? Example image of similar.

Response by Mowi Canada East Response by admin Thu May 11, 2023 10:53 am

We can acknowledge this incident did occur but cannot estimate the amount of material that bypassed the screens nor comment on the response time to recover materials. The Indian Head Hatchery Expansion Project will feature new technologies and updated design that includes triple screening to prevent a similar event from occurring.

Topic 11: Formaldehyde dumping in St. George's Bay

by Millions-of-Morts Tue Apr 25, 2023 1:42 pm

Question 6: While the hatchery dumps many types and huge quantities of poison into Bay St.George annually, I specifically want to know how many drums or litres of the known carcinogen/mutagen formaldehyde (like the one below) have been dumped in St.George's Bay via the effluent from the hatchery since the hatchery started? This drum was actually sent to the hatchery in Stephenville for use. https://photos.app.goo.gl/xukxfxeDejWa57GGA

Response by Mowi Canada East by admin Thu May 11, 2023 3:23 pm

The Health Canada approved and licensed use of formaldehyde to cure bacterial challenges at Canada's freshwater land-based fish facilities is made publicly available by the Department of Fisheries and Oceans Canada at this website: National Aquaculture Public Reporting Data - Land-Based and Freshwater Data 2021 - Open Government Portal (canada.ca)

Topic 12: Repeated ISVa outbreaks in the hatchery, where from?

by Millions-of-Morts Tue Apr 25, 2023 1:48 pm

Question 7: Hi; Can someone from Mowi explain how ISAv (an WOAH World Organization Animal Health, the animal version of the United Nations W.H.O. reportable disease) got in an deep underground, aquifer supplied, biosecure, hatchery several times? Also, what were the viral titres (concentration of viruses) in the effluent heading out into the 7 River's Bay after it was amplified in the bioreactors/tanks and which independent 3rd party verified the sampling results?

Response by Mowi Canada East Response by admin Thu May 11, 2023 3:22 pm

Infectious salmon anemia (ISAv) was found during routine fish health sampling at the Indian Head facility in Stephenville and reported publicly at MCE_ISAv_Stephenville_-_March_22_2022.pdf (naia.ca). ISAv is a naturally occurring virus and is not a human health

issue nor a food safety issue. Following all government regulations to protect fish health, the salmon group was immediately quarantined within the facility upon detection, and affected fish euthanized.

ISAv was transmitted vertically from the parental group – not via the water source (not horizontal transmission via aquifer). As Mowi announced last year, we have assembled a team of international experts to assist in developing plans to prevent vertical transmission in family groups. Throughout the event, the Provincial Government of NL made several site visits and drew samples.

3. Virtual Live Question & Answer Session

Time and date: 5:30-6:30pm May 11, 2023

Meeting access: Open to the public via meeting link provided 1 hour prior to the meeting on the IndianHeadProject.ca website.

The Virtual Live Q & A Session was an open public meeting that anyone could attend from the comfort of their home or office to hear and see project information and to post questions and/or comments for MCE response during the meeting.

Program

The Q & A Session was moderated by Aaron Bennett, MCE Development and Environmental Compliance Director and followed the agenda provided in Table 92.

Table 92 Virtual Live Question and Answer Session

Time*	Activity	Moderator
5:30-5:40	Welcome and Agenda	Aaron Bennett
5:40-6:00	Project Description and Information Questions and Responses from the Public In-person Open House	Pre-recorded
6:00-6:27	Questions and Comments Posted to the Comment Forum and Mowi Responses	Aaron Bennett
6:27-6:30	Closing Remarks	Aaron Bennett

*Newfoundland Time

The session started with a walk through the website which provided project information, followed by reading the questions and MCE responses from the public in-person Open House

held at Stephenville in April. The remainder of the program was dedicated to discussing participant's questions. The session was recorded including the attendees, presentations, questions, and responses. Details are provided in this section.

Attendees were encouraged throughout the Virtual Live Q & A Session to post questions and comments in the Comment Forum. The posting links were tested prior to the event and during the session to ensure continuous full functionality. Several attendees posted questions and no issues were reported. The Comment Forum remained open for additional questions or comments after the Q & A Session until June 1, 2023. The website and Comment Forum can be viewed until September 30, 2023.

Attendees

The event was held in the evening to not conflict with work hours, however, the attendance was low with only six (6) participants that were not Mowi representatives, see Table 93.

Table 93 Virtual Live Question and Answer Session Attendees

Attendees	Name	Affiliation
1	Guest	unknown
2	Jeff	unknown
3	Jon Kawaja	Department of Fisheries, Forestry and Agriculture
4	Nick Travis	The Navigator Magazine
5	Trevor Ryan	unknown
6	Adrian Sierra	Work Global Canada
Mowi Representatives		
	Aaron Bennett	Mowi Canada East Inc.
	Morgan Townsend	Mowi Canada East Inc.
	Linda Hiemstra	Mowi Canada East Inc.
	Amy Negrijn	Mowi Canada East Inc.
	Gideon Pringle	Mowi Canada East Inc.

Questions and Comments and MCE Responses

The questions posted during the Virtual Live Q & A Session and MCE responses are provided in this section with comments and questions posted prior provided in the previous section. MCE responses were discussed at the Q & A Session and posted directly after the session or the following day. There were no posts to the Comment Forum after that.

Topic 1: Do you support this project and want it to succeed?

By Trevor Ryan Thu May 11, 2023 6:08 pm

My questions were answered thoroughly and clearly. I fully support this project.

Topic 7: Environmental Benefits

by Trevor Ryan Thu May 11, 2023 1:14 pm

I see you have added an advanced water filtration system. Are there other features or upgrades at the facility that provide environmental benefits?

Response by Mowi Canada East by admin Fri May 12, 2023 8:19 am

The project has been designed to improve the environmental performance of freshwater production. In no particular order, here are some of the benefits that this project will provide:

All fish stay in the province, raised at Stephenville and supply farms in Newfoundland.

Improved wastewater treatment - new wastewater treatment with additional levels of treatment and disinfection reduces harmful components before discharge to a new deep-water outfall.

New real-time monitoring of the freshwater source ensures continuous high-quality water for all users and continuously provides data to the government managers.

Up to 97% of fish culture water is re-used with the new recirculating aquaculture technology reducing the volume of water required to grow each fish.

New fish transport line keeps fish contained and reduces potential spillage into natural water ways. eliminating the need for trucks and road transport of fish

Saltwater-acclimatized smolt reduces stress and improves fish health and survival.

Larger, older smolt will reduce time spent at sea to harvest.

Increased local economic benefits with expanded production.

Additional smolt production for greater business security and more secure jobs

Topic 8: Importance of NLFD

by Trevor Ryan Thu May 11, 2023 1:21 pm

Do you foresee a long-term and/or growing commitment to Newfoundland for Mowi operations? If so, why is Newfoundland such a desirable location for farming?

Response by Mowi Canada East by admin Fri May 12, 2023 8:11 am

Mowi is very committed to its farming business in Newfoundland and the people we employ throughout the supply chain. That is why we are looking to expand operations at our Indian Head Hatchery – to create an independent business unit Newfoundland, to provide year-round jobs throughout the supply chain, and to supply strong market demand year-round both in Canada and internationally.

Newfoundland is unique in many ways – and a good place to grow salmon in both freshwater and seawater.

The Stephenville hatchery is a good location to grow young salmon. The facility is in close proximity to the ocean on the shore of Bay St. George providing access to saltwater for the culture of larger more robust smolt. The natural aquifer has abundant water for the Hatchery Expansion Project and the water quality is ideal for salmon culture. Slope of the land allows for gravity fed water to the culture systems, this environmentally friendly method of water movement reduces energy usage for the facility, decreases the cost of salmon production and the pressure on natural resources, and reduces the facility carbon footprint. The hatchery is in the Port of Stephenville Industrial Park, serviced by the Town of Stephenville. Paved roads, potable water, power, are all readily available.

While farming in seawater in Newfoundland is a challenge due to wide-ranging winter and summer temperatures, and the weather can be rough at times, our company can draw on its international experience and the knowledge of over 11,000 experts around the world. Prior to selecting a site for a salmon farm, Mowi considers the alternatives. Extensive data is collected on many potential sites and only sites with excellent characteristics for salmon culture are candidates for application for an aquaculture licence. Several government agencies review the potential for environmental impact from salmon farming at the site and verify minimal impact as part of the licence process.

We are confident in our ability to grow and process healthy, top-quality salmon in Newfoundland and support the government’s vision of growing its aquaculture sector.

4. Interviews and Print Media

The Canadian Broadcasting Corporation (CBC) and Canadian Press both requested an interview with MCE to discuss the Indian Head Expansion Project. The interviews provided opportunities for project information to reach those living in rural parts of the Province of Newfoundland and Labrador and a wider Canadian audience.

Interviewers developed informed questions from public concerns and the subsequent MCE responses provided listeners with key project information. The interviews were also opportunities for public engagement events to be advertised.

CBC Newfoundland Morning Show

Hosts: Bernice Hill, Marten Jones

Date: April 19, 2023

https://www.cbc.ca/listen/live-radio/1-210-cbc-newfoundland-morning/clip/15979195-government-said-yes-court-ruling-said-no.-now

Canadian Press Weekly News

Interview: Jaymie White, Local Journalism Initiative Reporter, Wreckhouse Weekly News

Date: April 20, 2023

https://www.pentictonherald.ca/spare_news/article_285153ae-9923-5d57-b32a-87f8a94edabf.html

5. Focused Events

Focused events were organized in addition to the previously described public engagements for those wanting specialized information on the Hatchery Expansion or wishing to discuss private details such as business opportunities. Focused events were requested prior to the public engagements and during the Open House.

Focused events offer an opportunity to discuss specific interests with a select group that have a vested interest in the particular topic. All groups and individuals requesting a focused event were in support of the project.

These events include presentations and information sessions, virtual and in-person meetings, and tours of the Indian Head Hatchery. This type of public engagement is part of the MCE Good Neighbour Policy and will continue as the project progresses and after the project is completed. This section includes events completed as well as planned future events.

One reason for requesting a focused event is to have a private discussion – often business related. For this reason, general information is provided in this section, but detailed discussion information is not.

Town of Stephenville

Date: July 20, 2023
Attendees:

- Town of Stephenville: Mayor Tom Rose, three senior Town of Stephenville staff
- Mowi Canada East: Aaron Bennett, Development and Environmental Compliance Director

Letter of Support provided for the Hatchery Expansion with recognition of the contribution to the community in employment, service contracts, and taxes and municipal fees, See Appendix F: Town of Stephenville Letter of Support for the Indian Head Hatchery Expansion Project.

Qalipu First Nation

Event: Hatchery Tour
Date: April 12, 2023
Attendees:

- Qalipu First Nation: Charles Pender, Jonathan Strickland, Jon Davis
- Mowi Canada East: Cristian Roman, Hatchery Manager and Natasha Gill, Hatchery Operations Manager

General Information: The Indian Head Hatchery tour covered salmon rearing facilities including incubation, fry, and post smolt production. Discussions during the tour covered questions about the project as well Mowi business units in Canada and Mowi worldwide operations. There is a standing invitation to the Qalipu Nation for hatchery tours and information meetings.

Indian Head First Nation

Event: Hatchery Tour
Date: June 9, 2023
Attendees:

- Indian Head First Nations: Chief Byron Alexander, Vice Chief Jason Burroughs, and four others
- Mowi Canada East: Paul Fletcher, Freshwater Operations and Technical Manager (Stephenville Hatchery) and Natasha Gill, Hatchery Operations Manager

General Information: Discussions at the Open House led to an invitation to tour the hatchery and become better acquainted with the fish culture processes. The tour covered the need for cleanliness in fish rearing, duty of care for the welfare of the fish and how Mowi is constantly moving forward to make salmon farming more sustainable. Other discussion points were how the farm will impact the surrounding area and community engagement.

Miawpukek First Nation

Event: Project Status Update and Other Discussions
Date: April 17, 2023
Attendees:

- Miawpukek Nation: Chief Misel Joe, Ross Hinks, Director Natural Resources
- Mowi Canada East: Gideon Pringle, Managing Director, Aaron Bennett, Development and Environmental Compliance Director, Kristina White, HR Manager

General Information: MCE has other projects either underway or upcoming with the Nation. Regular meetings are an opportunity to provide updates on the Hatchery Expansion and discuss other collaborations.

Bay St. George Chamber of Commerce

Event: Chamber of Commerce General Meeting
Date: May 23, 2023
Attendees:

- Chamber members
- Mowi Canada East: Natasha Gill, Operations Manager Indian Head Hatchery

General Information: At the Open House, MCE made a commitment to attend the Chamber of Commerce meetings to answer any questions on the project and to provide regular project updates to the Town of Stephenville. The first Chamber meeting was on May 23 and was attended by Natasha Gill.

10.0 APPROVALS FOR THE UNDERTAKING

Guidelines: List the main permits, licences, approvals, and other forms of authorization required for the undertaking, together with the names of the authorities responsible for issuing them (e.g., federal government department, provincial government department, municipal council, etc.)

All permits required for the rearing of salmon at the hatchery and the saltwater farms have been received. The majority of the authorizations for completion of the Hatchery Expansion have been approved. Permits for fish transport are applied for prior to transport.

Please refer to the following sections for information related to this topic.

- Section 4.1c Geographic Location and Physical Components, Saltwater Farms
- Section 4.1f Geographic Location and Physical Components, Ownership and Zoning
- Section 4.2a Hatchery Expansion Construction

Permits and approvals listed in this section address the municipal, provincial, and federal regulatory requirements related to aquaculture operations, water quality, water extraction and use, aquatic habitat protection, land ownership, waste management, navigation, and other users.

