

# Environmental Management Plan for Loch Erisort, Isle of Lewis

## CONTENTS

1. Definitions.....	1
2. Introduction.....	2
3. EMP Management Area.....	3
4. Aims.....	3
5. Monitoring.....	4
6. Co-operation.....	6
7. Adaptive Management.....	7
8. Review.....	9
9. Dispute Resolution.....	9
10. Signatories.....	9
Annex A Maps.....	10
Annex B Statement of Operational Practice.....	11
Annex C Wild Fish Monitoring.....	14
Annex D Contacts.....	18

### 1. Definitions

In this document the following definitions shall apply:

*“a Farm Management Area”* (FMA) is set out in the Industry Code of Good Practice<sup>1</sup> where farmers undertake to coordinate many of their activities and synchronise production in order to reduce and manage risks posed by infectious agents and parasites which can be present in the environment, in wild and farmed fish, and in other naturally occurring biota.

*“a Farm Management Agreement or Farm Management Statement”* is a statement of farming activities within a Farm Management area.

*“the Management Area”* shall mean the area shown on the map at Figure 1 of Annex A

*“the Operator”* shall mean Mowi Scotland Limited

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<sup>1</sup> <http://scottishsalmon.co.uk/cogp/>

*“the Planning Authority”* shall mean The Comhairle nan Eilean Siar

*“the Planning condition”* shall mean –  
condition 2 of the planning permission granted for the establishment of North Shore fish farm, Loch Erisort, Isle of Lewis Planning reference 14/00318; and  
condition 2 of the planning permission granted for the establishment of Tabhaigh fish farm, Loch Erisort, Isle of Lewis, Planning reference 14/00227.

*“the Stakeholders”* shall mean the Trust and the Board

*“the Board”* shall mean the Western Isles District Salmon Fisheries Board

*“the Trust”* shall mean the Outer Hebrides Fisheries Trust

## **2. Introduction**

The Operator manages the North Shore and Tabhaigh fish farms in Farm Management Area W-3. Management Area W-3 comprises Loch Erisort as set out in Figure 1 of Annex A.

The Planning Authority regulates interactions between finfish aquaculture and wild salmonid populations through the exercise of its planning powers and in common with all public bodies in Scotland, is required to further the conservation of biodiversity when carrying out its responsibilities under the Nature Conservation (Scotland) Act 2004.

The Planning Authority has granted planning permission to Mowi for fish farms at North Shore and Tabhaigh in the Management Area subject to a Condition requiring submission of an Environmental Monitoring Plan to be approved in writing by the Planning Authority.

The wording of both Planning Conditions is as follows:

*“Throughout the lifetime of the development to which this planning permission relates the developer shall monitor and record sea lice levels and implement mitigation and management measures, in accordance with the terms of the ‘Loch Erisort - Environmental Management Plan - Sea Lice (LE-EMP)’ attached to and forming part of this planning permission, unless the Comhairle as planning authority has approved a revised EMPSL in writing.”*

It is the purpose of an EMP to provide a working framework that will give the Planning Authority confidence that the aquaculture industry and wild fish (salmonid) interests are engaging in a meaningful way to prevent potentially damaging interactions. This EMP is not intended to form a legal contract with any implied liability, excepting the obligations prescribed by Planning reference numbers 14/00318 (North Shore) and 14/00227 (Tabhaigh).

The Operator and the Stakeholders recognise that the aims of the Planning Condition, along with similar drivers such as the Aquaculture Stewardship Council (ASC) Salmon Standard<sup>2</sup>, will be best achieved by managing interactions at an appropriate scale so the geographical scope of the EMP has been increased to encompass all fish farming activity within the Management Area.

The Board has a statutory duty under s.45 of the Salmon and Freshwater (Consolidation) (Scotland) Act 2003 to protect the fisheries in their district and to increase salmon. The Western Isles District Salmon Fisheries Board district encompasses the Management Area.

The Trust is a Scottish charity regulated under the Charities and Trustee Investment (Scotland) Act 2005. A key element of its mission statement is to promote and improve the health of aquatic ecosystems and self-sustaining fish populations including Salmonids in the Western Isles.

It is recognised that harmonious local coexistence between fish farming companies and wild fish stakeholders is good for all parties, and that this may be achieved through co-operation, open communication and transparency.

### **3. EMP Management Area**

The geographical area covered by this EMP shall be the same as for Farm Management Area W-3 as set out in Figure 1 of Annex A. The sites covered by this EMP shall include North Shore and Tabhaigh fish farms as shown in Figure 2 of Annex A.

