Scottish Sea Farms

DUNSTAFFNAGE FISH FARM

Environmental Impact Assessment Report

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List of Acronyms

CAR	Controlled Activities Regulations
EIA	Environmental Impact Assessment
SEPA	Scottish Environment Protection Agency
SSF	Scottish Sea Farms

1 INTRODUCTION

1.1 APPLICANT DETAILS

Applicant:	Scottish Sea Farms Ltd
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Scottish Sea Farms (SSF) are pioneers in the farming of superior quality Scottish salmon since 1974. SSF views the quality of their product to be the highest corporate priority and operates under various quality assurance schemes to ensure that high standards are maintained. SSF's production systems satisfy the requirements of the following well known quality assurance standards:

- ISO 9001:2008 (Quality Management Standard);
- ISO 14001 (Environmental Management System);
- Global Standard for Food Safety;
- Freedom Food (RSPCA monitored);
- GLOBALGAP (International Standard for Safe and Sustainable Agriculture);
- Various customer codes of good practice (Marks & Spencer, Waitrose, Label Rouge and others); and
- Product specifications and Industry Standards, including those of Scottish Salmon Producers Organisation.

Effective quality management is maintained by:

- well-defined corporate policies and operational guidance;
- a routine programme of independent external audits by recognised certification bodies;
- customers own external audits;
- continued internal monitoring and auditing; and
- formal management review.

The company can be audited at any time on an unannounced basis under any one of the quality assurance schemes with which it is accredited, requiring best systems and practices be adhered to at all times.

1.2 PROPOSAL CONTEXT

SSF proposes a programme of developments at a number of their existing sites within the Linnhe region, Farm Management Area FMA M-36 (refer to Figure 1-1), namely Dunstaffnage, Shuna, Lismore North and Lismore West. Separate applications are being submitted in respect of each site.

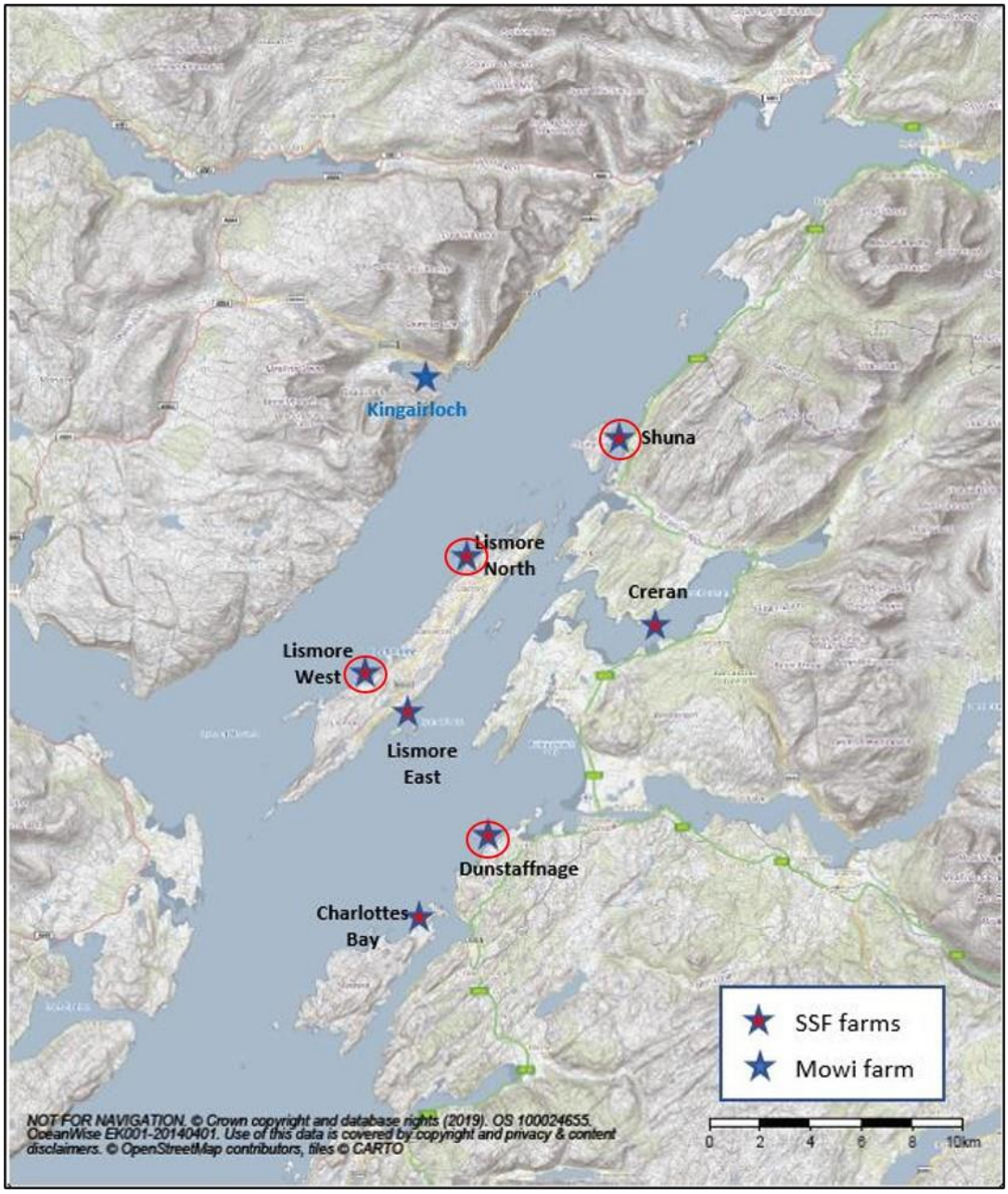


Figure 1-1 Fish farms within Farm Management Area FMA M-36 (farms circled form part of the programme of developments)

The focus of this report is the proposal to reconfigure and expand the infrastructure at the existing Dunstaffnage fish farm located in the Firth of Lorn, Argyll and Bute to facilitate an increase in production. However, the potential cumulative impacts of the wider programme of developments are also taken into consideration.

There has been a fish farm operating at this location since 1987. The current existing site at Dunstaffnage consists of 9 x 80m circumference cages in a 50m mooring grid, with associated automated 80T capacity feed barge which also provides storage for feed and equipment, as well as an incinerator, office and staff welfare facilities. Planning permission for the existing site and equipment was granted on 24/04/2013 under the Town and Country Planning (Marine Fish Farms Permitted Development) (Scotland) Order 2011.

SSF propose to reconfigure and expand the site at Dunstaffnage, replacing the existing infrastructure with 14 x 100m circumference cages in a 75m mooring grid. The proposal will facilitate a biomass increase of 1050T to a new

maximum biomass of 2350T. The Scottish Environment Protection Agency (SEPA) have approved a variation to the existing Controlled Activities Regulations (CAR) licence for this farm with a maximum biomass of 2350T (SEPA CAR Licence reference CAR/L/1009031 VN06).

The total surface area of the expanded site will be 11,388m^2 and the wider area of the expanded site including moorings will be 371,250m^2.

The cages deployed will be identical to those currently at the site but 20m larger in circumference (6.3m increase in diameter) – i.e., low in profile and constructed of black, non-reflective material. Top nets will be changed from the current hamster-wheel design to a pole net design. The proposed cage group will appear two cages longer with the length of the cage group increasing from 300m to 525m. The proposal includes the replacement of the existing cylindrical C-cap feed barge (11m diameter) with a new 300T feed barge (26m length, 10.5m width), which will remain located to the SE of the cage group centre, between the site and the shore.

The existing and proposed site overlay is shown in Figure 1-2.

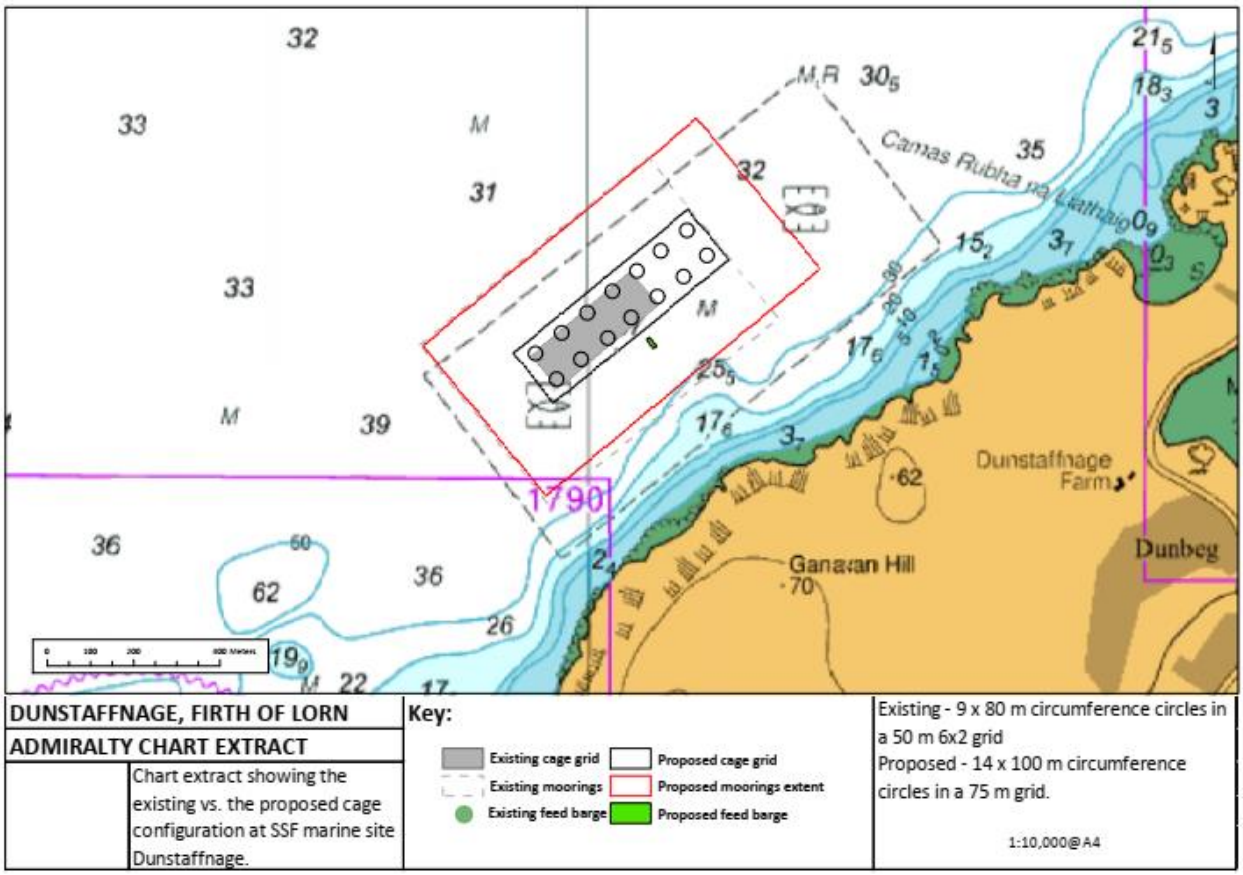


Figure 1-2 Existing and proposed site overlay

In terms of the Town and Country Planning (Scotland) Act 1997 (as amended) planning permission is required for all new aquaculture developments, change of use, and alterations to existing approved sites.