10a Hatchery Expansion

The Indian Head Hatchery is fully licensed and has all permits required for production of 4.5 million smolt including the Water Use Licence for fish culture water. Operational authorization to culture the additional 2.2 million smolt may include a revision to the existing aquaculture licence. The Water Use Licence was revised in 2019 to include the Hatchery Expansion requirements.

As described in section 4.2a, the Hatchery Expansion components are only partially complete. Modules 3 and 4 of the Modular RAS (post-smolt) Building, the Fish Transfer System, and the 3rd barrier well for fish culture saltwater are all unfinished. Construction permits and approvals for the full project were received in 2018 and are valid for the remaining work. Once the Hatchery Expansion is released from further environmental review, the government agencies and the Town of Stephenville will be advised, and a construction schedule provided. The permits for work not complete are provided in Table 94.

A new permit may be required to drill and test a 3rd saltwater barrier well (requirement for this to be determined with the hydrologist and Department of Environment and Climate Change) and a fire and safety inspection and report is required to occupy Modular RAS Building Modules 3 and 4 once constructed.

Table 94 Authorizations Required for Completion of Hatchery Expansion Construction

Purpose	Authority	Documentation, Authorization	Status as of June 1, 2023
Construction: Modular RAS Building, Modules 3 & 4 and Fish Transfer System	Service NL	Waste Management Plan	submitted and on file
	ECC[3]	Certificate of Approval – Water and Sewer	received 2018
	ECC[3]	Environmental Protection Plan - Construction	submitted and on file
	Town of Stephenville, Other Companies, Agencies	Easements or land purchase agreements	agreements complete or in negotiation
	Town of Stephenville	Development (Construction) Permit	received 2018
Construction: 3rd saltwater barrier well	ECC[3]	Permit to Construct non-domestic well	to be applied for upon ER[1] 1975 release
Building Use: Modular RAS Building, Modules 3 & 4	Service NL	Compliance national Fire Code; National Building Code; Life Safety Codes Report	Report received for Modular RAS Building, Modules 1 and 2, additional report to be completed following construction of Modules 3 & 4
Operations: Fish culture	FFA[2]	Aquaculture Licence #1087 - amendment if required	FFA[2] to review existing licence and amend as necessary following ER release
Operations: use of ground water (from aquifer) and saltwater	ECC[3]	Water Use Licence	revised 2019
Environmental Review ER[1] 1975	ECC[3]	Release of Undertaking	in process

[1]Environmental Registration, [2] Department of Fisheries, Forestry and Agriculture, [3] Department of Environment and Climate Change

Groundwater Use

The fish culture water volume required for the proposed Hatchery Expansion was taken into consideration during the planning of the existing well field. Currently, there is no requirement for additional groundwater wells. However, if more wells were needed, additional or revised Water Use Permits and groundwater permits, and new real-time monitoring stations may be required.

Effluent Outfall

The Hatchery Expansion Effluent Treatment Building 2 and deepwater outfall were designed to manage the full capacity of the hatchery fish culture effluent including the proposed Hatchery Expansion 2.2 million smolt. It is permitted under ALT11979-2021. It is not expected that the effluent management system will need to be altered or upgraded. However, should a new outfall be necessary, according to the Water Resources Act, section 48 approval will be required.

10b Transport of Smolt to Saltwater Farms

The following information applies to all salmon cultured by Mowi Canada East Inc. (MCE) in the province including the proposed Hatchery Expansion production.

A fish health survey is conducted on the fish prior to transport. A risk assessment of the health survey is conducted by the provincial aquaculture veterinarian. Transport licence and permit are required from provincial and federal regulators.

The fish transport vessels are under contract and fully licensed. The transport vessel crew is responsible for all registrations and authorizations required for ships working in Canadian waters. Permission to use the Port of Stephenville wharf is arranged by MCE in advance and provided to the vessel captain.

A Fisheries and Oceans Canada Introductions and Transfers Licence and a Province of Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture Transfer Permit are both required prior to transporting fish from the hatchery to the saltwater farms. Issuance of these mandatory permits is dependent on the outcome of a risk appraisal by the Provincial Aquaculture Veterinarian of a recent health assessment of the fish to be transported. The applications and processes are completed just prior to transport.

10c Saltwater Culture

The following information pertains to all MCE cultured salmon in the province, including the proposed Hatchery Expansion fish. Every MCE saltwater farm in the production planning has the authorizations required to grow Atlantic salmon. Table 95 provides a recap of these licences and approvals and status as of June 1, 2023.Please refer to section 4.1f Ownership and Zoning for detailed information on farm licences and approvals.

Table 95 Authorizations Required for Salmon Saltwater Farms

Licence, Lease or Approval	Authority	Purpose	Status as of June 1, 2023
Crown Lands Lease	Department of Fisheries, Forestry and Agriculture	Permits the occupation of the marine site	Received for all farms
Water Use Licence	Department of Environment and Climate Change	Permits construction of the farm infrastructure and operations	Received for all farms
Aquaculture Licence	Department of Fisheries, Forestry and Agriculture	Required to conduct salmon farming operations at the site	Received for all farms
Approval	Transport Canada	Approves layout of farm infrastructure and placement of navigational buoys	Received for all farms
Stocking Approval	Department of Fisheries, Forestry and Agriculture	Approval of the farms to receive smolt and the number of smolt for each farm	To be submitted prior to stocking