### **4. Aims**

The Operator and the Stakeholders are committed to work in partnership to achieve the following overarching aim: to ensure that salmonid farming activity, within the Management Area does not result in negative impacts to local salmon and sea trout populations and fisheries. This will be achieved by the following specific aims:

#### **4.1 Monitoring.**

To improve the understanding of the relationship between farmed salmon production and the health of wild salmonids in the Management Area through better science including monitoring of lice burdens on wild fish. To see how this will be achieved see section 5 below.

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<sup>2</sup> [https://www.asc-aqua.org/wp-content/uploads/2019/04/ASC-Salmon-Standard\\_v1.2.pdf](https://www.asc-aqua.org/wp-content/uploads/2019/04/ASC-Salmon-Standard_v1.2.pdf)

#### 4.2 Co-operation.

To develop trust between the Operator and the Stakeholders in mutual support of the overarching aim of this agreement through developing a framework for co-operation and transparency. To see how this will be achieved see section 6 below.

#### 4.3 Adaptive Management.

To develop a framework in which management measures will be taken by the Operator in the Management Area in response to scientific evidence of negative impacts on wild salmonids arising from farming activity. To see how this will be achieved see section 7 below.

### **5. Monitoring**

It is recognised that better monitoring is needed to establish the extent to which there is a causal relationship between farming activity and damage to wild salmonid populations. It is the key aim of this EMP to provide the mechanisms to ensure that farming activity does not cause negative impacts to wild fish populations. For those mechanisms to work there must be a sound evidence base.

A key goal for monitoring is understanding the relationship between lice on farms in the Management Area and lice infection (and related mortality) on wild salmonids. In order to better understand that relationship the parties will develop a science strategy that will include (but not necessarily be limited to) the following key components: -

#### 5.1 Monitoring lice infection on wild salmonids

The key element of the monitoring strategy will be a programme of wild fish monitoring to measure levels of sea lice infection pressure on wild salmonids in coastal waters. The monitoring programme should be designed to detect the potential effect (if any) of aquaculture on the local wild fisheries in the vicinity of the Mowi fin fish farms located in Loch Erisort.

Given the relative lack of knowledge of the distribution of migrating salmon smolts in coastal waters it is recognised that the monitoring programme should be designed with the focus on the sampling of juvenile sea trout as a surrogate means of assessing sea lice infestation pressure.

A wild fish monitoring strategy will be developed and implemented under the direction of the Trust. The components of the strategy will be as set out in Appendix C but shall be agreed by all parties.

#### 5.2 Monitoring lice infection on farmed salmon

A weekly record will be kept of estimated total lice infection pressure from farmed salmon in the Management Area. The lice count and number of farmed fish on each farm will be used to calculate an 'area lice load'. The Operator will aim to keep the

area lice load below a 'maximum sea lice load' for the farm management area. This will be calculated from the intervention threshold (0.5 lice/per fish) multiplied by the total number of farmed fish in the Management Area. Calculation of the 'area lice load' will be an iterative process with the basis for calculation subject to periodic review and agreement by all parties.

### 5.3 Lice Connectivity Model

Within 6 months from the signing of this agreement the Operator will develop a sea lice connectivity model for the Management Area with input from the Trust. The aim of the work is to simulate the distribution of farm derived sea lice within the Management Area in order to gain a better understanding of the specific areas which might be particularly vulnerable to infection pressure from farm derived lice.

The development of a sea lice connectivity modelling approach as part of the scientific study will additionally complement the Scottish Government/industry coordinated Farmed Fish Health Framework<sup>3</sup> in relation to the following objective: *"Create a sea lice modelling and farm connectivity action plan, identifying required resources and responsible parties. The plan should explore the use of hydrodynamic and other modelling types to manage sea lice infection pressure over larger areas and be complementary to other environmental models used to support optimal site identification."*

### 5.4 Acoustic tracking studies to map smolt migration pathways

The Operator will work with the Trusts and the Boards to support appropriately designed acoustic tracking studies of salmon and sea trout in and around Loch Erisort with the aim of addressing information gaps associated with the migration of salmon smolts. The aims of the monitoring strategy outlined in this EMP is to provide an evidence base to establish an understanding of the relationship between lice on farms in the EMP Management Area and lice infection on wild salmonids.

It is however acknowledged that to fully assess, this component may be better applied and considered over a wider area in order to understand potential effects of sea lice in W-3 on the migration of salmonid populations in that wider area. The Operator commits to engage with the stakeholders as to how this may be practically achieved.