According to the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 'the Environmental Impact Assessment (EIA) Regulations' EIA is a process which identifies the environmental effects (both negative and positive) of development proposals with the aim to prevent, reduce and offset any adverse impacts. Intensive fish farming is a type of development identified in Schedule 2 of the EIA Regulations requiring that marine finfish farm proposals in excess of 0.1 ha in area, or producing more than 10 tonnes deadweight of fish, or designed to hold a biomass of 100 tonnes or more, or located in a sensitive area, be assessed to establish whether

or not the proposed development is an EIA development. In carrying out the Screening Assessment, the 'characteristics of the development', the 'location of the development' and the 'characteristics of the potential impact' as set out in Schedule 3 of the EIA Regulations must be considered.

Argyll and Bute Council 'the Planning Authority' has adopted a Screening Opinion such that the proposed development is an EIA development. This EIA Report has therefore been compiled in support of the planning application submitted under the Town and Country Planning (Scotland) Act 1997 (as amended).

1.3 STATEMENT OF COMPETENCY

Under Regulation 5(5) of the EIA Regulations, the EIA Report must be prepared by competent experts and accompanied by a statement outlining the relevant expertise or qualifications of such experts. This EIA Report has been prepared by SSF informed by technical reports prepared by specialists where required. The relevant qualifications and expertise of the contributors is presented below:

Contributors	Relevant expertise and qualifications
Sheena Gallie, Head of Environment – Scottish Sea Farms	Sheena graduated with an Honours degree in Biology in 1994 from Stirling University. Since then, she has gathered over 15 years' experience in working in the aquaculture sector directly in various roles in environmental compliance and development, and another 7 years' in regulatory roles at Scottish Environment Protection Agency and Highland Council. She has led the Environment Team at SSF since February 2012.
Mark Steward, Development Manager – Scottish Sea Farms	Mark has over 20 years' experience in marine environmental management, policy and planning. With an Honours degree in Zoology (Marine and Fisheries) from Aberdeen University, Mark worked as a marine advisor for Scottish Natural Heritage and then as marine development manager with Argyll and Bute Council, before joining SSF in February 2018. Mark has extensive experience in marine and terrestrial planning, policy development and the environmental assessment and regulation of aquaculture.
Amanda Tresise, Development Officer – Scottish Sea Farms	Amanda has a BSc Honours degree in Zoology (Aquatic Health), an MSc degree in Zoology (Aquatic Health) as well as an MSc degree in Environmental Management from the University of Johannesburg and is a Practitioner Member of the Institute of Environmental Management and Assessment (IEMA). She joined SSF in June 2020 having worked in the aquaculture sector since April 2018 with previous employment at an environmental consultancy from May 2012. EIA coordination is her key area of expertise.

1.4 REPORT PURPOSE AND STRUCTURE

The purpose of this EIA Report is to detail the information that may be required for reaching a reasoned conclusion on the likely significant effects of the proposed development on the environment, taking into account current knowledge and methods of assessment. Regulation 5(2) of the EIA Regulations prescribe the required minimum content of an EIA Report and this report has been aligned to meet the content requirements as detailed below:

EIA Regulations - Regulation 5(2) "An EIA report is a report prepared in accordance with this regulation by the developer which includes (at least)—"	[Relevant section of this report where addressed]
(a) a description of the development comprising information on the site, design, size and other relevant features of the development;	Section 2

EIA Regulations - Regulation 5(2) "An EIA report is a report prepared in accordance with this regulation by the developer which includes (at least)—"	**[Relevant section of this report where addressed]**
(b) a description of the likely significant effects of the development on the environment;	Section 7
(c) a description of the features of the development and any measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;	Section 7 Section 9
(d) a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;	Section 4
(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d);	Appendix 1
(f) any other information specified in schedule 4 relevant to the specific characteristics of the development and to the environmental features likely to be affected.	Refer to the table below

Schedule 4 of the EIA Regulations further prescribes the required content of an EIA report and this report has been aligned to meet the content requirements as detailed below:

EIA Regulations - Schedule 4 "Information for inclusion in EIA reports"	**[Relevant section of this report where addressed]**
1. A description of the development, including in particular: (a) a description of the location of the development; (b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; (c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, [F52radiation)] and quantities and types of waste produced during the construction and operation phases.	Section 2
2. A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Section 4
3. A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with	Section 7

EIA Regulations - Schedule 4 "Information for inclusion in EIA reports"	[Relevant section of this report where addressed]
reasonable effort on the basis of the availability of relevant information and scientific knowledge.	
4. A description of the factors specified in Regulation 4(3) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Section 7
5. A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) the construction and existence of the development, including, where relevant, demolition works; (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; (g) the technologies and the substances used. The description of the likely significant effects on the factors specified in Regulation 4(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project including in particular those established under Council Directive [F5392/43/EEC] and Directive 2009/147/EC.	Section 7 Section 8
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Section 6 Section 7
7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis).	Section 7 Section 9

EIA Regulations - Schedule 4 "Information for inclusion in EIA reports"	[Relevant section of this report where addressed]
That description should explain the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	
8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to legislation of the European Union such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments may be used for this purpose provided that the requirements of [the Directive] are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Section 7 Section 8 Section 9
9. A non-technical summary of the information provided under paragraphs 1 to 8.	Appendix 1
10. A reference list detailing the sources used for the descriptions and assessments included in the EIA Report.	Section 10

1.4.1 Screening Opinion

The specific content of the EIA Report is further guided by the Screening Opinion provided by the Planning Authority on 30 October 2019, which requested that the pertinent aspects summarised in Table 1-1 below specifically be addressed.

Table 1-1 Pertinent aspects identified in the Screening Opinion to be addressed in the EIA Report

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
Benthic habitat impacts			
The site has the potential to produce waste in terms of faeces and uneaten food. There may also be a risk of pollution through the use of medication.	Argyll and Bute Council	Impacts on seabed habitats and species have been considered by SEPA and a variation to the CAR Licence for the existing site (reference CAR/L/1009031 VN06) has been granted which authorises the new proposed maximum biomass of 2350T at the expanded site and indicates the permitted quantities of chemotherapeutants and practical application times and is included as an appendix. The impact of the proposal on the benthic habitat including Priority Marine Feature habitats and species have been assessed as part of the EIA. The assessment was informed by monitoring surveys of the benthic conditions within the existing site footprint undertaken to ensure compliance with the SEPA CAR licence as well as a baseline Remotely Operated Vehicle survey carried out within the proposed development area adjacent to the existing site.	SEPA CAR Licence (Appendix 2) Biomass and Medicine Modelling report (Appendix 3) Hydrographic reports (Appendix 4) Impact assessment – Section 7.2 Benthic monitoring report (Appendix 5) Visual Seabed Survey Report (Appendix 6)
The applicant is requested to submit the full modelling (benthic, pollution, chemical and hydrographic) reports in support of any planning application.	Marine Scotland Science, Argyll and Bute Council and Scottish Natural Heritage (now NatureScot)		
Indicate the permitted quantities of chemotherapeutants and practical application times.	Marine Scotland Science		
Burrowed mud which is a Priority Marine Feature is present in the vicinity of the site. The applicant should submit with their full planning application, an accompanying survey report and an assessment of the significance of any impacts upon Priority Marine Feature habitats and species.	Argyll and Bute Council and Scottish Natural Heritage		

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
We can advise that any potential impacts on this Priority Marine Feature habitat are likely to be of local significance only and are unlikely to result in any significant impacts upon their national status.	Scottish Natural Heritage		
Water column impacts			
Details provided by the applicant state that the proposed development is currently within an uncategorised area (Lower Loch Linnhe) in the current Locational Guidelines (March 2019). The applicant has submitted a satisfactory Equilibrium Concentration Enhancement assessment estimate (April 2018). The report concluded that any increase in nutrient concentrations would likely to be insignificant in terms of the overall nutrient status of the water body. The applicant is however requested to provide a full nutrient enhancement calculation at the time of final planning application or ensure that it remains relevant to the proposal.	Marine Scotland Science and Argyll and Bute Council	The impact of the proposal as well as the cumulative impacts of the wider programme of developments proposed within Loch Linnhe on the water column have been assessed as part of the EIA. The Equilibrium Concentration Enhancement assessment estimate (April 2018) was used to inform the assessment as it was still considered relevant and sufficient at the time of compiling this EIA report, as it represents a worst-case scenario.	Impact assessment – Section 7.3 Equilibrium Concentration Enhancement assessment (Appendix 7)
Impacts on navigation, anchorage, commercial and other maritime uses			
The site will take up an area of the sea which may have consequences for commercial boats.	Argyll and Bute Council	Impacts on navigation, anchorage, commercial and other maritime uses have been assessed as part of the EIA.	Impact assessment – Section 7.1
The applicant is requested to provide an assessment of how the footprint of the farm (surface and seabed mooring area) will affect or interact with commercial fishing. ScotMAP data (July 2019) has identified the surrounding marine area of the farm as being of medium value for nephrops creels, crab / lobster creels and trawl fishing. However, the overall moorings area, might interact with fishing activity, and could be considered significant. With this in	Argyll and Bute Council	Pre-application consultation was undertaken through the West Coast Regional Inshore Fisheries Group on four proposals for expansion of existing sites in the Linnhe region. Clyde Fishermen's Association expressed concerns over the proposals, including Dunstaffnage, stating that the planned expansion will take	Pre-application consultation – Section 5 Impact assessment – Section 7.5