APPENDICES

TABLE OF CONTENTS

APPENDIX A: MOWI CANADA EAST INC. SALTWATER FARMS BY BAY MANAGEMENT AREA

Figure 1 MCE Saltwater Farms in BMA 1 Mal Bay

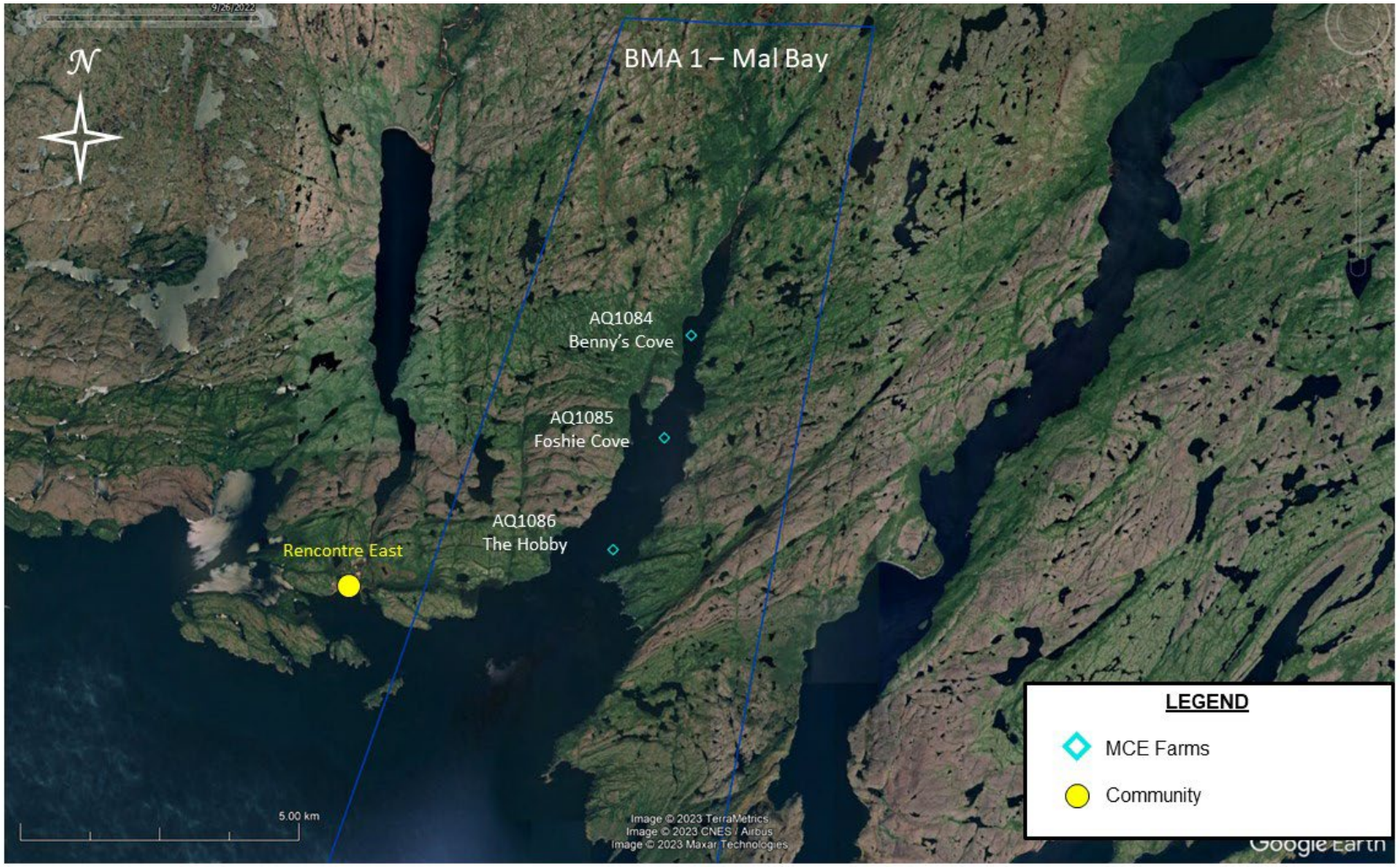


Figure 2 MCE Saltwater Farms in BMA 2 Rencontre East

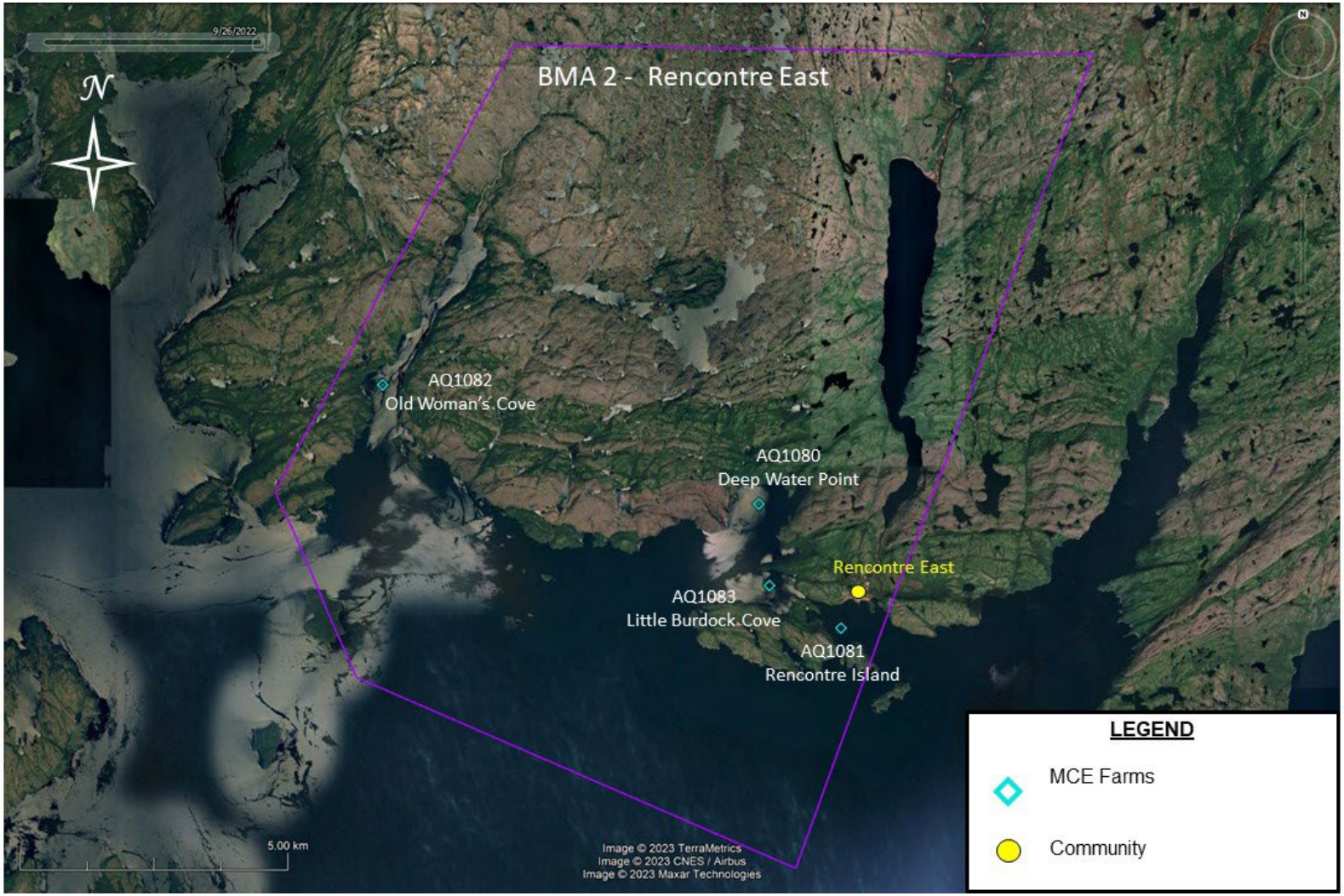


Figure 3 MCE Saltwater Farms in BMA 3 Fortune Bay West

Figure 4 MCE Saltwater Farms in BMA 4 Great Bay de l'Eau

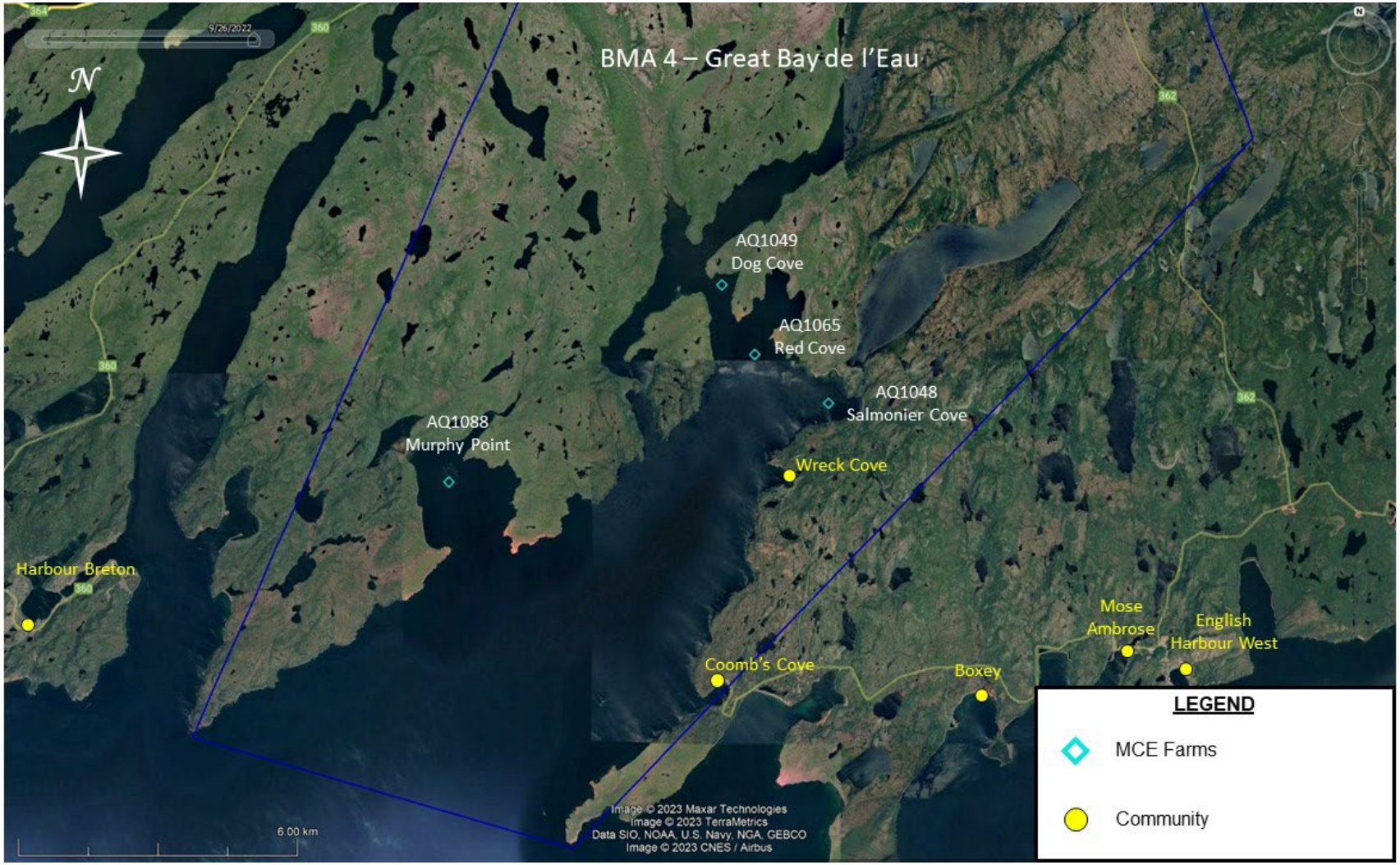


Figure 5 MCE Saltwater Farms in BMA 5 Harbour Breton Bay

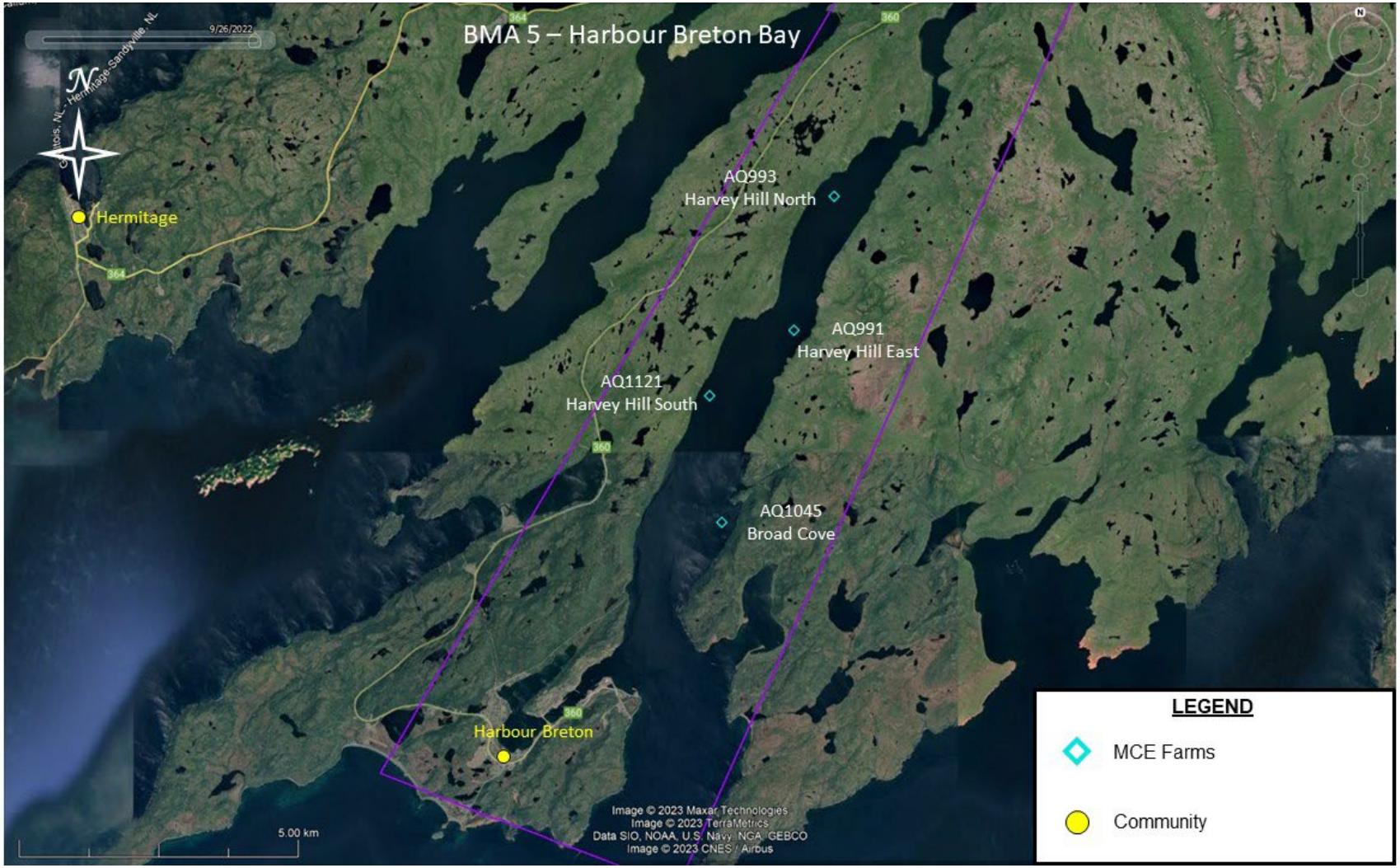


Figure 6 MCE Saltwater Farms in BMA 10 Facheux Bay

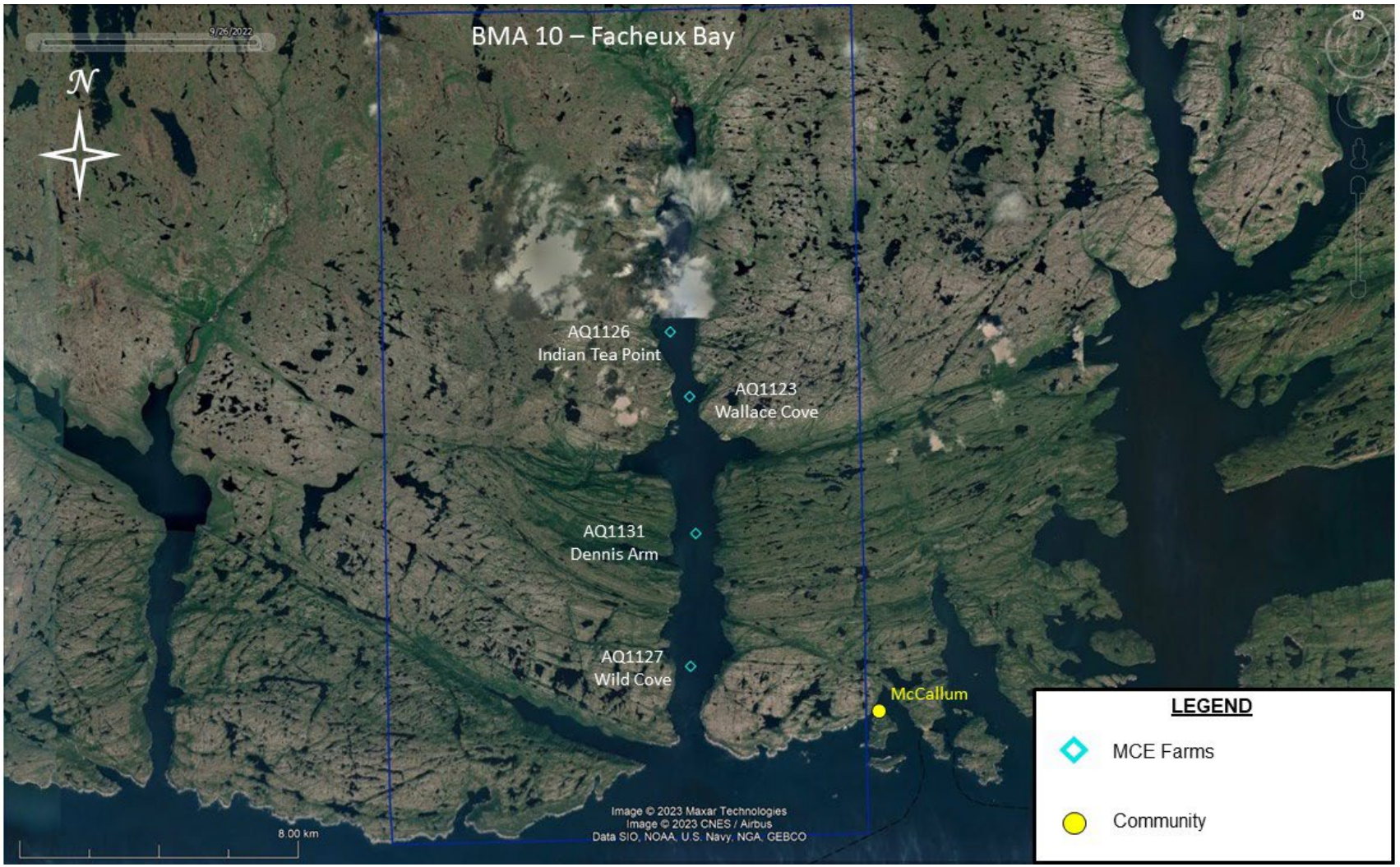


Figure 7 MCE Saltwater Farms in BMA 11 Hare Bay