### 5.5 Additional information on local wild salmon populations

The parties may call upon or utilise other scientific data to better understand the health and pressures on local wild salmonid populations. This data may include fish counters and structured electrofishing data collected to understand the diversity and abundance of river stocks. Additionally, the Operator is committed to develop with the Trust a genetic study on the health of wild salmonid populations in freshwater catchments discharging into Loch Erisort. The Trust will maintain a register of any

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<sup>3</sup> <https://www.gov.scot/Resource/0053/00535697.pdf>

significant changes in land management, or other significant pressures on wild salmonids.

## **6. Co-operation**

The Operator and the Stakeholders agree to co-operate to achieve the following objectives:

### 6.1 Access to lice counts

The Operator agrees to facilitate access for the Stakeholders (on reasonable notice) for the purposes of observing on farm lice counts. All parties will endeavour to arrange such visits so that they fit in with the company's routine sampling and minimise unnecessary disturbance to the fish. Reciprocal visits by the Operator's personnel to observe wild fish lice counts will be arranged if desired.

### 6.2 Information sharing

The Operator and the Stakeholders agree to share all data generated under this EMP in an open and transparent manner to foster a culture of trust. If there are compelling reasons or otherwise for data to be considered as sensitive prior to placing in the public domain, then discussions may initially be required to be held in confidence.

The Operator agrees to share other relevant information pertaining to farming activity within the Management Area on reasonable request. Relevant information shall include the Farm Management Agreement or Farm Management Statement. The Stakeholders shall hold any such information on a confidential basis provided that (i) the Operator requests the Stakeholders to do so in writing and (ii) the information is commercially confidential in nature.

A summary of lice counts of all stages will be available to the Stakeholders in an agreed format and to an agreed timescale. The Operator commits to provide sea lice data within one week of the count taking place so far as reasonably possible.

The Operator agrees to notify the Stakeholders should: -

- any farm within the Management Area breach Code of Good Practice sea lice thresholds for lice burden,
- or the maximum sea lice load for the Farm Management Area exceeds that as set out in the Statement of Operation Practice as soon as reasonably possible.

### 6.3 Meetings

The Operator commits to meet the Stakeholders at least twice per complete production cycle subject to stocking timings. Meetings will be scheduled to take place prior to the wild smolt migration periods and one meeting to be held at the end of the production cycle.

The Operator will compile a written report for circulation to the Stakeholders in advance of each meeting. This report shall provide a summary of actions taken including full details of lice counts, sea lice treatments, escapes, incident-based mortalities and diseases. Where a sea lice or medicinal treatment is not successful, the report will set out: the trigger level breach, treatment action taken, result of treatment and actions taken to ensure future treatments are successful.

The Stakeholders will compile a written report for circulation to the Operator in advance of each meeting. The report shall provide a summary of wild fish monitoring data and any other information deemed to be of relevance.

The Operator commits to consult the Stakeholders in advance if they intend to make any changes to their current practices that may have a bearing on their ability to achieve the requirements of the EMP. In addition, they will provide early notification and meaningful pre-application discussion of any intention to seek planning permission for a new farm; seek to exercise permitted development rights; or seek to gain consent for increased biomass on an existing site.

#### 6.4 Finance

The Operator shall provide reasonable financial contribution for the wild fish monitoring programme including elements, such as acoustic tracking and genetic studies as may be agreed by the parties.

### **7. Adaptive Management**

The Operator shall manage its farms in the Management Area in accordance with the Statement of Operational Practice as set in Annex B in order to minimise the impact of farming activity on wild salmonids.

This EMP shall facilitate adaptive management. This means that the Operator undertakes that management of the farms in the Management Area shall be responsive to evidence of impacts on wild salmonid populations from farming activity. This means that where data generated under this EMP suggests that farming activity in the Management Area is impacting on wild salmonids the Operator shall take all necessary management measures to mitigate those impacts so far as reasonably possible.

Stakeholders may request management action under the following request procedure and/or at the end of production cycle review.

#### **1. Operator Action Request Procedure**

The Stakeholders may initiate the following Operator Action Request (OAR) procedure where monitoring results and/or risk assessments suggest that farming activity is directly impacting wild salmonids. An OAR shall be sent in writing to the Operator and must:

- Summarise the evidence from monitoring that suggests the need for action.
- Indicate a time frame in which management action is requested.
- What outcomes are desired as a result of the OAR.