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
mind the applicant is advised to consult with the West Coast Regional Inshore Fisheries Group in the first instance		away significant safe fishing grounds for prawn fishing, with members increasingly concerned with the loss of grounds to natural wild fishers from a variety of activities. Concerns were also expressed over perceived impacts from the release of fish waste and medicines. The impact of the proposal as well as the cumulative impacts of the wider programme of developments proposed within Loch Linnhe on commercial fishing activities have been assessed as part of the EIA.	
Interaction with predators			
Overall, the proposed change in equipment and increase in biomass may increase the existing level of interaction with predators. The applicant is requested to submit a Predator Mitigation/Control Plan, detailing the sequential steps and triggers for specific control measures.	Argyll and Bute Council and Marine Scotland Science	A robust, site-specific Predator Exclusion Plan has been prepared which identifies preventative measures to avoid and minimise the risk of adverse interactions such as entanglement of predatory species. The Predator Exclusion Plan includes measures to deny predator access and reduce attraction to cages. Implementation of the measures detailed in the Predator Exclusion Plan will ensure that all impacts are minimised to the extent where significant effects will be avoided.	Project description – Section 2.5.6 Predator Exclusion Plan (Appendix 8)
Landscape and visual amenity impacts			
There may be some dwellings with visibility in the future as the development at Dunbeg progresses. In addition, there is a coastal path from which the site would be visible in places and the narrow end of the southwestern section of the fish farm would be visible	Argyll and Bute Council	A full Landscape Visual Impact Assessment was not considered necessary for the proposal, however a basic landscape and visual appraisal (including scaled diagrams and	Impact assessment – Section 7.1

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
from Ganavan Sands. The site will also be visible from passing boat traffic including passenger ferries and recreational craft. Given that the existing development is out-with the Lynn of Lorn National Scenic Area, and that landscape and visual effects from the proposed expansion are expected to be minimal and mitigated by the developer's regular layout and use of dark matt colours, a full Landscape Visual Impact Assessment will not be necessary. Scaled diagrams and photomontages should be included with the planning application. The new feed barge should be painted with dark matt colours to minimise reflections.		photomontages) was undertaken to inform the impact assessment. The recommendation regarding the feed barge colour scheme has been taken into account in the design.	Landscape and visual appraisal attached as Appendix 9 Project description – Section 2.3.4
Socio-economic, recreation and tourism			
The site will take up an area of the sea which may have consequences for recreational boats and activities.	Argyll and Bute Council	Impacts on socio-economic, recreation and tourism aspects have been assessed as part of the EIA.	Impact assessment – Section 7.1
The applicant should explain in the final application if there are to be any expected changes to noise levels resulting from the proposed modification.	Argyll and Bute Council	Potential noise impacts have been assessed as part of the EIA.	Impact assessment – Section 7.1
The applicant should outline if the proposal will help the long-term sustainability of the existing operations and jobs at the site.	Argyll and Bute Council	Positive socio-economic impacts have been assessed as part of the EIA.	Impact assessment – Section 7.1
Designated sites			

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
The site lies less than 3 kms from the Inner Hebrides and Minches Special Area of Conservation designated for harbour porpoise. The use of acoustic deterrent devices would result in a likely significant effect on harbour porpoise which are the qualifying interest of the Inner Hebrides and Minches Special Area of Conservation. If the use of acoustic deterrent devices proposed, information on the type and proposed use of the device and likely interaction with seals/cetaceans should be provided. In addition to this, a Habitats Regulations Appraisal would be required. An Appropriate Assessment will be carried out by the Council as competent authority prior to a determination on the planning application being made.	Argyll and Bute Council and Scottish Natural Heritage	Acoustic deterrent devices are currently not utilised at the site and it is unlikely that acoustic deterrent devices will be utilised at the site in the future. SSF is currently undertaking a Company-wide review of acoustic deterrent device use. Therefore, the use of acoustic deterrent devices is not currently proposed as part of the development proposal. However, should it be determined that the use of acoustic deterrent devices will be required at the farm in the future, appropriate consent will be sought prior to use as detailed under the legislative requirements section.	Legislative requirements - Section 3.1
Sea lice management			
There is no history of sea lice affecting the health of the aquaculture animals at this site to the knowledge of the Fish Health Inspectorate. The site is located within FMA M-36 which is farmed by three aquaculture production businesses and covers a relatively large area encompassing the lower part of Loch Linnhe, Loch Creran and rainbow trout sites in Loch Etive. Scottish Salmon Producers Organisation reports show adult female sea lice to be below Code of Good Practice suggested criteria for all but one month in 2018 at this site. Furthermore, there were no sites in the Farm Management Area reporting numbers of adult females above MS reporting levels in 2018 or 2019. The applicant has provided the existing sea lice management strategy for the Linnhe Region. SSF Linnhe sites will have a synchronous fallow period. The applicant refers to the farm management statement for the wider FMA M-36 area; MSS do not hold these documents therefore should be submitted. Confirmation	Marine Scotland Science	All SSF farm sites in the Farm Management Area (FMA M-36) are stocked and managed on a single year class basis, in accordance with the Farm Management Statement which is attached as an appendix. The production plan will follow a 24-month cycle, with a minimum period of 42 consecutive days fallow including a target of a minimum four-week synchronous fallow across all salmon farms (operated by both SSF and Mowi) within the Farm Management Area before the next production cycle begins. A risk assessment has been prepared and attached as an appendix for non-synchronous stocking and fallow with the rainbow trout farms operated by Dawnfresh within the Farm Management Area.	Farm Management Statement (Appendix 10) Non-synchronous Risk assessment (Appendix 11)

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
should be provided on the synchronicity of production within the wider Farm Management Area and a risk assessment provided where production in the whole Farm Management Area is non-synchronous.			
Sea lice management and control is focused on the use of cleaner fish which the applicant is authorised to use on this site; wild wrasse was stocked on site in the last production cycle. Confirmation should be provided that suitable numbers of cleaner fish can continue to be sourced to ensure stocking at a ratio that will provide efficacious biological control with the additional biomass proposed.	Marine Scotland Science	Detail regarding the stocking of cleaner fish is provided in the project description.	Project description – Section 2.5.4
Changes recently made to SEPA's interim position statement on the use of emamectin benzoate may also affect the proposed sea lice management strategy through a reduction in permitted quantities of emamectin benzoate. The applicant should make an assessment on any impact this may have on the overall sea lice management plan and provide details of how low quantities of emamectin benzoate may be used on site, in order to demonstrate how satisfactory measures will remain in place on site for the prevention, control and reduction of parasites. It may be useful to indicate how SLICE has been utilised in previous cycles to demonstrate the effect of the change.	Marine Scotland Science	A Sea Lice Efficacy Statement has been prepared as a supporting appendix and details the treatment options for the permitted quantities of all sea lice medicines, as authorised in a variation to the existing CAR licence (CAR/L/1009031 VN06) including emamectin benzoate. A Sea Lice Management Strategy for SSF Linnhe sites (FMA M-36) has been prepared (taking into account the changes to Marine Scotland's policy in June 2019) and included as an appendix, which demonstrates a fully integrated approach for the control of sea lice through prevention and continuous non-medicinal measures as the core strategy, which includes biological control (cleaner fish); physical delousing systems (thermolicer and hydrolicer); genetic selection of stock type; and functional health feeds. Recent investment by	Sea lice efficacy statement (Appendix 12) Sea Lice Management Strategy (Appendix 13)

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
		SSF in a second thermolicer will provide increased physical delousing intervention capacity. Despite a reducing reliance on medicinal treatments, in-feed and bath treatments still play an important role in sea lice management and the sea lice efficacy statement identifies that sufficient quantities of bath medicines have been permitted to allow effective medicinal treatment of the farm in its proposed configuration.	
Impacts on wild salmonids			
The rivers local to the application site are known to have fisheries for salmon and trout.	Argyll and Bute Council	The potential impact of the proposal as well as the cumulative impacts of the wider programme of developments proposed within Loch Linnhe on local wild salmonid populations have been assessed in the EIA.	Impact assessment – Section 7.4 Farm Management Statement (Appendix 10)
No designated sites with a wild salmonid related feature are likely to be impacted by this proposal. However, sea trout and Atlantic salmon are both Priority Marine Features and are therefore considered a sensitive species.	Scottish Natural Heritage		

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
The proposed fish farm is an open cage system so there may be consequences for the spread of disease and parasites between the cages and the wider marine environment.	Argyll and Bute Council	An efficacy statement has been prepared outlining the availability of medicinal sea lice therapeutants as authorised by the SEPA CAR licence variation. A sea lice attestation to provide an indication of how well the existing site is performing has been prepared and included as an appendix in support of the assessment. Sea lice dispersal modelling, with a primary focus in Loch Linnhe, and with reference to SSF sites within the Farm Management Area (FMA M-36), was conducted and is included as an appendix in support of the assessment. Management plans have been prepared to coordinate management efforts over several SSF sites within the Farm Management Area where appropriate, which are appended to this EIA Report including: • All SSF farm sites within the Farm Management Area (FMA M-36) are stocked and managed on a single year class basis, in accordance with the Farm Management Statement.	Sea Lice Efficacy Statement (Appendix 12) Sea Lice Management Strategy (Appendix 13) Sea lice attestation (Appendix 14) Sea lice dispersal modelling summary report (Appendix 15) Environmental Management Plan (Appendix 16)
This proposal has potential to impact on sea trout and Atlantic salmon. Impacts could occur as a result of the release of sea lice into the marine environment and, should farmed stock escape in to the wild, as a result of genetic introgression with wild Atlantic salmon populations.	Scottish Natural Heritage		

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
An increase in tonnage may present a greater risk to the health and survival of wild migratory salmonids, due to an increase in the number of hosts, which in-turn may increase infection levels on wild fish. Marine Scotland Science advice identifies that the greater number of lice on a farm, the greater the risk to wild salmon and sea trout. While it is not possible to accurately predict the future lice levels on a farm, the performance of existing farms within the area could act as a guide for future performance. It is suggested that given the scale of expansion, consideration should be given to the provision of site-specific information in relation to sea lice management, in order to determine how well the existing site is performing. The applicant has provided some supporting information that identifies appropriate industry good practice measures set out in the Sea Lice Management Strategy for SSF Linnhe sites (FMA M-36). While the applicant has identified a number of mitigation measures to limit potential effects on wild salmonids from the operation of the farm, additional information will be required in order to fully assess the likely risk to wild salmonids from the proposed expansion. Mitigation should include: Environmental Management Plan (EMP), Farm Management Statement (to include details of husbandry procedures to minimise the risk of disease being spread); site specific sea lice action/management plan, efficacy statement in terms of availability of sea lice chemical treatments; operational details for other sea lice management measures including mechanical removal, and evidence of effectiveness of more recent sea lice management measures (mechanical removal).	Argyll and Bute Council and Marine Scotland Science	• A Sea Lice Management Strategy for SSF Linnhe sites (FMA M-36) which outlines effective and appropriate farm management practices to prevent, monitor and control sea lice on farmed fish, which in turn will minimise risk of impact on local wild salmonid populations. • An Environmental Management Plan to prevent significant adverse effects on local wild salmonid populations by facilitating an adaptive management approach based on farm and wild salmonid monitoring findings.	