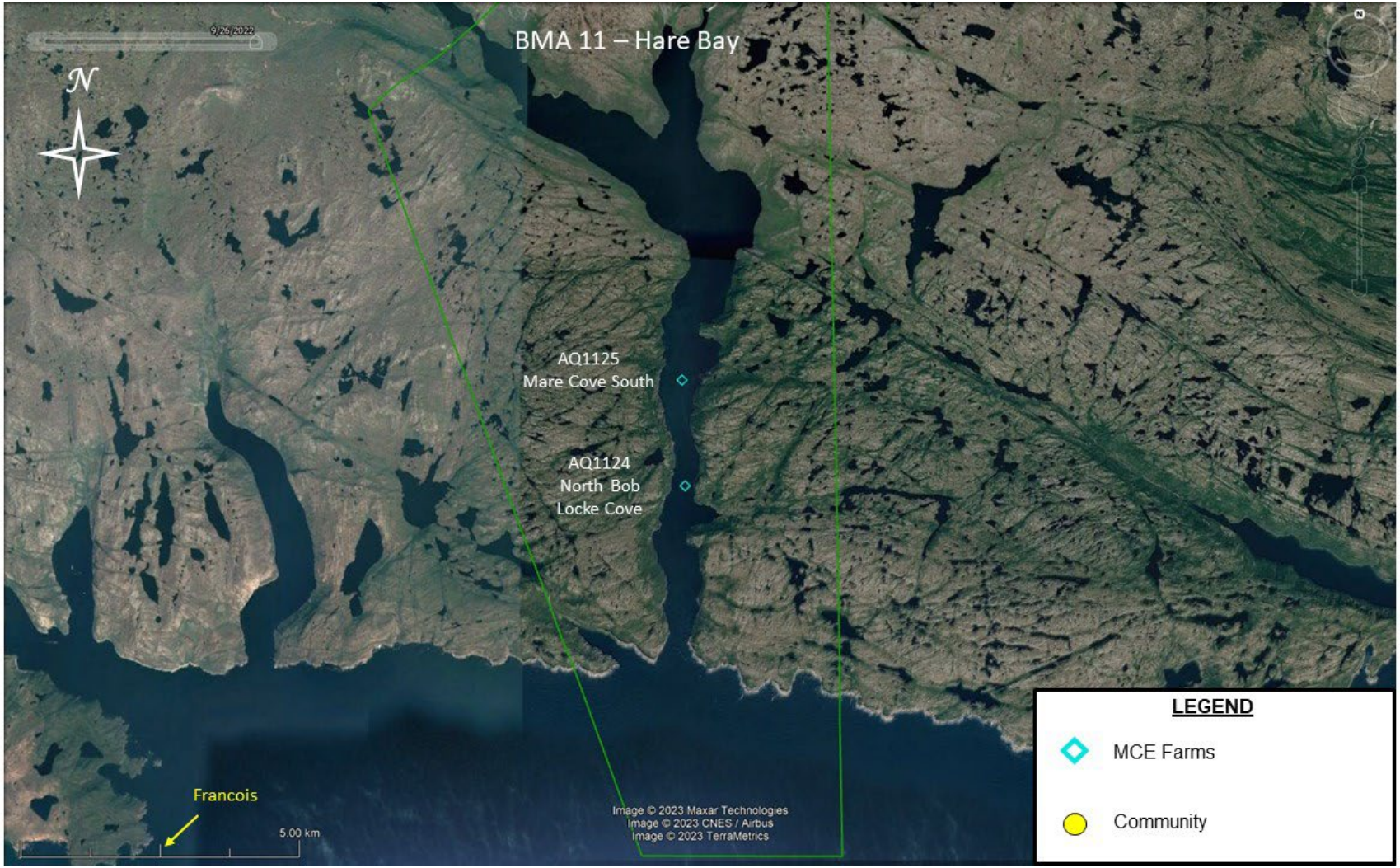
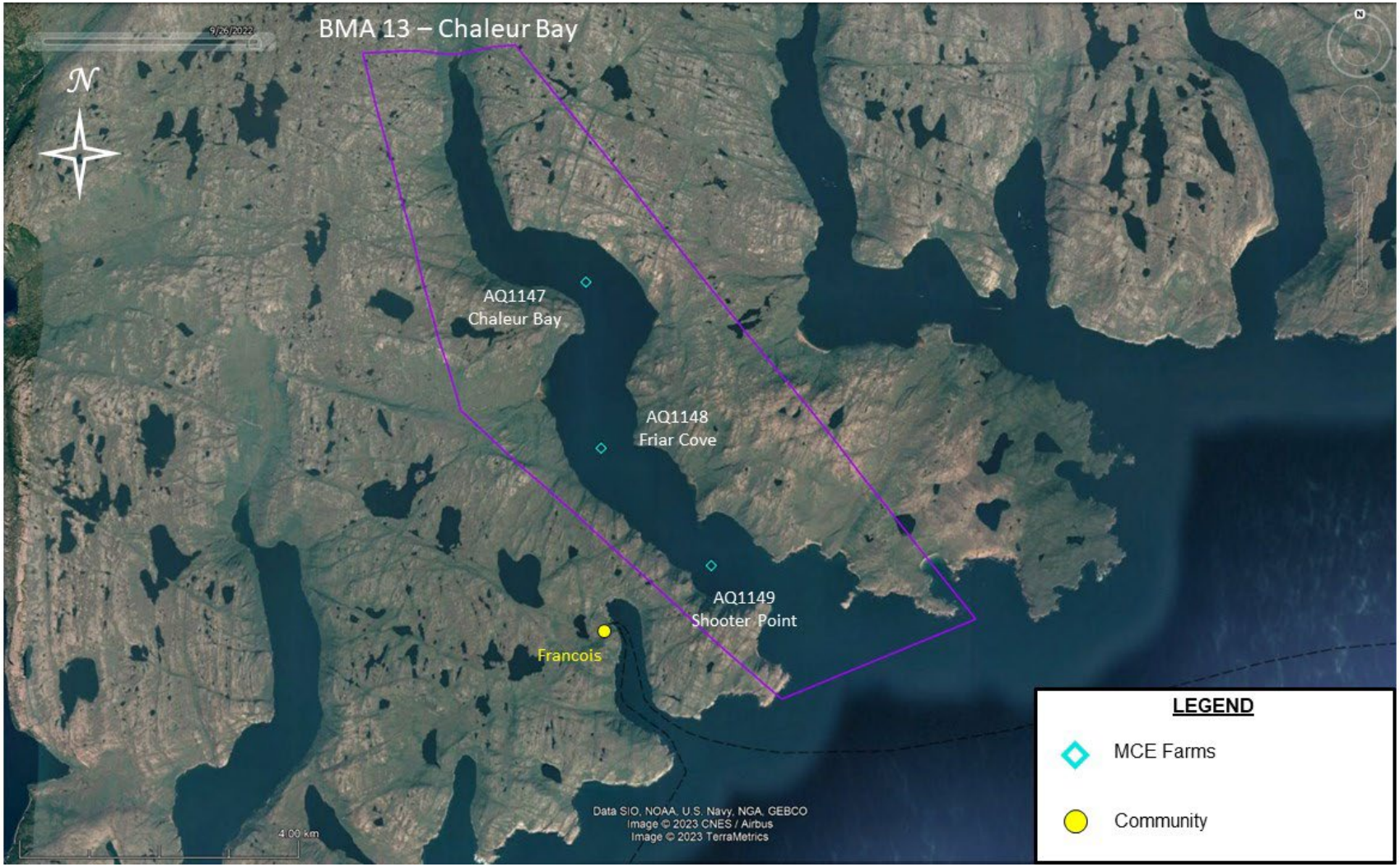


Figure 8 MCE Saltwater Farms in BMA 12 Rencontre West

Figure 9 MCE Saltwater Farms in BMA 13 Chaleur Bay



APPENDIX B: MOWI CANADA EAST INC. SALTWATER FARMS AND POTENTIAL POLLUTION SOURCES BY BAY MANAGEMENT AREA

Figure 10 MCE Saltwater Farms and Potential Pollution Sources in BMA 1 Mal Bay

There are no communities within this BMA.

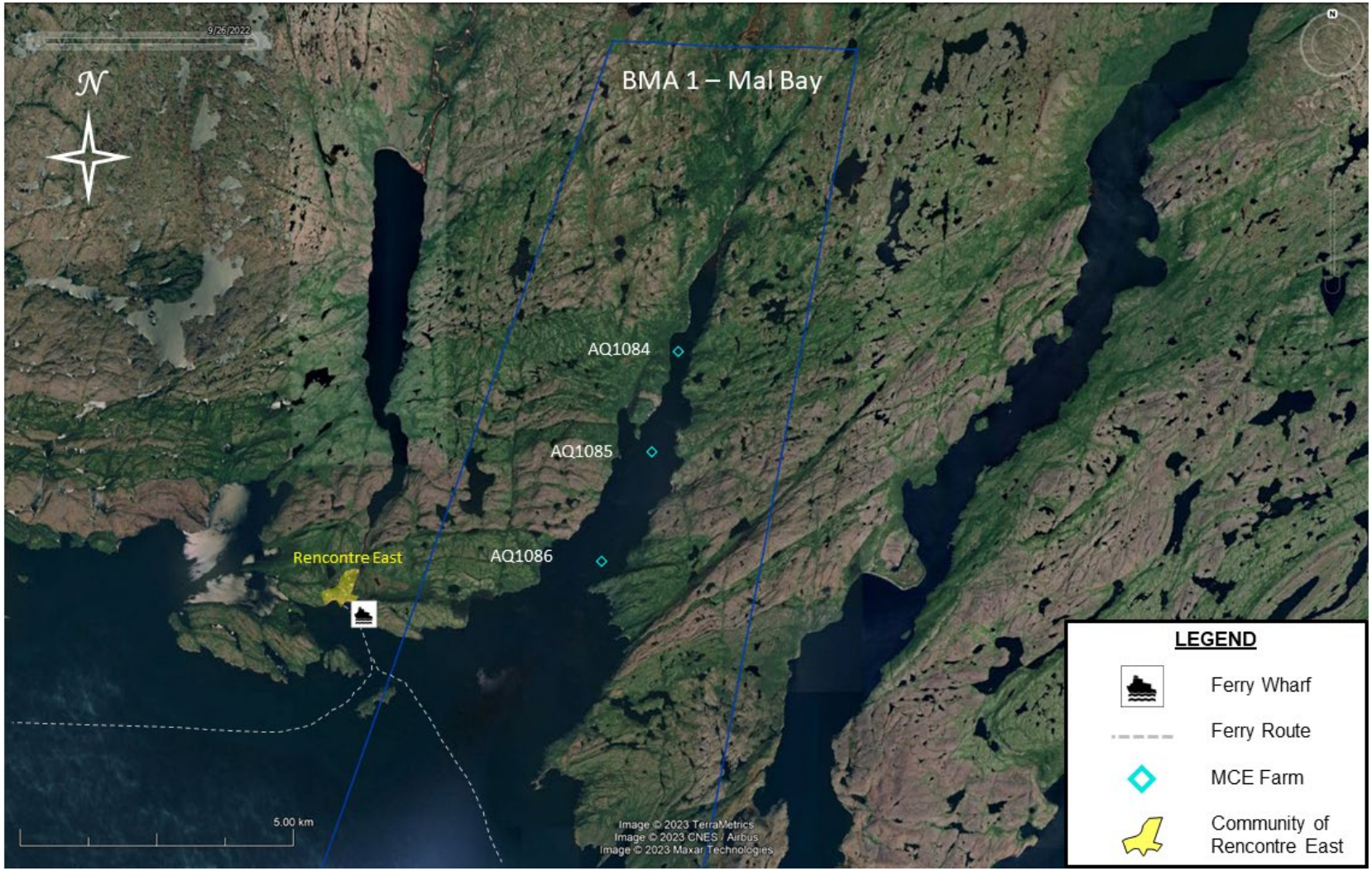


Figure 11 MCE Saltwater Farms and Potential Pollution Sources in BMA 2 Rencontre East

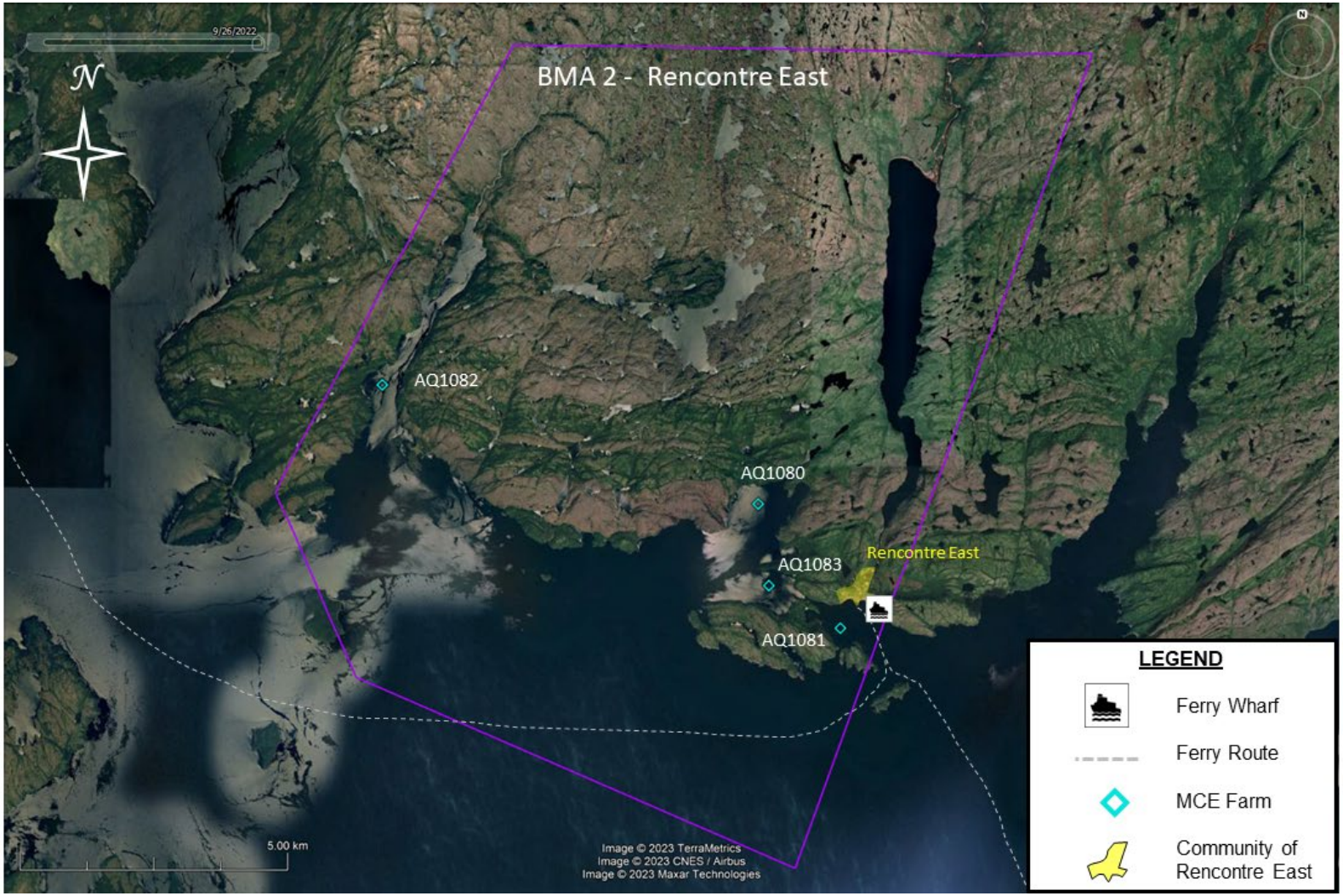


Figure 12 MCE Saltwater Farms and Potential Pollution Sources in BMA 3 Fortune Bay West