The procedure will contain the following steps: -

- Step One: A Stakeholder serves an OAR on the Operator.
- Step Two: The Operator will respond in writing to the Stakeholders within 7 days of receipt of the OAR setting out the management measures taken and the metrics that will be used to review success of the measures and the review period.
- Step Three (optional): If at the end of that review period, the predicted results of those measures have not been achieved then the Stakeholders may issue a request for further action to the Operator.
- Step Four (optional): Within 7 days of receipt of the request for further action the Operator will respond to the Stakeholders in writing setting out the further management measures taken, the metrics that will be used to review success of the measures and the review period.

The extent of management action required in response to an OAR will be driven by the outcome to be achieved and shall include all management actions up to and including early harvest.

Further procedures may be agreed between the Operator and the Stakeholders as necessary.

The Operator or the Stakeholder may request a meeting with each other at any stage in the OAR procedure to discuss management actions.

## 2. End of production cycle review

The parties agree to meet at the end of the production cycle and that meeting will include a full review of all relevant data from the farms in the area, in addition to the results of the wild fish monitoring collected during the completed cycle.

In advance of the meeting the operator will produce a report which will provide a summary of key data metrics through the production cycle including sea lice infestation levels relative to the 'area lice load', specified in section 5.2, based on the stocked numbers of fish and adult female lice counts. Details of management interventions to address sea lice levels through the production cycle will additionally be made available within the same report.

In advance of the meeting wild fish stakeholders will report the results of and wild fish monitoring undertaken during the previous farm production cycle including relevant

metadata any relevant descriptive statistics of the secondary data metrics (such as sea lice abundance, intensity and proportional infestation).

Where monitoring evidence suggests a population regulating effect arising from sea lice, or impacts arising from an escape are identified, appropriate management measures will be agreed. The Operator will identify and deploy outcome-focussed alternative management actions designed to prevent any such impacts occurring during the next production cycle. For example, such measures could include the following:

- Pre-transfer sea lice treatments, where possible;
- A review of management intervention frequency, type and duration such as enhanced cleaner fish stocking or targeted use of resources such as mechanical or freshwater treatments;
- a change in the pen level sea lice intervention criteria or use of strategic site level treatments during sensitive periods for wild fish;
- amended harvest planning during second year of production;
- a reduction in cumulative area lice threshold for the farms in the management area.

If farm derived sea lice impact on wild fish populations continue to be identified over consecutive production cycles, despite previous management action having been deployed to mitigate those impacts, then further management action shall be required. Such management action may include alternate stocking strategies to avoid peak sea lice challenges during sensitive periods for wild fish, such as timing of fish inputs and changes to production cycle length (including developing use of post smolts), a reduction in biomass at any appropriate sites, or relocation of some production to a different location.

A minute of the meeting will be taken and sent to the planning authority and other regulatory bodies as appropriate.