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
Further evidence in the form of an attestation from the applicant indicating the existing site's compliance with the Code of Good Practice, their own targets, and their success in treatment of lice on site. No actual figures are necessary but any failure to control sea lice on site should be described. The attestation should cover information for the current and previous cycle. However, if it is early in the current cycle the previous two cycle's information would be preferable.	Marine Scotland Science		
Cumulative impacts			
There are currently five other salmon farms within 15km of the application site. This would indicate that cumulative factors may come in to play.	Argyll and Bute Council	Potential cumulative impacts have been assessed for each receptor (where relevant) as part of the EIA.	Impact assessment – Section 7
Project description			
The applicant is requested to submit mooring and cage coordinates, including maps detailing pen group. In addition, the applicant is requested to provide full details of underwater and navigation lighting within the final application.	Argyll and Bute Council	Mooring and cage coordinates, including maps detailing cage group have been provided as attachments. Details of underwater and navigation lighting have been provided in the project description.	Attachments A - C Project description – Section 2.3.5
Details of net depth should be provided.	Marine Scotland Science	Cage net depth will be 16m.	Project description – Section 2.3.1
The nature of the modifications proposed are not expected to impact the escapes contingency plan. Please provide confirmation that there are no changes to these elements or provide details of the escapes contingency plan. Environmental conditions likely to be encountered at the site should be considered in conjunction with the specifications of the equipment, to establish if the proposed new equipment can endure the conditions at the site. Evidence that	Marine Scotland Science	The nature of the modifications proposed are not expected to impact the escapes contingency plan. The Containment Plan and Escapes Prevention and Recapture Strategy have been included as appendices. An equipment attestation (included as an Appendix) has been provided which confirms	Containment Plan (Appendix 17) Escapes Prevention and Recapture Strategy (Appendix 18)

Screening Opinion Aspect	Organisation	Response	[Relevant section of this report where addressed]
equipment (nets, cages and moorings) is suitable for purpose on the site in question is required in the form of a site-specific attestation from the manufacturer or other suitably qualified person.		that the proposed specification of equipment has been carefully identified by suitably qualified personnel and are appropriate for the site-specific conditions expected at the proposed site. The proposed cages, grid and mooring system have been designed to meet the Scottish Technical Standard, which applies appropriate safety factors to ensure that equipment will withstand the worst conditions expected at the farm location.	Equipment attestation (Appendix 19)
The nature of the modifications proposed are not expected to impact husbandry procedures on site; please provide confirmation that there are no changes to this or provide details on the method and frequency of removing mortalities and the disposal route.	Marine Scotland Science	The proposal will not impact husbandry procedures on site. Details on the method and frequency of removing mortalities and the disposal route is provided in the project description.	Project description – Section 2.5.3 and Section 2.5.6

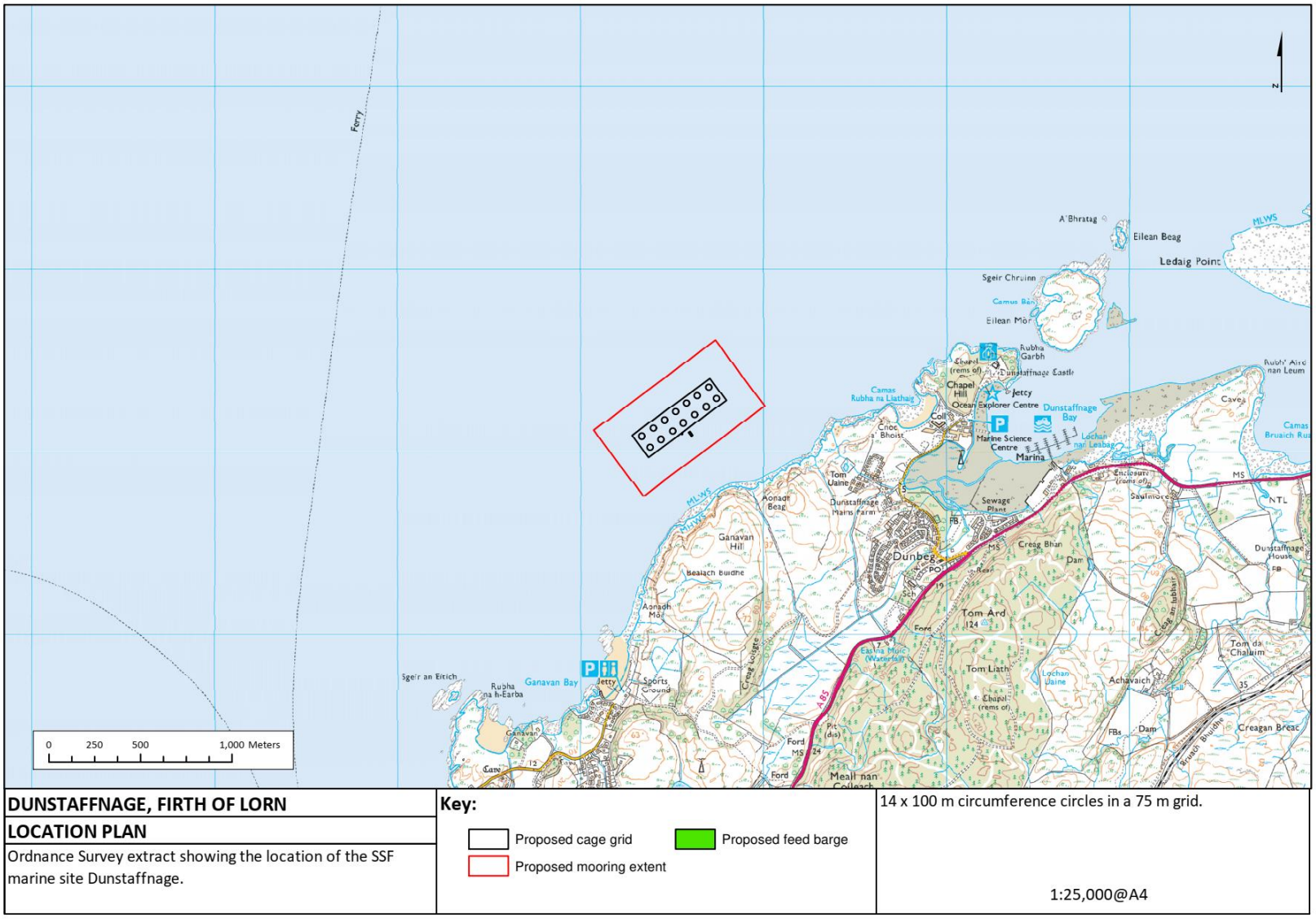
2 DESCRIPTION OF THE DEVELOPMENT

2.1 DEVELOPMENT PROPOSAL

SSF propose to reconfigure and expand the existing site at Dunstaffnage, replacing the existing infrastructure (9 x 80m circumference cages in a 50m mooring grid) with 14 x 100m circumference cages in a 75m mooring grid (refer to Figure 1-2). The expanded site will be serviced by a new 300T feed barge, positioned off the centre of the cage group on the southeast (shoreward) side. The site plan for the proposed expanded Dunstaffnage farm is shown in Figure 2-2, showing the planned cage grid layout and orientation, barge position and mooring configuration. The total surface area of the expanded site will be 11,388m^2 and the wider area of the expanded site including moorings will be 371,250m^2. The SEPA CAR Licence for the existing site (reference CAR/L/1009031 VN06) has been varied and authorises the new proposed maximum biomass of 2350T at the expanded site.

2.2 LOCATION

The Dunstaffnage farm is aligned with and adjacent to the coast between Dunbeg and Ganavan. The centre of the existing site is at 186470 E, 734137 N in the Firth of Lorn, Argyll and Bute and the centre of the proposed expanded site is 186536 E, 734186 N (refer to Figure 2-1). Figure 1-2 shows the overlap between the existing and proposed cage group and mooring extent.



DUNSTAFFNAGE, FIRTH OF LORN **LOCATION PLAN** Ordnance Survey extract showing the location of the SSF marine site Dunstaffnage.	**Key:** Proposed cage grid Proposed feed barge Proposed mooring extent	14 x 100 m circumference circles in a 75 m grid. 1:25,000@A4