Figure 13 MCE Saltwater Farms and Potential Pollution Sources in BMA 4 Great Bay de l'Eau

Figure 14 MCE Saltwater Farms and Potential Pollution Sources in BMA 5 Harbour Breton Bay

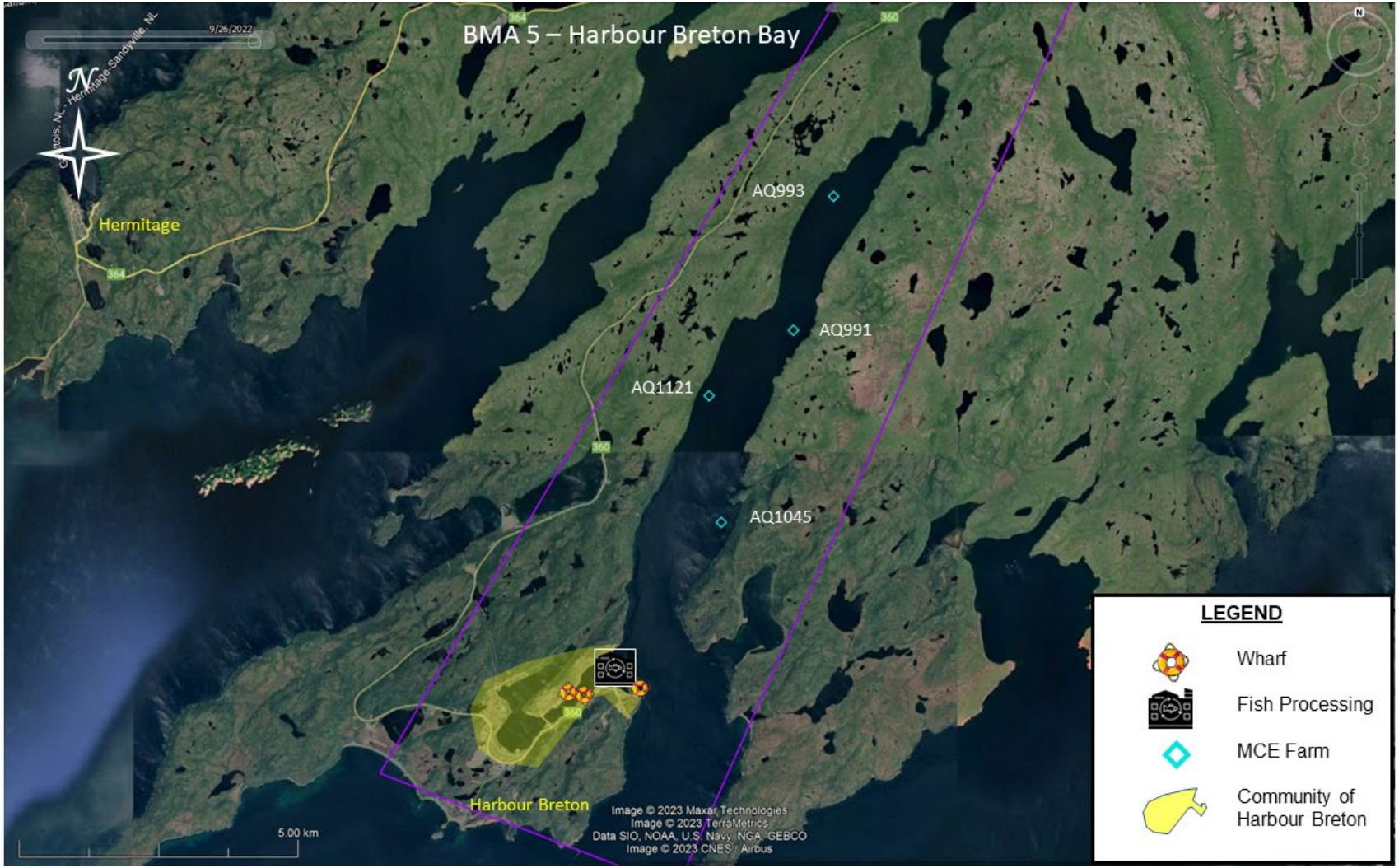


Figure 15 MCE Saltwater Farms and Potential Pollution Sources in BMA 10 Facheux Bay

There are no communities within this BMA.

Figure 16 MCE Saltwater Farms and Potential Pollution Sources in BMA 11 Hare Bay

There are no communities in this BMA.

Figure 17 MCE Saltwater Farms and Potential Pollution Sources in BMA 12 Rencontre West

There are no communities within this BMA.

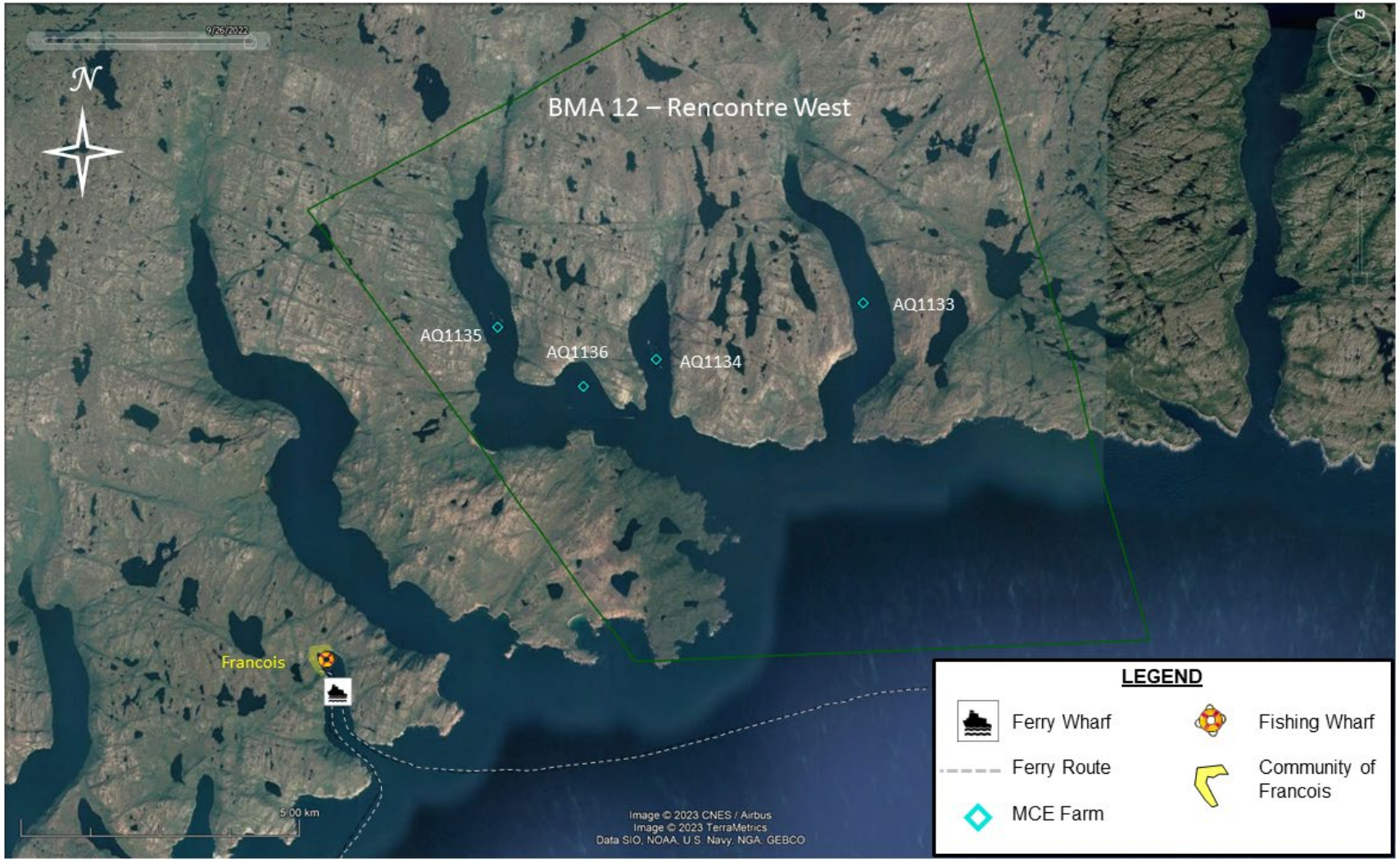
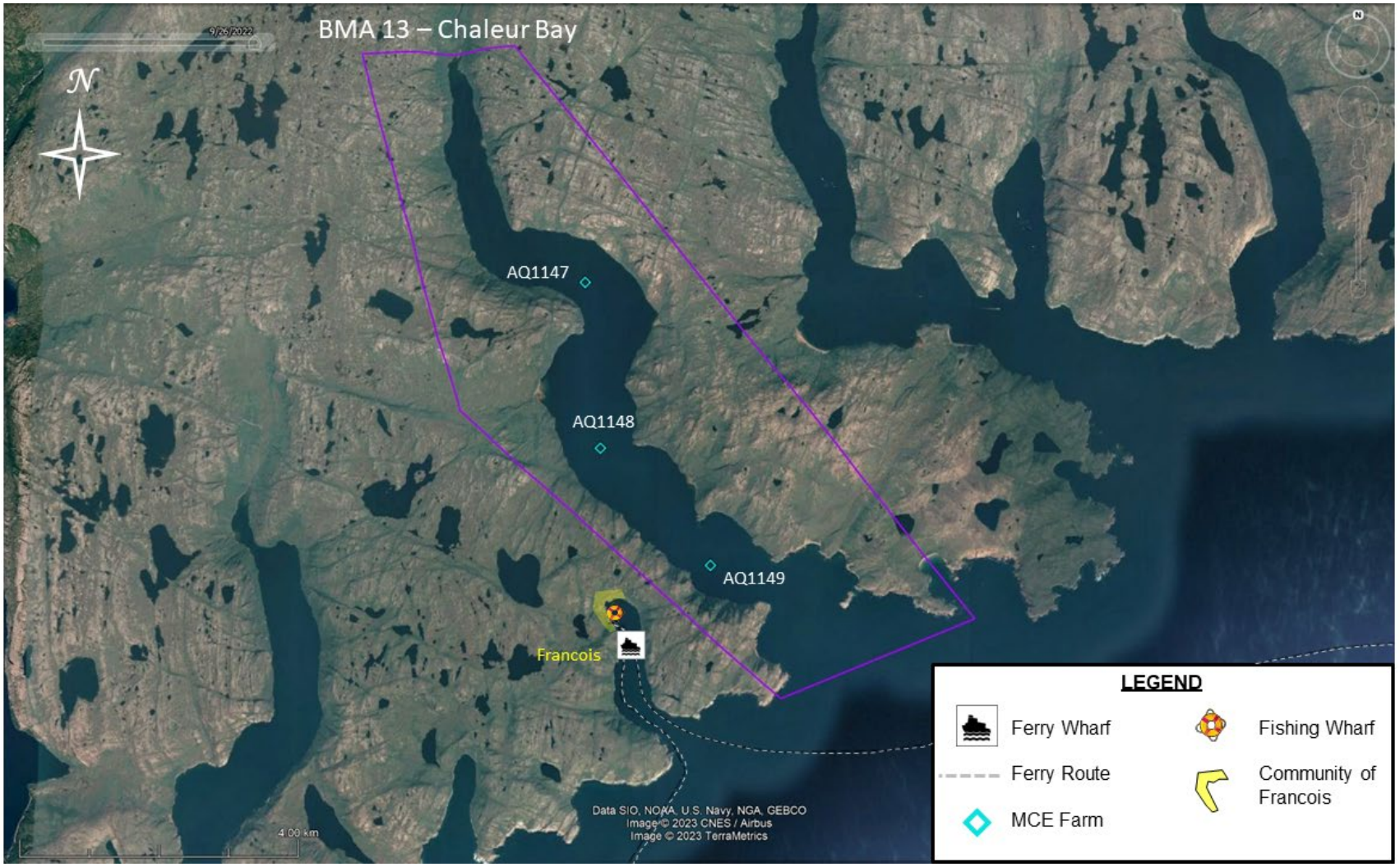


Figure 18 MCE Saltwater Farms and Potential Pollution Sources in BMA 13 Chaleur Bay

There are no communities within this BMA.



APPENDIX C: INDIAN HEAD HATCHERY EXPANSION PROJECT

ER 1975 CONDITIONS OF RELEASE

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Municipal Affairs and Environment
Office of the Minister

File # 2.1129.0045
Reg. #1975

September 4, 2018

Mr. James Gaskill
Northern Harvest Smolt Ltd.
P.O. Box 460
St. Alban's, NL A0H 2E0

Dear Mr. Gaskill:

RE: Indian Head Hatchery Expansion Project – Registration 1975

Your proposal has been reviewed by an interdepartmental screening committee and an opportunity to comment has been provided to the public as required by the Newfoundland and Labrador *Environmental Protection Act*, SNL 2002, cE-14.2. Please be advised that this undertaking is **released** from further environmental assessment subject to the following conditions:

- The proponent shall complete a hydrogeologic assessment of the proposed groundwater source. This assessment shall be carried out by a qualified hydrogeologic professional and submitted to the Minister of Municipal Affairs and Environment for approval. Reports on the progress of this assessment are required to be submitted to the Water Resource Management Division every two months until the assessment is complete and accepted by the Minister of Municipal Affairs and Environment.