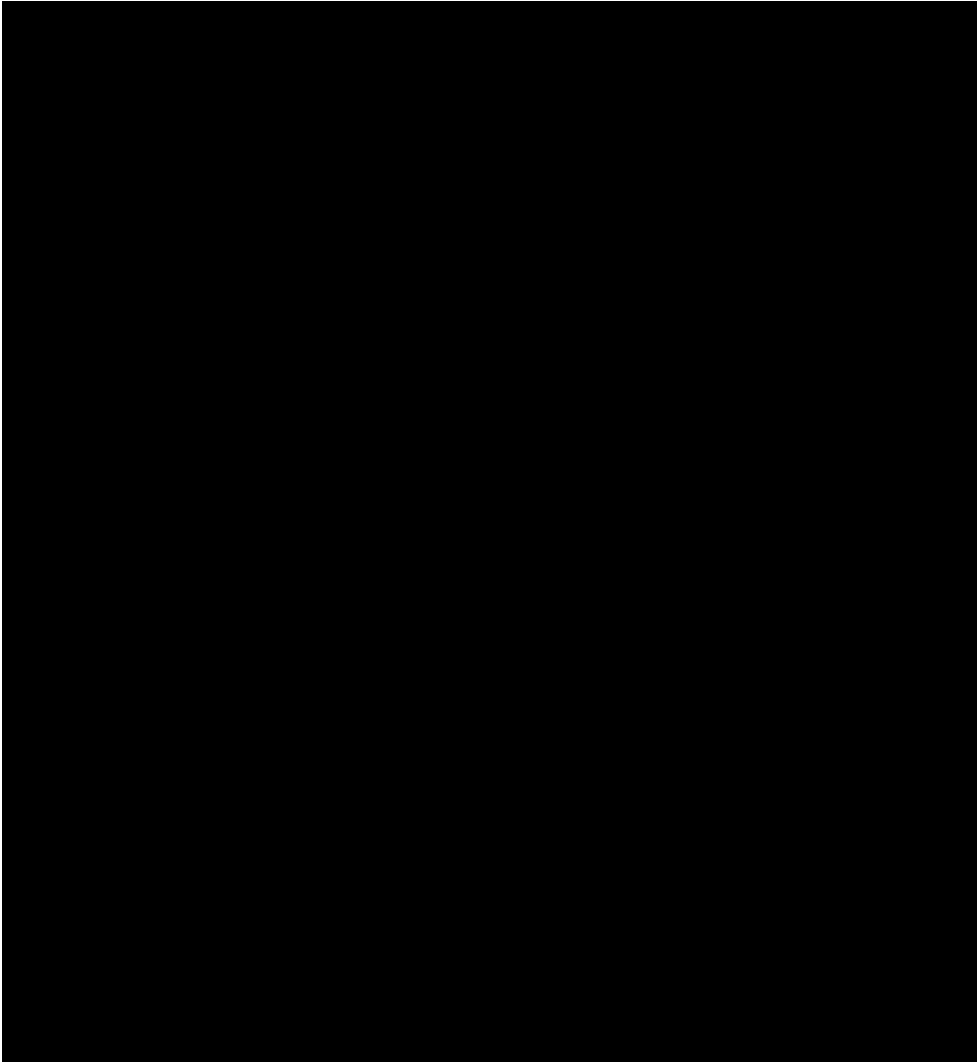
## **8. Review**

The EMP will be reviewed annually between the Operator and the Stakeholders to ensure that its aims are being met and modifications to the EMP may be made by common consent in the light of new data or management techniques.

Any changes made to the EMP shall be notified to and agreed by the Planning Authority.

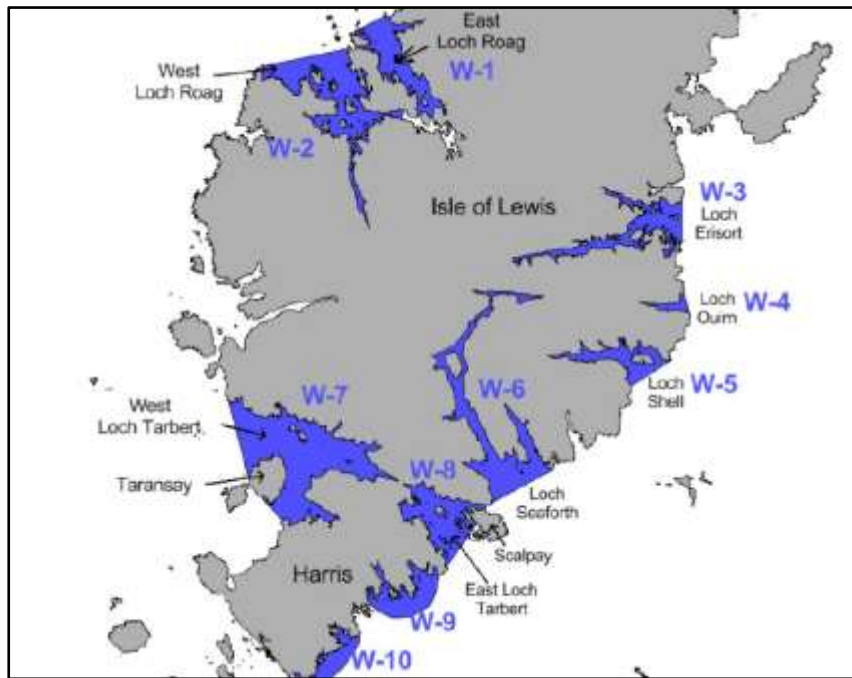
## **9. Dispute Resolution**

Any disputes regarding interpretation of this EMP or actions arising out of the EMP may be referred to the local planning authority for mediation.



**Annex A Maps of Farm Management Area**

This EMP will therefore cover the operational marine cage fish farms located in Farm Management Area W-3.



**Figure 1:** Farm Management Area W-3.

The operational fish farms and their location are identified within Figure 2 below:



**Figure 2:** North Shore and Tabhaigh fish farms

**Annex B Statement of Operational Practice**

**B.1 Sea Lice Monitoring**

Lice monitoring will be in accordance with the Code of Good Practice, in particular;

- Personnel carrying out lice counts will have appropriate training in lice recognition and recording and will be able to demonstrate post-training competence;
- A minimum of weekly monitoring will take place throughout the year;
- A minimum of 20 fish/pen from every pen will be counted;
- Fish will be netted straight from the pen into anaesthetic solution;
- Each life cycle stage of *Lepeophtheirus salmonis* will be counted in turn i.e., gravid females, adult stages (females and males recorded together), pre-adult stages (females and males recorded together), chalimus;
- All identifiable life cycle stages of *Caligus elongatus* will be grouped together
- After completing the lice counts on the fish from each pen, the tub containing the anaesthetic solution will be examined for sea lice which may have been shed from the fish and any lice found added to the total;
- A record will be made of the name of the person carrying out the count, the pen number, and the water temperature;
- Minimum sea lice recording requirements are i) *Lepeophtheirus salmonis* - chalimus, non-gravid mobiles (pre-adult males and females, plus adult males) and adult females with or without egg strings; and ii) *Caligus elongatus* – mobile stages.