Figure 2-1 Location map of the proposed Dunstaffnage farm

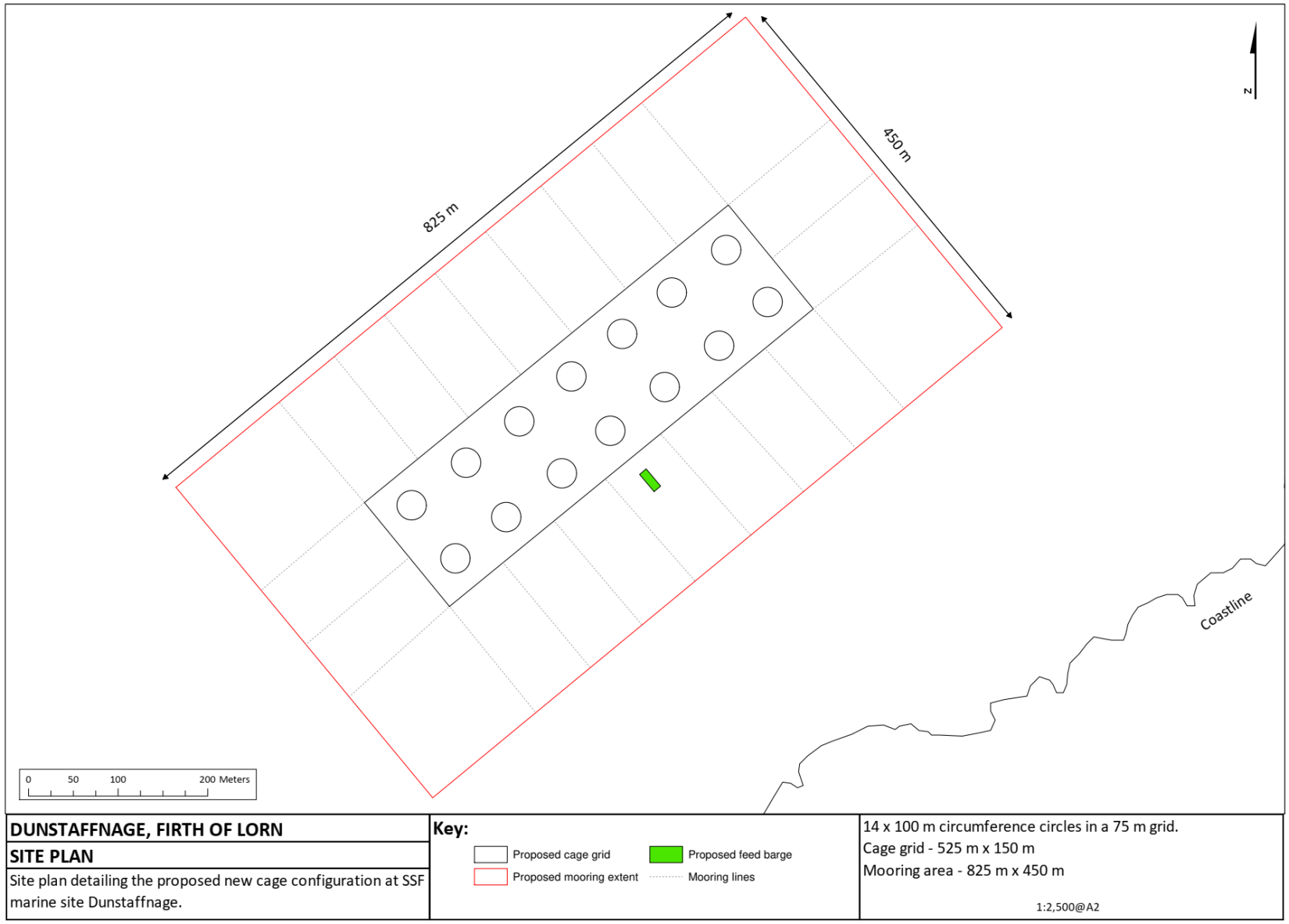


Figure 2-2 Dunstaffnage fish farm site plan

2.3 DEVELOPMENT COMPONENTS AND EQUIPMENT

2.3.1 Cages

All cages that will be used on the site conform to the Scottish Technical Standard BS EN 12201-2, as outlined in the Technical Standard for Scottish Finfish Aquaculture (2015), which places technical requirements on the dimensioning, design, installation, and operation of floating aquaculture solutions. Cages will be constructed of black, non-reflective material. All cages are designed to minimise the risk of escaping fish (refer to Appendix 19 – Attestation, Appendix 17 - Containment Plan, and Appendix 18 Escapes Prevention and Recapture Strategy).

The configuration of the cages to be installed is shown in Table 2-1 below.

Table 2-1 Proposed cage configuration

Number of cages:	14
Circumference of cages:	100m
Depth of nets:	16m
Number of cage groups:	1
Number of cages in row 1:	7
Number of cages in row 2:	7

2.3.2 Nets

SSF purchases all nets from reputable manufacturers who meet or exceed the Scottish Technical Standards. Nets are regularly serviced by the net manufacturers.

The site will use 20mm half mesh Sapphire Seal Pro polyethylene cage nets (or equivalent) which provide increased strength, and significantly greater cut resistance than nylon nets, thereby providing additional protection from predators. Fish mortalities are collected and removed via a dead sock and basket built into the base of the cage net. The net specification includes a double net security panel which is fitted to the base and bottom 0.5m of the net, and a double abrasion net on the outside of the dead sock to deter against wear from the dead basket and act as a mask to predators. These measures will reduce predation and lower the risk of escape (refer to Appendix 8 - Predator Exclusion Plan).

Sinker tubes will be used at the site. These are rigid, circular structures, manufactured of high-density plastic and filled with chain or steel wire, which are attached to the cage structure and held level with the base of the nets, beneath the surface. The cage nets attach to the sinker tubes at regularly spaced fixing points, this ensures nets are highly tensioned and cage volume and structure is maintained. All SSF nets are also fitted with a 160kg centre weight (chain link) and net sidewall weighting to allow the net to form correctly, maintain maximum stocking volume (and thus fish welfare), and retain tension on the base netting to deter predator attack. Nets will be inspected daily for mortalities using cameras. Nets are also routinely inspected, on a monthly basis, by divers throughout the production cycle. Double skinned-predator nets are not deployed on SSF's mainland sites as these pose an increased risk of entanglement to marine wildlife.

Top nets are fitted to the upper surface of the cages to prevent predation from birds and other wildlife. To prevent accidental entanglement, the colour, tensioning and mesh size of the nets used at a fish farm are site specific. The specifications used are determined by local wildlife considerations both in terms of deterring the type of local predator species most likely to attack the cages and to protect the local species most at risk of entanglement. The design chosen is often a compromise which attempts to balance these two requirements and guidance is sought where appropriate

from NatureScot, on these matters. Top nets will be supported and tensioned by fiberglass poles extending 5.3m above the water level and constructed of dark grey mesh (refer to Attachment C1 and C2). The side panel will have a mesh size of 75mm and the ceiling panel a mesh size of 100mm. The mesh size selection was informed by advice from NatureScot. A record of any bird entanglements will also be kept and reported.

2.3.3 Moorings

Mooring design and specification are tailored to meet the meteorological, hydrological and topographical conditions at any given site. The mooring design for Dunstaffnage has been designed and confirmed by a competent third party as suitable for use at the location (Appendix 19). Cages will be tethered to a purpose designed mooring grid with 75m square cells which forms a matrix 6m below the water and is attached to the seabed by bridles, rope, chain and steel plough type anchors. Full mooring diagrams and component specifications will be available for inspection on site after installation. The moorings at all SSF sites are inspected annually by divers or Remotely Operated Vehicle to ensure that they remain in excellent condition and are fit for purpose.

2.3.4 Feed barge

The proposed new feed barge (elevation drawing shown in Attachment C3) will be independently moored off the centre of the cage group on the southeast (shoreward) side and used as a main control station / storage for on-site supplies (such as first aid supplies and fish feed) and provide welfare facilities for staff as well as an incinerator. The feed barge will have capacity for 300 tonnes of feed for the stock. Feed supplies will be delivered by boat approximately 3 to 4 times per month, depending on the stage in the production cycle. The colouring of the barge will be within the dark matt scheme as requested by the Planning Authority.

2.3.5 Lighting and marking

As part of the production cycle, it may be necessary during periods of reduced daylight hours to use underwater lighting for the cages. Typically, lighting will be used between December and April in alternate years but may also be used out-with these times. The equipment will be the same industry standard lights used at the existing site, installed downward facing at a depth of 6m. The potential effect from these lights will be a slight underwater illumination with minimal visibility from the surface.

While the cage group and barge will be larger than before, the number and type of navigational lights will be the same as before. Navigational lighting and marking measures will be in line with the conditions of the Marine Licence and any recommendations from the Northern Lighthouse Board. This is typically the only lighting that would remain on outside normal working hours (8am to 5pm). However, during the winter months where there are some hours of darkness during normal working hours in the early morning and late afternoon, a downward facing safety light will be used on the deck of the feed barge and deck lights may be switched on, on any operational work boats.

2.4 CONSTRUCTION AND INSTALLATION

The cages will be built ashore and towed to the site for final installation. Navigational warnings will be issued in advance of cage towing, along with planned routes, to the relevant authority to ensure other marine users are aware of the potential hazard. Total time for building and installation of all equipment at the site will be approximately 3 months, with the installation of equipment on site taking 6 to 8 weeks, allowing for poor weather.

There are no additional permanent onshore facilities required for the proposed development. All requirements will be met by the existing shore base facility on Kerrera.

2.5 OPERATION

Operations will generally take place during working hours (8am to 5pm). Harvesting generally takes place roughly twice a week over the last five months of the production cycle and occasionally this activity (and other unplanned operations)

will occur outside normal working hours. Staff will travel to the farm daily by work boat from the North Pier in Oban, as at present. Daily activities during the production cycle will include feeding and routine maintenance. Daily site start-up checks include checking the integrity of the site, i.e., cages, nets and moorings. Checks for mortalities will be carried out once per day, and any dead fish will be removed. Sea lice and gill checks will be carried out once per week, as a minimum, in line with best practice guidance and as part of the Environmental Management Plan (Appendix 16). Other staff tasks will involve grading and harvesting, salmon and cleaner fish husbandry, as well as carrying out treatments, should they be required.

2.5.1 Staffing levels

As the proposed development involves the expansion of the existing site, no additional staff positions will be required. Current levels of employment will be maintained with the site manned by a Site Manager and five full-time staff members. However, in addition to maintaining existing staffing levels, should the increase in cages at Dunstaffnage and the wider Loch Linnhe programme of developments be approved, this will make it feasible to employ an internal net support team for the area to fulfil this function, which is currently outsourced. This would equate to an additional four full time staff members.

2.5.2 Vessels

A number of vessels will continue to be used at the expanded site with a range of functions. The various types of vessel which are involved in operations at the farm are outlined below.

Work boats

Two work boats operate at the site which are used for daily travel to the site for SSF operatives from Oban and are furnished with a crane to assist with maintenance activities.

Well-boat

A well-boat will be used to harvest and transport live fish for processing. During the harvest period, the well-boat will call several times a week at the site to collect harvest fish. Each harvesting operation will normally take less than two hours. Should it prove necessary, well-boats may also be used to undertake medicinal bath treatments or other veterinary treatments under the appropriate licence (previously Marine Scotland and from SEPA as of November 2020).

Net washing vessel

A dedicated net washing vessel will be available which will move between and service the farms within the Farm Management Area.

2.5.3 Husbandry

Production plan

SSF operates all sites to production plans which are designed to maximise welfare and operational efficiency and minimise environmental impacts. All SSF farm sites in Farm Management Area are stocked and managed on a single year class basis, in accordance with the Farm Management Statement (Appendix 10). The production plan will follow a 24-month cycle, which includes a minimum period of 42 consecutive days fallow including a target of a minimum four-week synchronous fallow across all salmon farms (operated by both SSF and Mowi) within the Farm Management Area before the next production cycle begins. A risk assessment has been prepared (Appendix 11) for non-synchronous stocking and fallow with the rainbow trout farms operated by Dawnfresh within the Farm Management Area. The proposed operational biomass (standing stock) that will be present at the site over the course of the production cycle will not exceed 2350T.

Stocking

Smolts will be transported from the hatchery by well-boat to the farm to stock the cages.