- The proponent shall implement a groundwater monitoring program to monitor water levels and water quality. The program must be developed with and meet the approval of the Minister of Municipal Affairs and Environment within two months from this release date. Water level data shall be collected continuously using a recording data logger, and selected water quality parameters will be monitored and annual reports submitted to this department for review for a period of at least two years. Extension of the monitoring and reporting beyond two years will be at the discretion of the Minister of Municipal Affairs and Environment.

- The proponent will be required to enter into a Memorandum of Understanding with the Department of Municipal Affairs and Environment for the installation of a real time water quality and quantity monitoring network to monitor water levels and selected water quality parameters within two months from this release date. The type, number and location of the stations required will depend on site conditions and final operation plans. The proponent is to bear all costs associated with the groundwater monitoring network and installation, operation, and maintenance.

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 709 729 3046 709 729 0943 www.gov.nl.ca

- The proponent shall provide proof of a minimum $1,000,000 surety bond or guaranteed letter of credit from a recognized lending institution, to be held as financial security should the hydrological assessment and groundwater monitoring, including real-time monitoring, not be completed and as per the release condition.

- The proponent must demonstrate that waste from the hatchery can be managed in a manner that meets the approval of the Department of Municipal Affairs and Environment, by submitting a comprehensive Waste Management Plan prior to the commencement of hatchery operations.

- A women's employment plan for this project shall be submitted for the approval of the Women's Policy Office within one month from this release date. During the tendering process, contracted companies must be informed that a women's employment plan for the project must be submitted as a requirement of successful bidding.

- The proponent must submit clarification on the full-time status of occupations associated with the construction phase, as well as hiring arrangements for all occupations associated with the operations phase to the Department of Advanced Education, Skills and Labour within one month from this release date.

- The Proponent must complete a pathogen profile of the saltwater source to ensure biosecurity of the hatchery. This profile must be determined and reviewed by the Department of Fisheries and Land Resources and the company veterinarian prior to the commencement of hatchery operations.

- A health and safety plan is required if any excavation is going to take place in subsurface soil (below 1 metre depth) in the areas of identified or potential contamination. In addition, the proponent shall make workers aware of the contamination and require they wear personnel protective equipment to minimize potential exposure to contaminants.

In addition, the Water Resources Management Division of this Department advise that you must apply for and obtain a water use licence for the use of water from any water source for any purpose, as well as a non-domestic drilled well permit under Section 58 of the *Water Resources Act* for any proposed drilled well(s). A permit is also required under the *Water Resources Act* for any work in any body of water (including wetland) prior to the start of alteration/development. For further information, please contact the Water Resources Management Division at (709) 729-2539.

The Pollution Prevention Division advise that any effluent or runoff leaving the site will be required to conform to the requirements of the *Environmental Control Water and Sewage*

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 709 729 3046 709 729 0943 www.gov.nl.ca

Newfoundland Labrador

Regulations. The Pollution Prevention Division should be contacted where analytical parameters are shown to exceed applicable provincial criteria for petroleum hydrocarbons and metals. With respect to soil, upon determination of soil impacts at any location on site, the Pollution Prevention Division or Service NL should be notified, and action should be taken by the proponent as the person responsible to ensure that such impacts are assessed and delineated, followed by properly addressing the nature of contamination through remediation or risk assessment. For further information, please contact the Pollution Prevention Division at (709) 729-4147 or (709) 729-6771.

The Department of Fisheries and Land Resources advise that a title to the subject property should be confirmed through Crown Lands as the Land Use Atlas does not have a record of a title to NL Housing or the Town of Stephenville. For additional information, please contact Crown Lands at (709) 637-2093.

Service NL advise all building drawings, plans, and specifications, including those from service bays or other areas handling used or waste oils and electrical plans, must be submitted for review and approval by Government Service Centre prior to the start of construction and/or installation. For further information, please contact Service NL at (709) 643-8650.

Although the undertaking, as proposed, is released from further environmental assessment, it is still subject to other legislative requirements. A summary of the comments received from government agencies during the review is attached to provide an indication of likely applicable permits, approvals, and legislative requirements. Please note that you must comply with all relevant legislation and obtain all necessary permits and approvals. You are required to inform this Department of any proposed significant changes to the undertaking.

If you have any questions concerning these matters, please contact Dr. Susan Squires, Director, Environmental Assessment Division, at (709) 729-0673 or susansquires@gov.nl.ca.

Sincerely,

ANDREW PARSONS, QC
Minister of Municipal Affairs and Environment

Attachment

cc: John Finn, MHA, District of Stephenville – Port au Port

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 709 729 3046 709 729 0943 www.gov.nl.ca

3

APPENDIX D: MOWI CANADA EAST INC. SALTWATER FARMS AND OTHER MARINE ACTIVITIES IN THE BAY MANAGEMENT AREA

Figure 19 MCE Saltwater Farms and Other Marine Activities in BMA 1 Mal Bay

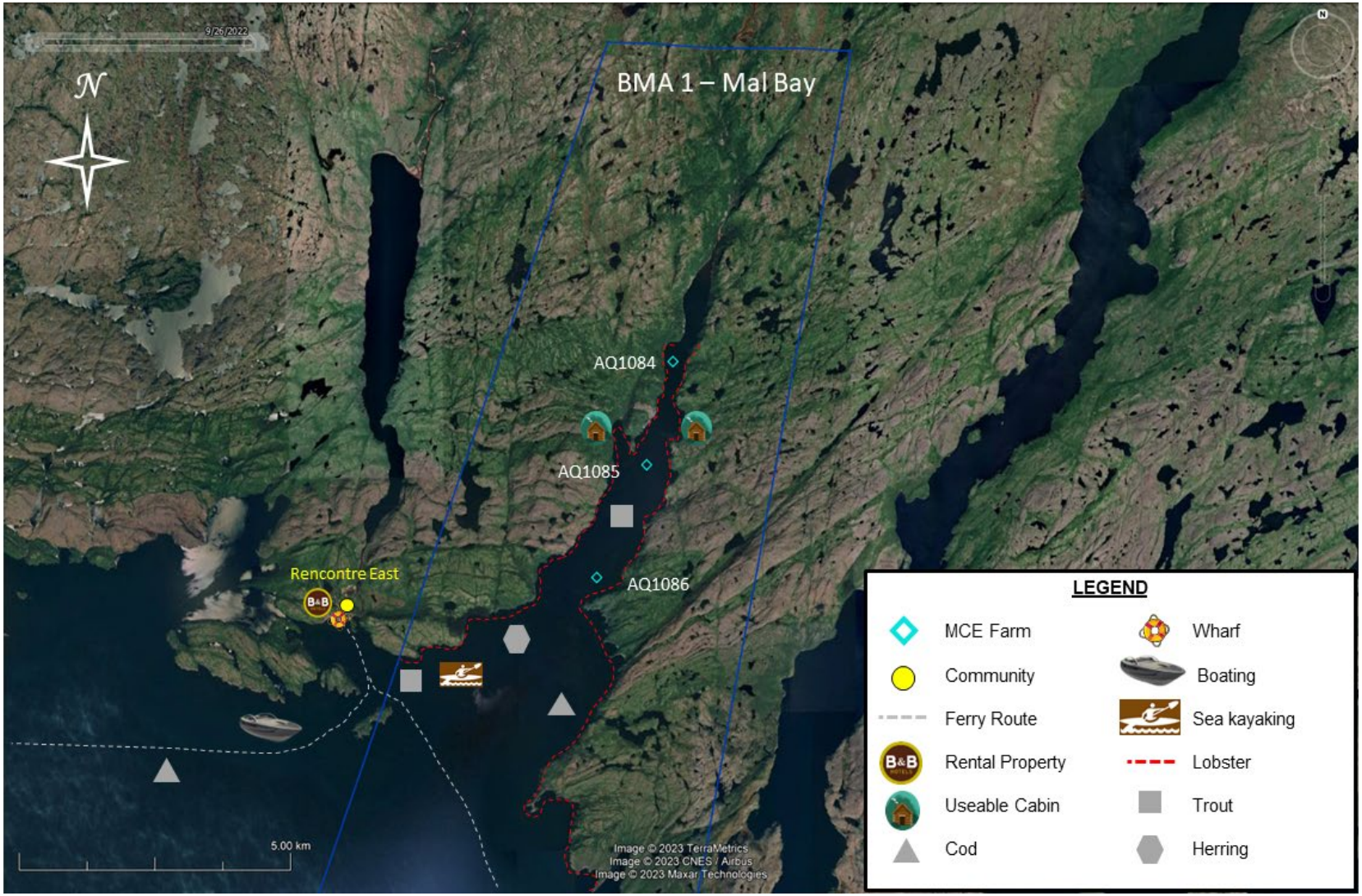


Figure 20 MCE Saltwater Farms and Other Marine Activities in BMA 2 Rencontre East

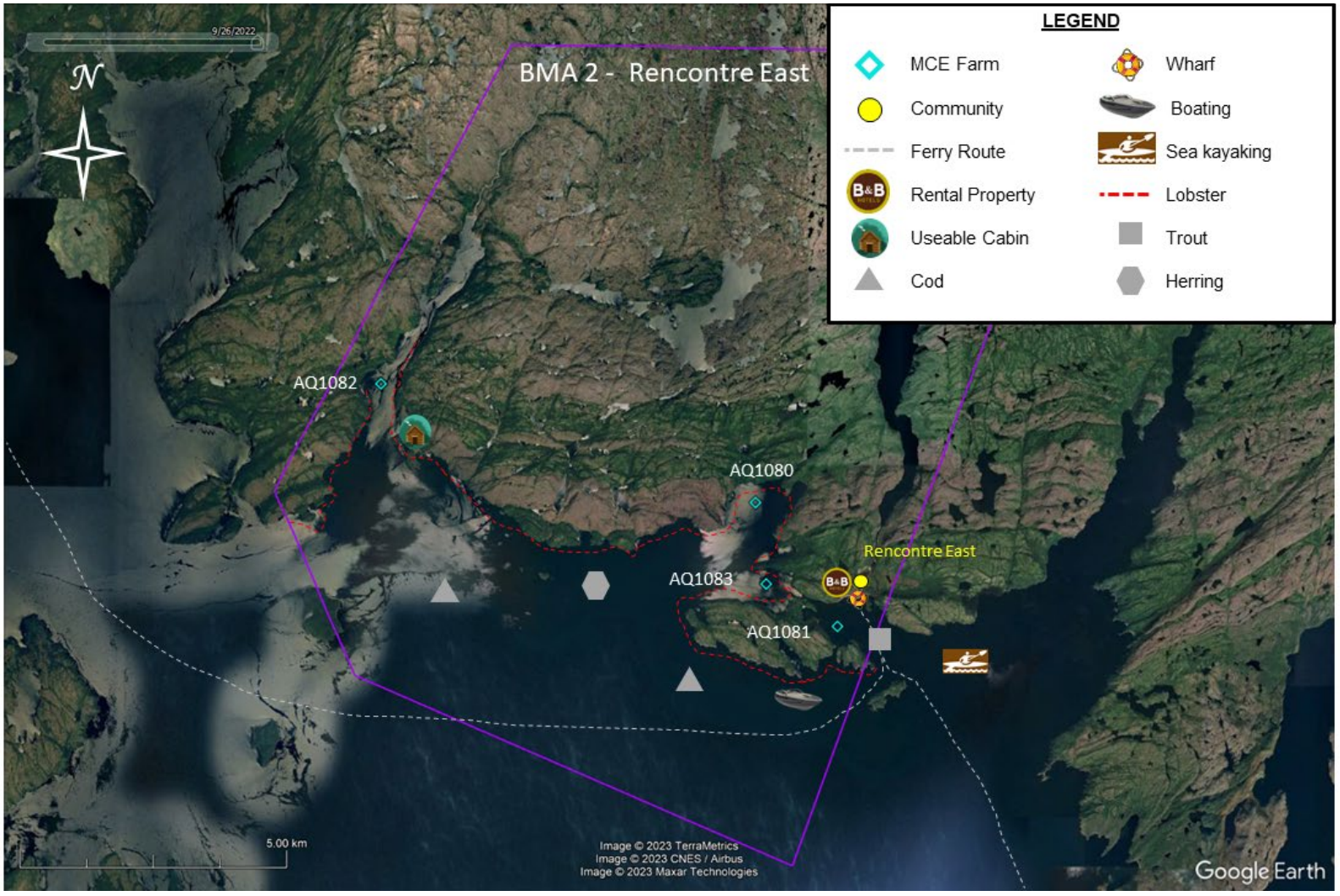


Figure 21 MCE Saltwater Farms and Other Marine Activities in BMA 3 Fortune Bay West