**B. 2 Sea Lice Management and Control**

Effective sea lice management is a critical requirement to protect the health and welfare of farmed fish and to minimise the risk of potential impacts on wild salmonids. Poor management of sea lice not only generates potential environmental impacts, but also a significant cost to business primarily through compromised fish health and performance.

The Operator is committed to compliance with the on-farm sea lice management threshold levels prescribed by legislative requirements<sup>4</sup> and set out in the Industry Code of Good Practice<sup>5</sup>. This is achieved by applying strategic treatments/interventions to sites, aimed at minimising the numbers of sea lice on farmed fish, and prioritising control during the wild smolt migration period.

In addition to the current legislation and good practice compliance levels, the Operator are committed to manage to: -

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<sup>4</sup> <https://www.gov.scot/publications/fish-health-inspectorate-sea-lice-information/>

<sup>5</sup> <http://scottishsalmon.co.uk/cogp/>

- keep the area lice load in the Management Area below a 'maximum sea lice load' for the Management Area.
- maintain sea lice burdens on fish farm sites within the Management Area below an agreed level, so as not to present increased potential risk to wild salmonid stocks.

Management practice is aimed at two key outcomes: -

- to achieve no ovigerous female (AF) lice per fish during sensitive periods, which for the purpose of this document shall be the period February to October, inclusive;
- to achieve maximum treatment control and efficacy.

The sea lice strategy is based on the early (within 7 days) treatment of the very first individual pens rather than the later treatment of whole farms.

The lice count threshold for intervention is set at: 0.5 adult females. Identification of the lice count threshold of intervention will be an iterative process subject to periodic review and agreement by all parties.

The Operator will aim to coordinate lice treatments with the aim of maximising the benefits of anti-lice treatments and preventing cross-contamination of lice between farm sites and from farm fish to wild fish. A successful lice management strategy requires access to a range of effective, unrelated active ingredients and tools, to maintain efficacy. The Operator will commit to progress the further development of mechanical and biological lice management tools and share and allocate resource accordingly.

### B.3 Stocking

Within Farm Management Area W-3, all sites will be stocked and managed on a single year class basis and as defined by the Joint Working Group report on ISA<sup>6</sup>.

At the end of each production cycle, sites will be fallowed for a minimum period of 6 weeks with the intention of extending this period when possible to do so. Individual sites may be fallowed for a longer period.

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<sup>6</sup> <http://www.gov.scot/Uploads/Documents/JGIWGRReport.pdf>

#### B.4 Disease Status

All smolts stocked into the area encompassed by this EMP for the purpose of aquaculture will be fully vaccinated against all common bacterial and viral infections. The Operator will adhere to the Code of Practice proposed by the Joint Working Group Report on ISA (February 2000) and the Industry Code of Good Practice. The occurrence of any suspected disease within any part of the Farm Management Area W-3 area boundary will be managed in accordance with Farm Management Agreement and the individual fish farms veterinary health plans and reported via established procedures to the Scottish Government Fish Health Inspectorate

All stakeholders party to this EMP will aim to ensure that information about the parasite *Gyrodactylus salaris* and methods to prevent its spread are made available to the general public.

#### B.5 Escapes

The Operator will adhere to the recommendations made by the Containment Working Group, a sub-group of the Strategic Framework, the SSPO Code of Good Practice and the Scottish Technical Standard.

The design specifications of the pens, nets, feed barges, and mooring grid systems used by the Operator are fully appraised and based on a comprehensive site-specific environmental data set. For each site, data on geographic location, bathymetry, wind, waves, and hydrography are collected, analysed and compiled. Advanced hydrodynamic models are also often used to provide a more comprehensive picture of hydrodynamic conditions in a wider region.

The Operator's suppliers work with AquaSim or other approved software in accordance with the Norwegian Standard 9415<sup>7</sup> or The Scottish Technical Standard<sup>8</sup> Both standards were introduced to prevent failure of farm infrastructure and in turn limit escapes. The 1 in 50-year storm event is the minimum standard to which equipment is rated. All equipment is specified to Norwegian and United Kingdom engineering quality standards, whilst its installation is undertaken by dedicated teams of suitably qualified staff.