Feeding

Fish feed is held in the feed barge which forms part of the fish farm infrastructure. The proposed feed barge has capacity to hold approximately 300 tonnes of feed. Feed will be transported to the site by boat by an external contractor and stored in individual silos within the feed barge. The feed system blows feed to each cage via black feed pipes and will be equipped to feed multiple cages at the same time. Feeding is monitored by camera and is terminated when monitoring indicates the fish are satiated. This practice optimises feeding rates, reduces waste feed and minimises the amount of feed falling to the seabed. The number of times a day the fish are fed varies with fish size.

Harvest

Harvesting will be carried out using a well-boat that will visit the site approximately twice a week over the last five months of the production cycle to remove graded fish by pumping them into the well-boat holds. The fish are transported alive within the tanks of the well-boat until they reach the processing facility in South Shian, Argyll, ensuring the maximum freshness of the fish. At the processing facility they are pumped ashore and despatched and processed on-site.

2.5.4 Fish health and welfare

SSF are committed to rearing farmed Atlantic salmon to the highest health and welfare standards and the Fish Husbandry Manual (Appendix 20) provides a framework of guidance, operating principles and protocols, and systems of accountability designed to achieve this.

The aims of the Fish Husbandry Manual are to:

- prevent the introduction of disease into the farms.
- prevent the spread of disease within and between farms and minimise the impact of any health problem encountered.
- establish management and husbandry systems which ensure best practice in maintaining the health and welfare of the fish.
- ensure that environmental conditions and husbandry practices are optimised to reduce stress and susceptibility to disease.
- provide monitoring and reporting frameworks which allow early recognition of health and welfare issues and promote corrective actions.
- protect consumer health.
- minimise environmental impact.

A range of preventative and reactive measures are utilised to maintain good fish health and welfare, including high standards of biosecurity at all stage of fish production, vaccination of smolts before transfer to marine production, routine husbandry procedures, appropriate stocking densities, regular fish health checks and veterinary intervention if necessary.

SSF have dedicated fish health staff who are trained and competent in all aspects of fish health welfare and best practice husbandry. Additionally, all SSF sites are held to the RSPCA's Freedom Food welfare standards for both farmed Atlantic salmon and cleaner fish and are regularly audited to ensure compliance with these standards.

Sea lice management

The salmon louse *Lepeophtheirus salmonis* is ubiquitous in the marine environment and the most common parasite on farmed salmon. It is one of the main challenges faced by the industry. Sea lice numbers on farmed fish are regulated by Marine Scotland through the Fish Health Inspectorate, who carry out regular site inspections. In addition, SSF are members of the Scottish Salmon Producers Organisation and signatories to the industry Code of Good Practice, which includes an extensive section on sea lice control.

A site-specific Sea Lice Management Strategy will be in place (Appendix 13) which sets out a range of management and treatment measures which can be employed to manage sea lice on farmed fish, in accordance with the industry best practice set out in the Code of Good Practice. This strategy focusses on preventative and continuous non-medicinal measures as the core strategy.

SSF biological control for sea lice has underpinned the strategy since 2014, augmented by medicinal and physical intervention where required. Cleaner fish represent an effective biological method for the removal of lice. SSF have stocked wild ballan wrasse at the existing site at a stocking level of between 2 and 4% with the ability to stock up after first stocking and will continue to deploy cleaner fish as a biological control for sea lice at the expanded site. These fish are sourced from a dedicated contractor who has supplied SSF to meet requirements for past three years and there are agreements in place to ensure an adequate supply of cleaner fish going forward. The use of cleaner fish as a biological control for sea lice is regulated by Marine Scotland through the Fish Health Inspectorate.

SSF have a dedicated fish veterinarian and health team who monitor the health of the farmed stock in collaboration with trained site staff. This personnel structure ensures swift diagnosis and medicinal intervention if deemed appropriate by the company vet. Where necessary, SSF will be able to use emamectin benzoate (SLICE), hydrogen peroxide, azamethiphos (Salmosan Vet/Azasure) and / or cypermethrin (Excis) / deltamethrin (AMX/Alphamax) in sea lice management, all of which have been approved for use in this context by the Veterinary Medicines Directorate and by SEPA, who regulate their discharge (consented quantities for these chemicals are detailed in the SEPA CAR licence CAR/L/1009031 VN06) included as Appendix 2.

In addition, SSF have access to physical delousing systems which physically remove lice from the farmed fish and allow removal of these lice from the environment via filtration.

2.5.5 Net cleaning and maintenance

Cleaning

The nets are currently cleaned by a separate contractor. However, as mentioned above, this proposal and the wider programme of developments will make it feasible to employ an internal net support team for the area to fulfil this function. Nets are cleaned using a high-pressure sea water cleaner. This system is operated from a raft or boat and, using a hydraulic pulley system, the cleaning heads are lowered and raised around the net and so it can be cleaned *in situ*. The nets are cleaned every 2-3 weeks during the summer but typically do not need cleaning from November to April due to low levels of fouling. The nets can be cleaned whilst the cages are stocked with fish.

Maintenance

Site staff are fully briefed on net maintenance practices, good net management and how to identify and report problems with netting.

Daily maintenance checks are carried out for net tension and damage, and surface observations are made of net integrity, entanglements etc. A monthly dive confirms sub-sea net integrity and identifies any maintenance issues and entanglements. SSF site managers keep a log of all interactions with each net on site. This log will detail the dates the net was cleaned, the dates it was diver checked for holes etc. These inspections will be used in combination with wildlife logs to note any and all entanglements and these logs will be presented to the relevant regulatory bodies on request (e.g., Planning Authority and NatureScot).

Nets are serviced, repaired, strength tested and disinfected according to industry-led quality control standards by the net supplier. A full history of each net from production to servicing is recorded by the supplier in a site database which is shared with SSF.

Nets are strength-tested post cleaning and repair and should be replaced as standard every six years or earlier if test results reveal that they are performing at below 50% of the original specified strength on any part (top/middle/base), or when damaged too severely to be economically repaired.

2.5.6 Predator exclusion

High densities of fish and feed at fish farms can attract scavenging and predatory species including seals, otters and piscivorous bird species. In addition to damage to stocks and equipment (potentially leading to stock escapes), predators and scavengers can spread disease or sufficiently stress farmed stock to affect welfare and production. Anti-predator measures are therefore implemented to protect farmed stocks.

The proposed Predator Exclusion Plan for the Dunstaffnage site is included in Appendix 8. The Predator Exclusion Plan contains measures to deter predators. An overview of the measures is provided below.

Nets

Predator exclusion is largely achieved through passive measures such as good net design, quality and strength of net, and effective net tensioning.

Checks

In addition, SSF operatives' day to day activities include the following predator exclusion measures:

- checking net integrity (top-nets and cage-nets) physically and by camera during feeding;
- ensuring proper net tensioning is maintained;
- updating entanglement records daily;
- updating seal log daily (presence and behaviour of any seals in the vicinity); and
- updating wildlife logs to record species such as cetaceans, birds and other mammals sighted close to the site.

SSF staff are trained in species identification to ensure accuracy of wildlife logs kept on SSF fish farms and the maximum effectiveness of the Predator Exclusion Plan.

Mortalities

Mortalities will be removed daily. All mortalities will be transferred in sealed bins for incineration on the feed barge. All ensiled waste is collected by external contractor for onward transport and further processing. All ash generated by incineration is legally disposed of with mixed municipal waste. The management of waste, including fish mortalities is addressed in the Waste Management Plan (Appendix 21).

Acoustic Deterrent Devices

Acoustic deterrent devices have been used at the site in the past prior to the installation of Seal Pro netting in 2018. Since then, acoustic deterrent devices have not been utilised at the site as there have been no instances of seal predation warranting their use. Acoustic deterrent device use is not currently proposed at the Dunstaffnage farm and it is unlikely that they will be utilised at this site in the future. However, should it be determined that the use of acoustic deterrent devices will be required at the farm it will be subject to a separate licensing process (refer to Section 3.1).

2.5.7 Escape prevention

SSF has site specific escapes prevention and containment policies as recommended by the industry Code of Good Practice. There is an extensive escape prevention plan that details the arrangements that will be in place at the farm to minimise the risk of salmon escapes. The plan covers all the perceived risks and explains the preventative measures in place and can be viewed in full in the Escapes Prevention and Recapture Strategy (Appendix 18).

Fish farm escapes can occur as a result of predator damage to nets. The cage nets which will be used at the farm are designed specifically for local conditions, made of high-density polyethylene which provides a high level of strength and durability, and tensioned using sinker tubes (refer to Section 2.3.2), a method which minimises predation and also keeps the nets in the correct position. The small mesh size (20mm) also reduces the incidence of net damage from predators. Regular net checks are carried out by SSF staff (refer to Section 2.5.6) which provide early identification of any damage or maintenance requirements, thus reducing potential for escapes due to net failure.

Scottish legislation requires mandatory notification of all escapes of farmed fish, and any suspected escape or circumstance that could give rise to a significant risk of escape will be reported.

2.5.8 Recycling and waste management

SSF has prepared a Waste Management Plan (Appendix 21) as part of standard practice during day-to-day operations. The plan indicates how waste generated at all stages of the development (construction, operation, servicing/maintenance and decommissioning) will be dealt with and includes details of the disposal of surplus material and equipment that may need to be replaced. The plan includes details of measures that will be taken to reduce, re-use and recycle wastes and how any remaining wastes will be disposed of.

Both for economic reasons and to avoid the creation of waste, SSF reuses and recycles old cages wherever possible. Any sections in good condition are refurbished and will be reused, possibly at one of SSF's other sites. Any remaining plastic or metal scrap is recovered and goes to a dealer for recycling. Any remaining unusable waste is uplifted by an authorised carrier and disposed of to a licensed landfill. Empty feed bags are returned to the feed manufacturer. Special wastes such as oil and batteries are removed by a maintenance contractor or disposed of via licensed facilities.

SSF has achieved Environmental Management System ISO 14001 accreditation since October 2000, which is next due for review and re-certification in 2021. This accreditation includes a commitment to review the Company's waste management policy on an annual basis.

2.5.9 Health and safety

During all operations and voyages, SSF health and safety rules dictate the following:

- There will be a minimum of two crew members aboard a work boat at all times;
- The nominated skipper will hold appropriate valid certification – which must be commercially endorsed - at one of the following levels:
    - Day Skipper
    - Yachtmaster (Coastal or Offshore)
    - Boatmaster Licence
    - Boatmaster Exemption Certificate
- Guardrails will be securely fixed in their proper position whenever the boat is underway outside the leased area;
- At least one crew member is a qualified First Aider; and
- At least one crew member is a qualified radio operator.