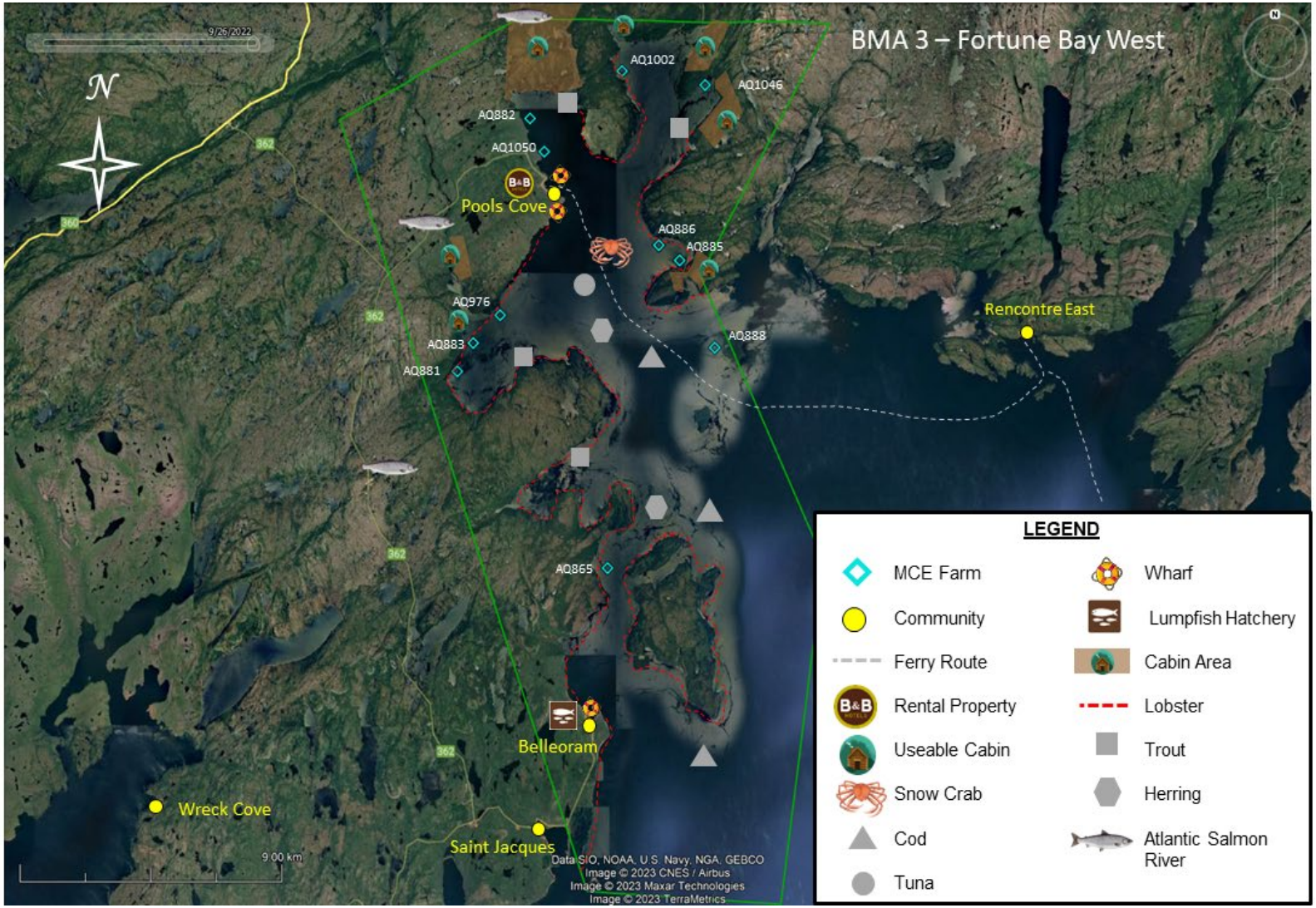


Figure 22 MCE Saltwater Farms and Other Marine Activities in BMA 4 Great Bay de l'Eau

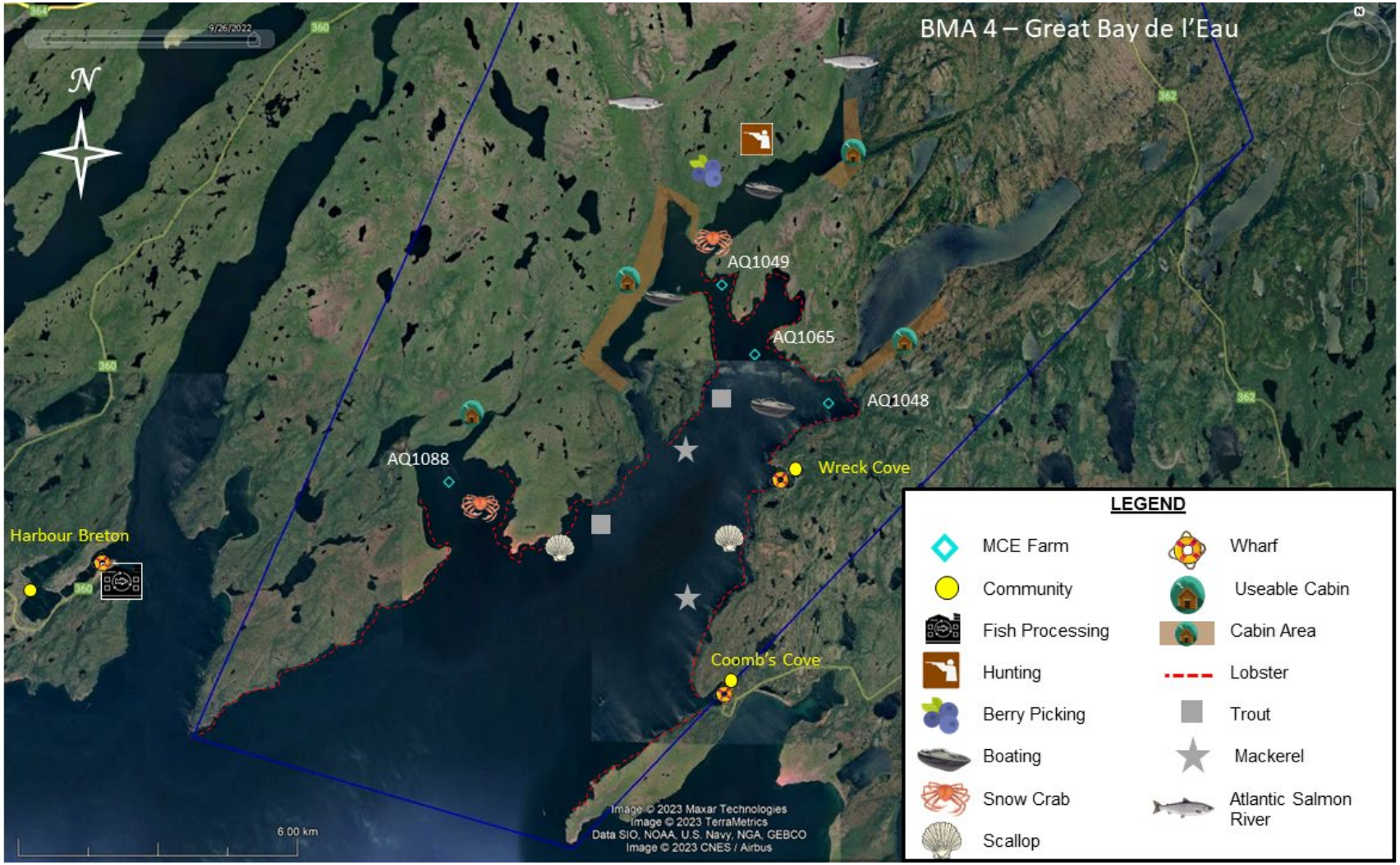


Figure 23 MCE Saltwater Farms and Other Marine Activities in BMA 5 Harbour Breton Bay

Figure 24 MCE Saltwater Farms and Other Marine Activities in BMA 10 Facheux Bay

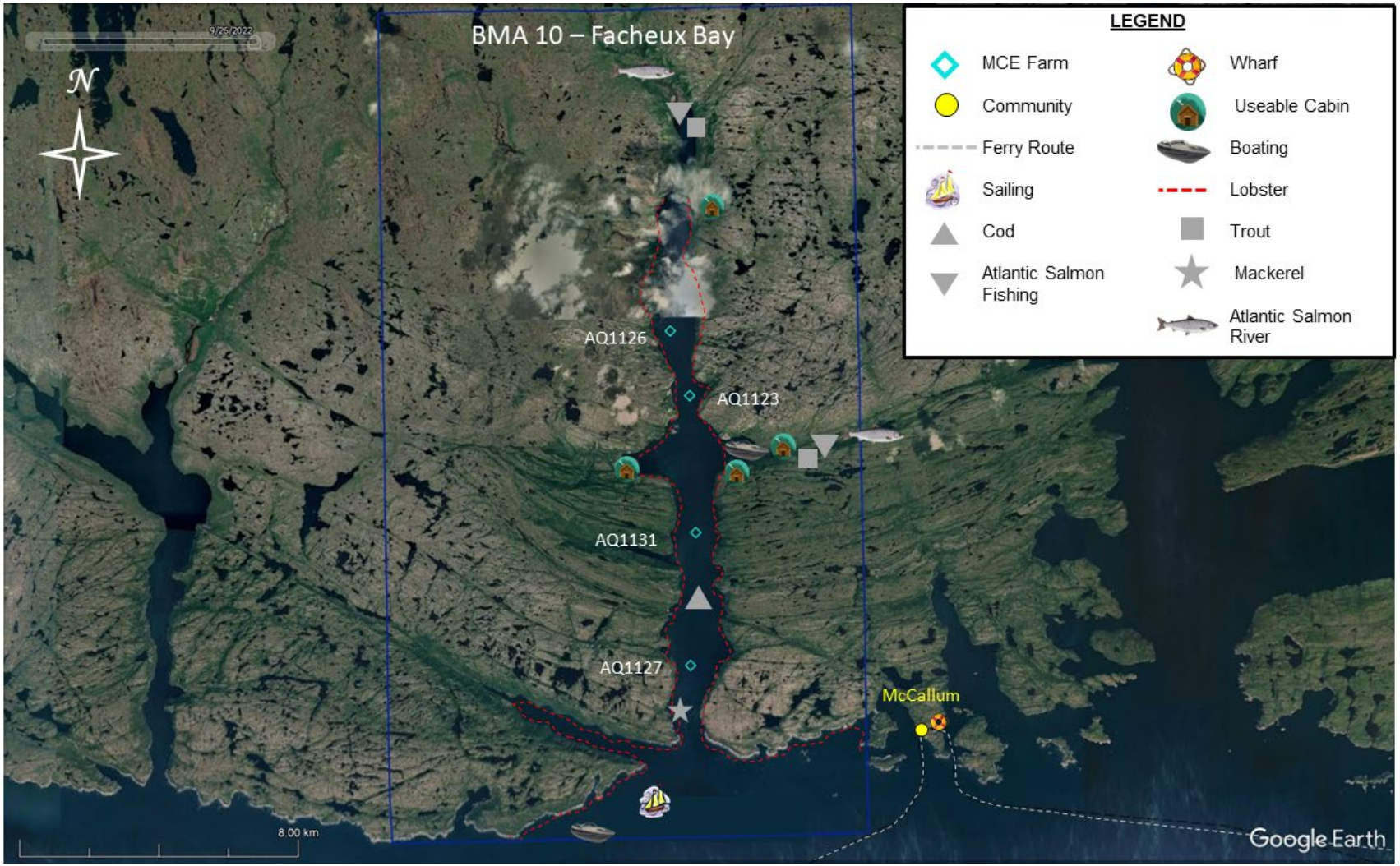


Figure 25 MCE Saltwater Farms and Other Marine Activities in BMA 11 Hare Bay

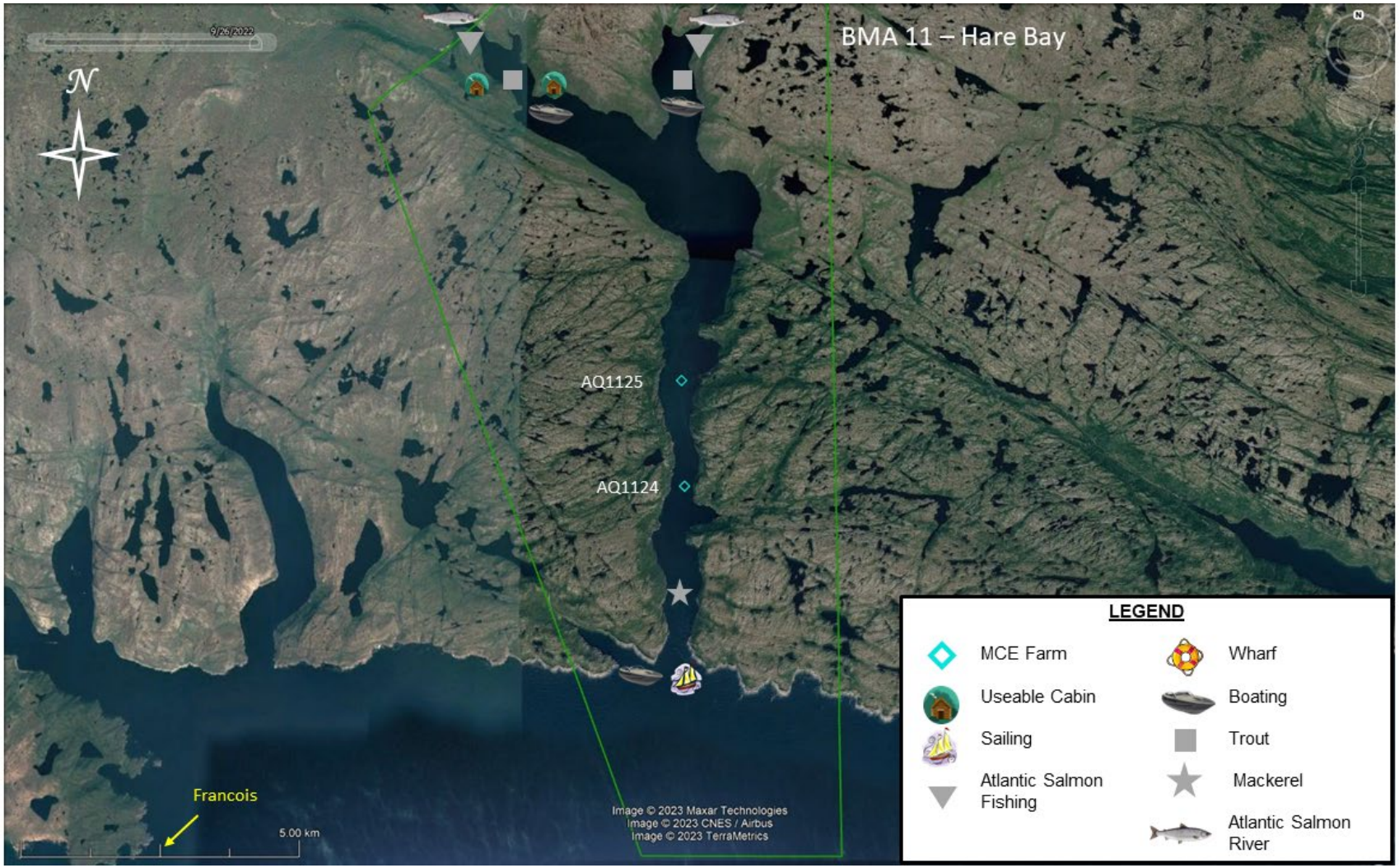


Figure 26 MCE Saltwater Farms and Other Marine Activities in BMA 12 Rencontre West