Farm sites within the area covered by this EMP will have site-specific escape prevention and contingency plans to provide effective means of reporting and potentially re-capturing escapee farm stock. The escape contingency plans will be agreed in advance and subject to periodic review and agreement by all parties.

In all cases of suspected farm escapes, the procedure set out by the Scottish Government Fish Health Inspectorate<sup>9</sup> will be strictly adhered to.

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<sup>7</sup> <https://www.standard.no/en/nyheter/news-in-english/2012/marine-fish-farms/#.X3RuN9ZFx9A>

<sup>8</sup> <https://www.gov.scot/publications/technical-standard-scottish-finfish-aquaculture/>

<sup>9</sup> <http://www.scotland.gov.uk/Topics/marine/Fish-Shellfish/18364/18692/escape>

In the event of an escape incident the Operator will also inform the Stakeholders of the event as soon as an escape is reported to management. An agreed procedure and format for notification will be established in consultation with the Stakeholders. If the Stakeholders become aware of any evidence that is indicative of an escape incident then that information will be shared with the Operator.

If fish presumed to be escaped farmed salmon are caught in the areas around Lewis, then evidence should be taken to allow confirmation. Ideally the fish, or at least scales and photos should be kept for analysis. If there is doubt as to the source of escaped fish, the Operator will provide genetic samples of farmed fish to allow genetic testing to take place. The Operator will assist in the capture of any escaped farmed fish for early verification.

If an escape event occurs, in consultation with the Stakeholders, a program of additional monitoring activity with the intention of furthering knowledge as to the genetic impact of escapes on wild salmonid populations will be agreed and implemented.

### **Annex C Wild Fish Monitoring Programme**

A wild fish monitoring strategy will be developed under the direction of the Trust with the aim of establishing a data set capable of detecting the potential effect (if any) of aquaculture on the local wild fish in both the marine and freshwater phases of their life cycle. The area covered by the studies detailed below will be focussed within the vicinity of the Mowi fin fish farms located in Loch Erisort with the monitoring scheduled between the months of April to September inclusive.

The wild fish monitoring strategy shall be kept under review and where appropriate, scientific oversight from Fisheries Management Scotland and/or independent academic partners will be sought. Additional appropriate sampling techniques may be used depending upon sound scientific requirements and subject to discussion and agreement. The individual components that comprise the monitoring approach at a local level will depend heavily on local conditions and the ability to practically deploy the various equipment suggested above. In addition to funding support for wild fish monitoring, the Operator will commit to provision of reasonable resourcing support to assist delivery and implementation of monitoring.

#### **C.1 Marine monitoring of wild fish**

Given the relative lack of knowledge of the distribution of migrating salmon smolts in coastal waters, it is recognised that the components of a wild fish monitoring strategy should be designed with the focus on the sampling of juvenile sea trout as a surrogate means of assessing sea lice infestation pressure. It is important that the ability to sample juvenile wild salmonid populations is carried out in a true and representative manner of salmonid populations within the defined area.

Sea lice monitoring will be undertaken at the location identified in table 1 below. Wild salmonids will be targeted, using fixed fyke nets. Fish captured will be weighed,

measured and visually checked for sea lice. Methods of identification, counting and recording of sea lice should mirror but not be limited by that undertaken on farm fish.

Marine Monitoring Locations
Loch Erisort

**Table 1:** Wild Fish Marine Monitoring Locations

- Each fish will be weighed and measured. Checks will be made for lice damage and a record made of the state of the dorsal fin
- Each life cycle stage of *Lepeophtheirus salmonis* will be counted in turn i.e., gravid females, adult stages (females and males recorded together), pre-adult stages (females and males recorded together), chalimus;
- All identifiable life cycle stages of *Caligus elongatus* will be grouped together
- After completing the lice counts on the fish from each pen, the tub containing the anaesthetic solution will be examined for sea lice which may have been shed from the fish and any lice found added to the total;
- Additional information on sea trout will be recorded on sea lice grazing damage to fins and physical damage caused by predators.
- A record will be made of the name of the person carrying out the count and the water temperature and salinity.

Once fully recovered fish will be released.

Fixed fyke nets with leaders can be deployed perpendicular to the shore and have proved to be an effective way of catching wild salmonids. The nets have the advantage of fishing continuously and can be deployed over a wide range of coastal habitats. Nets are checked every 24 hours to ensure fish welfare is not compromised. Nets can be left open when not fishing. The operator will provide support where practical to the deployment and fishing of fixed fyke nets.