All SSF marine site staff working on vessels are now trained in at least Powerboat level 2, use of VHF, first aid, sea survival and manual handing.

2.5.10 Routine equipment inspections

Regular inspections of all equipment include:

- Annual checks of floating installations through insurer's risk assessment or by another competent third party, report filed on-site, and actions listed;
- Annual inspection of moorings by divers or Remote Operated Vehicle, report filed on site;
- On-site maintenance schedules for moorings and cage inspections with clear and defined monthly checks - open to audit; and
- Annual Northern Lighthouse Board inspection of navigation lighting installations.

2.6 DECOMMISSIONING

Should the equipment proposed cease to be in operational use for a period exceeding three years, it will be removed, and the site restored to the satisfaction of the Planning Authority.

2.7 RESEARCH AND DEVELOPMENT

Marine aquaculture is not considered a major contributor in terms of greenhouse gas emissions. Activities resulting in emissions include diesel powered vessel engines, diesel generators used to power machinery and equipment on feed barges and work boats, as well as incinerators. SSF are committed to reducing their greenhouse gas emissions through research and development programmes including the trialling of hybrid (lithium battery and diesel generator) energy systems on feed barges to reduce reliance on diesel as well as investigating ensiling as an alternative to incineration to manage fish waste where practicable.

2.8 REFERENCES

- Marine Scotland, 2015. A Technical Standard for Scottish Finfish Aquaculture; developed by the ministerial group for sustainable aquaculture's Scottish technical standard steering Group. Available online http://www.gov.scot/Resource/0047/00479005.pdf

3 LEGISLATIVE AND POLICY FRAMEWORK

This chapter outlines the policy and legislative framework for finfish farming development in Scotland and considers the proposal against relevant local, regional and national planning policy.

3.1 LEGISLATIVE REQUIREMENTS

The Planning Authority has a statutory duty to meet the requirements of numerous pieces of legislation when determining planning applications for aquaculture developments. The main legislative requirements relevant to aquaculture developments are listed in Table 3-1.

Table 3-1 Main legislative requirements relevant to aquaculture developments

Legislation	Description	Applicability to the proposed development
Town and Country Planning (Scotland) Act 1997, as amended **Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017**	Since 2007 marine fish farming has required planning permission from Local Authorities in accordance with the 1997 Act. This applies to all new fish farms out to 12 nautical miles including modifications to existing ones. The 2017 Regulations transpose the requirements of the EIA Directive 85/337/EC (as amended) into the Scottish regulatory system. The Directive sets out the EIA procedure to draw together, in a systematic way, an assessment of a project's likely significant environmental effects.	The existing farm has planning permission in place. Planning permission for the existing site and equipment was granted on 24/04/2013 under the Town and Country Planning (Marine Fish Farms Permitted Development) (Scotland) Order 2011. This EIA Report is being submitted in support of an application for planning permission for the proposed expansion from the local Planning Authority (in this case Argyll and Bute Council).
Conservation (Natural Habitats and Conservation) Regulations 1994	In Scotland, the EC Habitats Directive and Wild Birds Directive are transposed through a combination of the Regulations through the designation of Natura 2000 sites which are a Europe-wide network of protected sites namely Special Areas of Conservation or bird Special Protection Areas. Proposals which are likely to have a significant effect on the integrity of a Natura 2000 site must be subject to an Appropriate Assessment. An Appropriate Assessment is carried out by the competent authority and is an assessment of the implications of the proposed development on the conservation interests for which the site is designated. A Habitats Regulations Appraisal may therefore be required in support of applications for such proposals. Certain species listed on Annex IV of the Habitats Directive are given special protection in Scotland as European Protected Species. European Protected Species in Scotland include otters, cetaceans, and marine turtles. It is an offence to deliberately or recklessly injure, capture, kill, harass, or disturb an	The site does not fall within a designated Special Areas of Conservation or Special Protection Areas. However, it is located within 3km of the Inner Hebrides and the Minches Special Areas of Conservation designated for harbour porpoises. Therefore, should acoustic deterrent devices be used at the farm it poses a potential risk to the integrity of the Special Areas of Conservation through the disturbance of the qualifying interest (harbour porpoises). The use of acoustic deterrent devices is not included as part of the development proposal as the site currently does not utilise acoustic deterrent devices and is unlikely to require the use of acoustic deterrent devices in the future. Should it be determined that the use of acoustic deterrent devices will be required at the farm at any point in the future, a risk assessment will be undertaken to

Legislation	Description	Applicability to the proposed development
	European Protected Species. An European Protected Species licence from Marine Scotland Licensing Ops Team (MS-LOT) is required to authorise an activity which results in an offence relating to an European Protected Species.	determine whether a European Protected Species licence needs to be applied for. The Proposal is located within the mean maximum foraging range of the qualifying features of the Ailsa Craig Special Protection Area which are: breeding seabird assemblage, gannet (breeding), common guillemot (breeding), herring gull (breeding), kittiwake (breeding), and lesser black-backed gulls (breeding). Furthermore, for gannets, kittiwakes, lesser black-backed gulls and guillemots, the Proposal is within their mean foraging distance from the Ailsa Craig SPA. The use of pole-mounted top nets poses a potential entanglement risk to birds, including species of conservation interest. The potential effects on the integrity of the Special Protection Area have been assessed in Section 7.1.
Water Environment and Water Services (Scotland) Act 2003 **Water Environment (Controlled Activities) (Scotland) Regulations 2011**	The purpose of the Act and Regulations is to protect the water environment including river basin management planning, controlled activities regulations, provision of water and sewerage services. Operators wishing to establish a fish farm in the sea around Scotland must apply for and be granted a SEPA CAR licence. SEPA sets limits on the number of fish that can be held in the cages and thus the amount of feed used. SEPA also limits the quantities of certain medicines that can be administered and discharged from fish farm sites. It requires that effluent be assimilated and broken down by natural processes, without irreversible or lasting benthic impacts or accumulation of pollutants.	The proposed development has an authorised SEPA CAR Licence (CAR/L/1009031 VN06) variation in respect of medicinal treatments and discharges from the site for a proposed increase in biomass to 2350T.
Marine (Scotland) Act 2010	The Act provides a framework to help balance competing demands on Scotland's seas. It introduces duties to protect and enhance the marine environment. The main measures include marine planning, marine licensing, marine conservation, and enforcement. All public authorities taking authorisation or enforcement decisions that affect or might affect the UK marine area must do so in accordance with the UK Marine Policy Statement, the Scottish National Marine Plan	The existing farm has a Marine Licence (06610/18/0) from Marine Scotland, in respect of placement of works in the sea, navigation matters and use of well-boats which will be varied to reflect the proposed development. The proposal is also considered to be consistent with National Marine Plan policies as detailed below (refer to Section 3.2).

Legislation	Description	Applicability to the proposed development
	and any subsequent Regional Marine Plan, unless relevant considerations indicate otherwise.	
Aquaculture and Fisheries (Scotland) Act 2013 **Aquatic Animal Health (Scotland) Regulations 2009**	The Act provides for a series of information gathering, inspection and enforcement measures aimed at controlling parasites on fish farms and shellfish farms and at improving, in respect of fish farms only, the containment of, prevention or escape and recovery of, escaped fish. It also contains measures which regulate the movement of live fish with a view to preventing the spread of fish diseases. The Regulations set statutory responsibilities for the health of farmed fish. The Regulations require the authorisation of all Aquaculture Production Businesses by Marine Scotland. In addition, the Fish Health Inspectorate are responsible for ensuring integrity of sites with regard to containment and equipment standards, escape incidents and sea lice issues.	SSF are already authorised to farm at the farm location. Fish health at the farm will continue to be managed in accordance with Marine Scotland Fish Health Inspectorate and RSPCA Freedom Foods requirements, as well as being managed with adherence to industry Code of Good Practice and best company practice.
Crown Estate Act 1961	Equipment sited below Mean Low Water Springs will generally require a seabed lease from Crown Estate Scotland in the discharge of its functions under the Act.	SSF has a Crown Lease (AR2-37-65) in place for the existing site which will be amended should planning be granted for the development.

3.2 RELEVANT PLANNING POLICY AND GUIDANCE

Section 25 of the Town and Country Planning (Scotland) Act 1997, as amended requires planning applications to be determined in accordance with the development plan unless material considerations indicate otherwise. This essentially means that the application requires to be assessed against all relevant policies of the Development Plan, national and local policy guidance and all other material considerations relevant to the application. The consideration of the proposal against relevant policy and guidance is outlined below.

3.2.1 National Policy

Scotland's Third National Planning Framework (NPF3)

The National Planning Framework (NPF3) 2014 is the long-term planning strategy for Scotland at a national level and represents the spatial expression of the Government Economic Strategy. Statutory development plans must have regard to the National Planning Framework, and decisions must support its delivery. The National Planning Framework is broadly supportive of the aquaculture industry considering the economic benefits generated by the sector. National Planning Framework (NPF3) notes that '*Aquaculture is an important aspect of the economy across parts of coastal Scotland, supporting many jobs – often in small communities – and representing a significant element of Scotland's exports. The industry has identified ambitious growth targets which we want to see realised.'*

Scottish Planning Policy

Scottish Planning Policy 2014 is a consideration in decisions on planning applications and informs development proposals from initial concept to implementation. In relation to fish farm development, the Scottish Planning Policy notes that *'aquaculture makes a significant contribution to the Scottish economy, particularly for coastal and island communities…'* and *'Planning can play a role in supporting the sectoral growth targets to grow marine finfish (including farmed Atlantic salmon) production sustainably to 210,000 tonnes…… with due regard to the marine environment by 2020.'*

The Scottish Planning Policy notes that the planning system should not duplicate other control regimes such as controlled activities regulation licences from SEPA or fish health, sea lice and containment regulation by Marine Scotland.

The Scottish Government has identified the food and drink sector as a key economic area for development. Scottish Government targets are to increase sustainable production of marine finfish by 32% in 2020, based on a 2011/2012 baseline. The strategy aims to double the economic contribution of the sector from £1.8 billion in 2016, to £3.6 billion by 2030 and double the number of jobs to 18,000 by 2030.

National Marine Plan

The National Marine Plan 2015 sets out a national strategy and overarching framework for all marine activity in Scottish waters. It facilitates sustainable development and use of Scottish seas in a way that will protect and enhance the marine environment whilst promoting both existing and emerging industries.