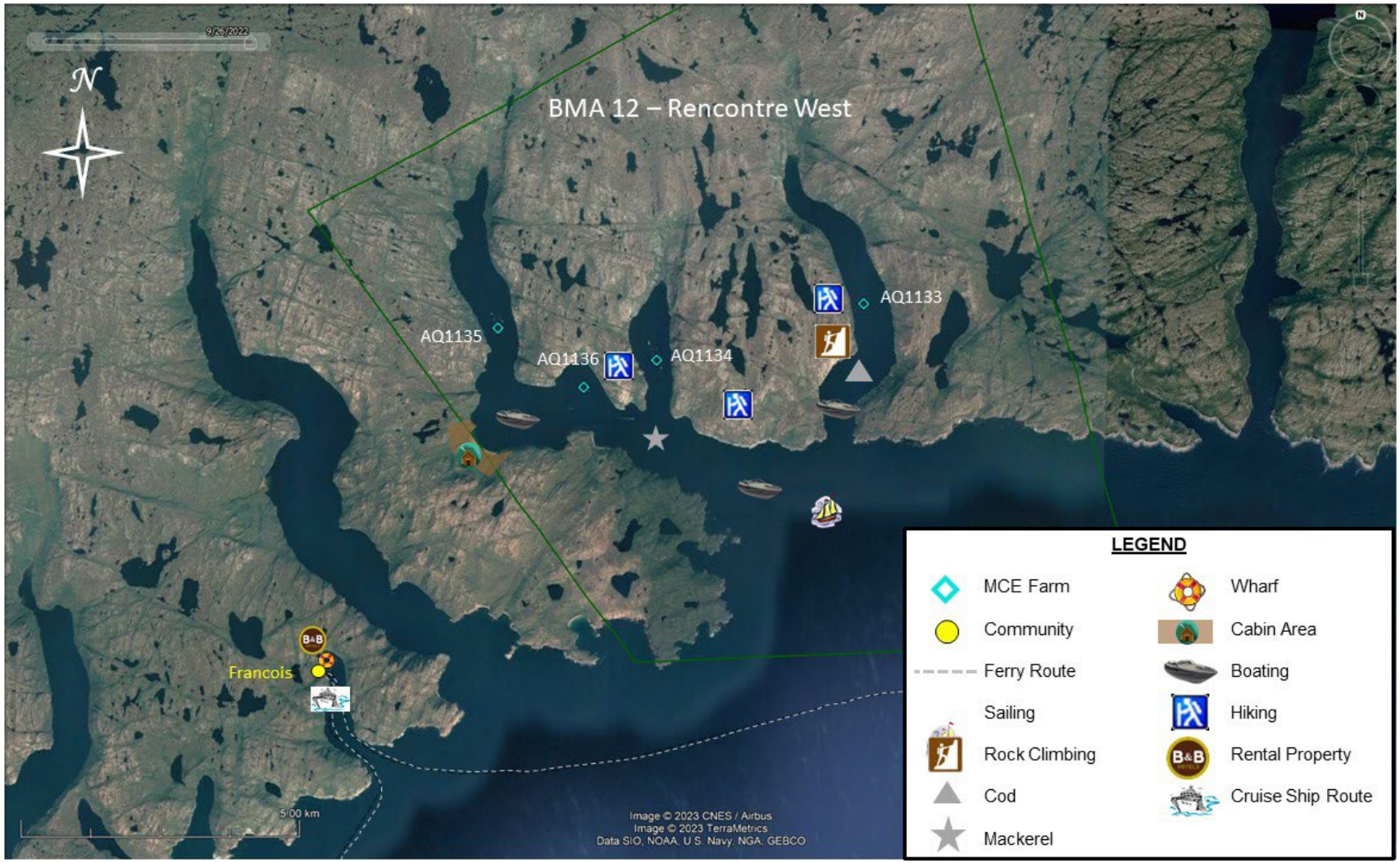
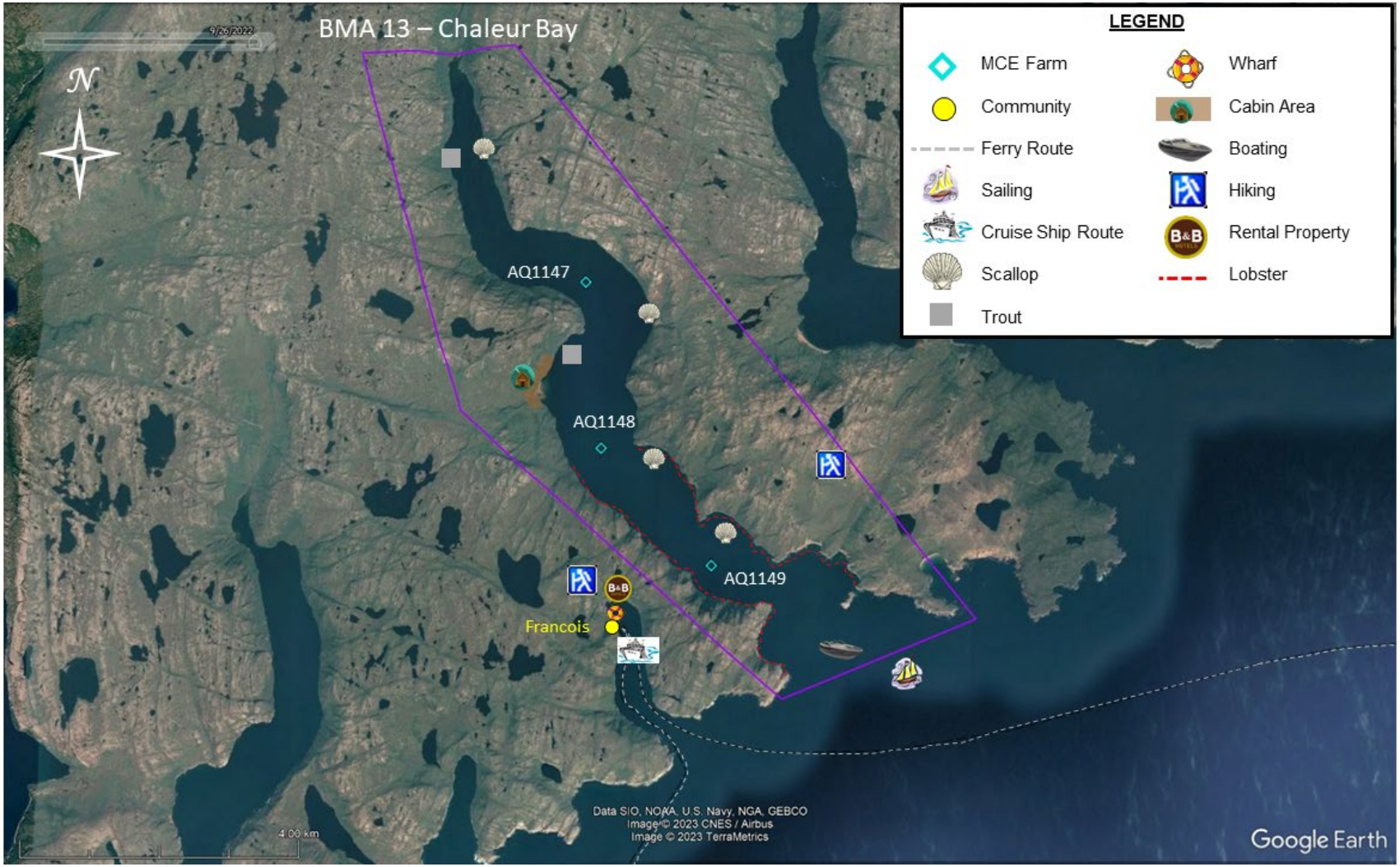


Figure 27 MCE Saltwater Farms and Other Marine Activities in BMA 13 Chaleur Bay



APPENDIX E: PUBLIC ENGAGEMENT EVENT NOTIFICATIONS

Indian Head Hatchery Expansion Project Environmental Preview Report Public Engagement: Public Notice Requirements

APPENDIX A

Public Notices

Under the provisions of the Environmental Assessment Regulations 2003, Section 10, and where the approved Guidelines require a public information session(s), the following specified public notification requirements must be met by the proponent prior to each meeting:

PUBLIC NOTICE

Public Information Session on the Proposed

Name of undertaking
Location of undertaking

shall be held at
Date and Time
Location

This session shall be conducted by the proponent,
Proponent name and contact phone number/email address,
as part of the environmental assessment for this project.
The purpose of this session is to describe all aspects of the proposed project, to describe the activities associated with it, and to provide an opportunity for all interested
persons to request information or state their concerns.

ALL ARE WELCOME

MINIMUM INFORMATION CONTENT OF PUBLIC ADVERTISEMENT

- Minimum newspaper ad size: 2 column widths. Minimum posted ad size: 7" x 5"
- Minimum newspaper ad coverage: Weekend preceding meeting and 3 consecutive days prior to meeting date; to be run in newspaper locally distributed within meeting area or newspaper with closest local distribution area.
- Minimum posted ad coverage: Local Town or City website (if permitted), proponent's web site (if applicable), and local community channel (if applicable), to be posted continually for 1 full week prior to meeting date.
- Social media posts (optional).

Indian Head Hatchery Expansion Project Environmental Preview Report Public Engagement: Public In-Person Open House Public Notification

PUBLIC NOTICE
Public Information Session on the Proposed

Indian Head Hatchery Expansion Project
Stephenville, NL

shall be held at

April 20, 2023, at 6:30PM
Days Inn by Wyndham Hotel – 44 Queen Street, Stephenville, NL

This session shall be conducted by the proponent,

Northern Harvest Smolt Inc (Mowi Canada East Inc.)
Contact: Aaron Bennett, Phone:506-469-4750, Email:aaron.bennett@mowi.com.

as part of the environmental assessment for this project.

The purpose of this session is to describe all aspects of the proposed project, to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns.
ALL ARE WELCOME

Indian Head Hatchery Expansion Project Environmental Preview Report Public Engagement: Virtual Live Question & Answer Session Public Notification

PUBLIC NOTICE

Virtual Engagement on the Proposed

Indian Head Hatchery Expansion Project

Stephenville, NL

The engagement will consist of a Virtual Q&A Session, to be held online from 5:30 PM - 6:30PM (NDT) May 11, 2023, and a project information website: www.indianheadproject.ca.

The Q&A Session will provide an overview of the project. The website will go live to the public on April 20, 2023 and will have a portal to capture comments or questions on the project.

This engagement shall be conducted by the proponent,

Northern Harvest Smolt Inc (Mowi Canada East Inc.) as part of the environmental assessment for this project.

Registration is required to participate in the Virtual Q&A Session. To register for the Virtual Q&A Session, please go to www.indianheadproject.ca after April 20, 2023 and follow the registration information.

ALL ARE WELCOME

APPENDIX F: TOWN OF STEPHENVILLE LETTER OF SUPPORT

The Town of Stephenville
P.O. Box 420, 125 Carolina Avenue
Stephenville, NL A2N 2Z5

27 July 2023

Dear Mr. Bennet,

Re: Letter of Support for the MOWI Expansion in the Town of Stephenville

On behalf of the Town of Stephenville, I would like to provide our unqualified support for the planned expansion of the Salmon Aquaculture facility in the Town of Stephenville. Having had the opportunity to host the Northern Harvest facility over the years, and now seeing the expansion of the MOWI facility, the Town is very pleased and supportive of these developments. We recognize the impact to the community in:

Employment: The proposed increase in smolt production will create an additional 10 positions created at the hatchery benefitting the Town of Stephenville ad surrounding area. When the wider impact of these secure and permanent jobs is considered, the impact is significant.

Service Contracts: The current operation of the MOWI Aquaculture Facility in Stephenville supports the local economy with local purchases of goods and services. The facility expansion will require a range of contractors, not only focused on construction but in supporting the wider operation of the facility going forward.

Taxes and Municipal fees: In 2022, the MOWI Aquaculture facility paid, water and sewer, and business taxes of over $200,000.

I would reiterate the support of the Town for this planned expansion and respectfully request that every and all consideration be provided for the timely approvals required to move forward this most important of expansions.

Yours truly,

Thomas Rose
Mayor
Town of Stephenville

Tel.: (709) 643-8360; Fax: (709) 643-2770
www.townofstephenville.com