## C.2 Freshwater monitoring

The monitoring of salmonid fish in freshwater catchments flowing into the management area will seek to provide information on the recruitment of salmon and trout smolts. Monitoring is to be carried out to: -

- Identify distribution of species;
- Provide estimates of abundance for juvenile trout and salmon in relation to habitat characteristics and condition;
- Identify stock diversity and effective breeding population sizes through genetic analysis of trout and salmon;
- Identify genetic profile and potential introgression of escapee farm salmon and wild salmon populations.

Densities of juvenile salmonids may be affected by many factors, both in river and at sea. As adult salmon and sea trout can produce large numbers of eggs, even relatively few returning adults can result in good densities of juvenile salmonids. However low

numbers of returning adults may lead to a lack of genetic diversity in juvenile populations, and juvenile surveys can detect changes in juvenile densities if there are very low numbers of returning adults.

Juvenile fish densities will be monitored by electrofishing. Monitoring site selection can be influenced by historical monitoring activity in previous years and data collection. Alternatively, the GRTS (Generalised Random Tessellation Stratified) design and juvenile assessment model being developed by Marine Scotland Science could be utilised to determine survey sites on these burns. Both approaches (using historical sites or using new GRTS sites) have their drawbacks since the ability of the GRTS approach to provide a good assessment of salmon population status has not been fully validated, GRTS are currently only used to assess salmon populations, not sea trout and historic electrofishing data show such high levels of variability between years that trends might not easily be determined. Further discussion between the Operator and the Trust will determine the best survey method.

Genetic samples will be taken from juvenile salmon to determine if there is any introgression of farmed genes and also to assess genetic diversity in salmon populations. Surveys should be repeated preferably every year and at least every second year over the course of three farm production cycles.

The monitoring of salmonid fish in freshwater catchments will be undertaken at the locations identified in table 2 below.

<b>Freshwater Monitoring Locations</b>
Laxay River

**Table 1:** Freshwater Monitoring locations.

### **C.3 Assessment: Interpretation of wild fish monitoring**

#### **C.3.1 Freshwater Monitoring**

The results of the wild fish monitoring surveys will be reported annually and will be used to undertake an assessment of salmon population abundance in the Laxay River. Further discussion between the operator and the Trust will establish an agreed method of classification. Assessment of data generated by the electrofishing surveys will include comparison with wider wild fish monitoring data generated by the Trust to better reflect general trends in salmonid abundance over time.

The Trust will also report catches of salmon and trout in fisheries and create a register of changes in local land and water use within the EMP management area that may affect freshwater recruitment of wild salmonids. The Operator commits to work with the Trust and Board to identify opportunities for habitat restoration plans for impacted areas of the freshwater environment within the EMP management area.

### C.3.2 Marine Monitoring

A salmon lice risk index, attempting to estimate the increased mortality due to salmon lice infections, has been proposed by Taranger *et al.* (2014). This approach will be adopted to assess the impact of sea lice on wild fish, but the approach will be kept under review and will be re-assessed if new information, of relevance to impacts on wild fish, becomes available.

The risk to wild salmonids arising from sea lice will therefore be assessed as follows for small salmonid post-smolts (<150 g body weight):

<i>Sea lice (all stages) g<sup>-1</sup> fish weight</i>	<i>Risk category</i>	<i>Lice related mortality</i>
>0.3 lice g <sup>-1</sup> fish weight	High	100%
0.2 - 0.3 lice g <sup>-1</sup> fish weight	Medium	50%
0.1 - 0.2 lice g <sup>-1</sup> fish weight	Low	20%
<0.1 lice g <sup>-1</sup> fish weight	Minimal risk	0%

The risk to wild salmonids will then be further scored to assess sea lice related increased mortality rate at a population level. Increased mortality risk is calculated as the sum of the increased mortalities in the sample, reflecting the distribution of the intensity of salmon lice infection of the different individuals sampled, as set out in the table below.

<i>Increased mortality risk at population level</i>	<i>Population regulating effect</i>
>30% of fish have >0.1 lice g <sup>-1</sup> fish weight	High
10%-30% of fish have >0.1 lice g <sup>-1</sup> fish weight	Medium
<10% of fish have >0.1 lice g <sup>-1</sup> fish weight	Low

Where monitoring of wild salmonids demonstrates that the risk of increased mortality at a population level is medium or high or is suggestive that lice on wild fish may be approaching these levels, this will be communicated to the Operator within 7 days.