The National Marine Plan acknowledges that *'Aquaculture in Scotland is an increasingly important industry, and the Scottish Government supports industry plans to grow the sector sustainably'* and that *'Aquaculture makes an important contribution to food security.'*

The National Marine Plan includes specific industry targets to increase marine finfish production sustainably to 210,000 tonnes by 2020, by approximately 30% from 2015 levels.

The proposal has been considered against the relevant guidance in Table 3-2 below.

Table 3-2 Consideration of the proposal against relevant National Marine Plan (2015) policies

Policy guidance	Consideration of proposal	[Relevant section of this report where addressed]
AQUACULTURE 3 - In relation to nutrient enhancement and benthic impacts, as set out under Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters, fish farm development is likely to be acceptable in Category 3 areas, subject to other criteria being satisfied. A degree of precaution should be applied to consideration of further fish farming development in Category 2 areas and there will be a presumption against further fish farm development in Category 1 areas.	The existing site and proposed expansion are located within lower end of Loch Linnhe, which is uncategorised in terms of the Locational Guidelines.	Impact assessment – Section 7.3
AQUACULTURE 5 - Aquaculture developments should avoid and/or mitigate adverse impacts upon the seascape, landscape and visual amenity of an area, following Scottish Natural Heritage	The proposal follows Scottish Natural Heritage guidance on the siting and design of aquaculture development and the visual and landscape appraisal concludes no significant adverse effects on landscape and visual amenity.	Landscape and visual appraisal (Appendix 9)

Policy guidance	Consideration of proposal	[Relevant section of this report where addressed]
guidance on the siting and design of aquaculture.		
AQUACULTURE 6 - New aquaculture sites should not bridge Disease Management Areas although boundaries may be revised by Marine Scotland to take account of any changes in fish farm location, subject to the continued management of risk.	The development will not breach Disease Management Areas as the extended site will continue to fall within Disease Management Area 15b, which was confirmed by Marine Scotland in response to the screening request.	Farm Management Statement (Appendix 10)
AQUACULTURE 7 - Operators and regulators should continue to utilise a risk-based approach to the location of fish farms and potential impacts on wild fish.	The EIA considers the risk to wild salmonids from the operation of the proposed expanded site, and an Environmental Management Plan has been developed for salmon farms within the Farm Management Area to minimise likely significant effects.	Impact assessment – Section 7.4 Environmental Management Plan (Appendix 16)
AQUACULTURE 8 - Guidance on harassment at designated seal haul out sites should be taken into account and seal conservation areas should also be taken into account in site selection and operation.	There are no designated seal haul outs in proximity to the site, with the nearest being in the East end of the Sound of Mull approximately 15km away. Measures will be implemented to deter seals from fish farm cages through a Predator Exclusion Plan.	Predator Exclusion Plan (Appendix 8)
AQUACULTURE 9 - Consenting and licensing authorities should be satisfied that appropriate emergency response plans are in place.	Appropriate emergency measures will be in place, covering storm events, escapes and waste management for large scale mortalities.	Section 8
AQUACULTURE 10 - Operators should carry out pre-application discussion and consultation and engage with local communities and others who may be affected, to identify and, where possible, address any concerns in advance of submitting an application.	SSF undertook pre-application consultation with the Planning Authority, statutory consultees and relevant community councils.	Section 5
AQUACULTURE 11 - Aquaculture equipment, including but not limited to installations, facilities, moorings, pens and nets must be fit for purpose for the site conditions, subject to future climate change. Any statutory technical standard must be adhered to. Equipment and activities should be optimised in order to reduce greenhouse gas emissions.	The proposed cage specification will conform to best practice standards, including the British Standard BS EN 12201-2, as outlined in 'A Technical Standard for Scottish Finfish Aquaculture', which places technical requirements on the dimensions, design, installation, and operation of floating aquaculture solutions. SSF purchases all nets from reputable manufacturers who meet or exceed the Scottish Technical Standard.	Appendix 19

Policy guidance	Consideration of proposal	[Relevant section of this report where addressed]
	Mooring design and specification are tailored to meet the environmental conditions at any given site, and in line with the Scottish Technical Standard. The mooring design for the proposal has been designed and confirmed by a competent third party as suitable for use at the proposed location.	
AQUACULTURE 12 - Applications which promote the use of sustainable biological controls for sea lice (such as farmed wrasse) will be encouraged.	SSF have stocked wild ballan wrasse at the existing site and will continue to deploy cleaner fish as a biological control for sea lice at the expanded site. These fish are sourced from a dedicated contractor who has supplied SSF to meet requirements for the past three years and there are agreements in place to ensure an adequate supply of cleaner fish going forward. SSF will continue to investigate the use of farmed wrasse and implement this change as soon as feasible.	Fish Husbandry Manual (Appendix 20) Sea Lice Strategy (Appendix 13)

Economic Recovery Implementation Plan

The Scottish Government's 2020 Economic Recovery Implementation Plan has highlighted aquaculture as essential to the country's ability to recover from the economic impacts of the coronavirus pandemic. Scottish aquaculture is an essential component of the rural economy, supporting families and livelihoods in some of the most fragile communities. Along with its wider supply chain, aquaculture contributes £620 million Gross Value Added to the Scottish economy, supporting over 12,000 jobs. The Economic Recovery Implementation Plan lists the benefits of encouraging sustainable growth of Scottish aquaculture with due regard for the environment as a way of boosting economic prosperity, contributing to global challenges by delivering low carbon, nutritious animal protein and adding value to supply chains that support often highly skilled jobs and much needed investment in rural Scotland.

3.2.2 Local Policy

Argyll and Bute Local Development Plan

The Argyll and Bute Local Development Plan 2015 was adopted by the Council on 26th March 2015. However, a new version is currently being prepared which will replace the Local Development Plan (2015). The Local Development Plan is a land use planning document that sets out a settlement strategy and spatial framework for how the council wants to see Argyll and Bute develop to 2024 and beyond, excluding the area of Argyll and Bute covered by the Loch Lomond and Trossachs National Park that has its own plan.

As per Policy LDP DM 1: Development within the Development Management Zones the coast adjacent to the development is designated within the Countryside Zone. As is expected with development management policies, and any policies that do not specifically relate to marine interest, Policy LDP DM 1 is mostly however a consideration of land use development.

The policies relevant to the proposal contained within the Local Development Plan include:

- LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment;
- LDP 4 - Supporting the Sustainable Development of our Coastal Zone;
- LDP 5 - Supporting the Sustainable Growth of our Economy; and
- LDP 9 - Development Setting, Layout and Design.

The proposal has been considered against the relevant policies in Table 3-3 below.

Table 3-3 Consideration of the proposal against relevant policies of the Local Development Plan (2015)

Policy element	Consideration of proposal
LDP 3 – Supporting the Protection, Conservation and Enhancement of our Environment The Council wishes to encourage sustainable forms of development that seek to protect, conserve and where possible enhance the natural, human and built environment.	The reconfiguration of this existing site has been designed to have minimal impact on the environment and it will contribute to the long-term sustainability of the existing farm by increasing its economic viability and subsequently safeguarding employment and associated socio-economic benefits.
LDP 4 - Supporting the Sustainable Development of our Coastal Zone The coastal area of Argyll and Bute is an exceptional asset. Much of the population occupies settlements or areas that are immediately adjacent to the coast and it continues to provide a focus for economic activity, recreation and tourism. Developments in the renewable energy and aquaculture sectors have increased the focus on coastal and offshore areas with a likely increasing need for coastline locations for associated facilities. This policy recognises the significant economic potential of the coast and promotes the sustainable development of the coastal zone. In assessing coastal development proposals, the Council will take account of other relevant plans and strategies not adopted by the Council, including the National Marine Plan and forthcoming regional marine plans.	The proposal involves the expansion of an existing farm to its optimum production capacity within the assimilative capacity of the environment, which will facilitate sustainable development of the coastal zone. The proposal has been considered against the National Marine Plan and is aligned with the strategies outlined therein (refer to Table 3-2).
LDP 5 - Supporting the Sustainable Growth of our Economy Argyll and Bute Council will support the development of new industry and business which helps deliver sustainable economic growth by: - • taking full account of the economic benefits of any proposed development; • ensuring that the different spatial needs and locational requirements of the various sectors and scales of business are able to be met within the context of the settlement and spatial strategy; and • focussing regeneration activity and promoting environmental enhancement; and by safeguarding existing industrial and business areas for employment uses.	The Marine Scotland commissioned report – Estimation of the Wider Economic Impacts of the Aquaculture Sector in Scotland, 2020[1] – estimates the economic impact of aquaculture is widely felt beyond the industry. It is an important provider of employment in rural Scotland and wages are often higher than other industries. The study considered the wider value of the sector to the Scottish economy and the source of these impacts. Key findings include: • Aquaculture contributed £94.1 million in taxes paid to local, Scottish and UK Governments in 2018 • The aquaculture sector spent £1.4 billion on supplies and capital investments in 2018, with the majority (76%) of these goods and services purchased from within Scotland

[1] A report to Marine Scotland prepared by Biggar Economics (2020) Estimation of the Wider Economic Impacts of the Aquaculture Sector in Scotland [online]: https://www.scottishsalmon.co.uk/sites/default/files/2020-09/estimation-wider-economic-impacts-aquaculture-sector-scotland.pdf accessed on 27/10/2020.

Policy element	Consideration of proposal
Argyll and Bute Council will give particular priority to new business and industry development in business allocations, established business and industry areas and economically fragile areas. A greater focus on the potential main growth sectors including aquaculture.	• The majority of this impact came from salmon farming and the processing of aquaculture products. In 2018 the majority of the Gross Value Added of aquaculture was from the salmon production subsector, followed by aquaculture processing. Combined, these accounted for 96% of the Gross Value Added impact of the aquaculture sector • Staffing costs accounted for 12% of the turnover of the aquaculture sector - £185 million in 2018. Staffing costs have risen in recent years following an increase in the number of jobs supported by the sector and the higher workforce skills. Aquaculture is a key marine and coastal economic growth sector in Argyll and Bute. Aquaculture makes a significant contribution to the economy of Argyll and Bute and in particular to more remote and fragile areas. Aquaculture provides year-round jobs which are important for coastal communities and downstream jobs are also supported in transport, processing and support services. In 2019, the salmon farming industry in Argyll and Bute was estimated to support 595 employees, contributing over £12 million gross pay and contributing over £31 million in Gross Value Added.[2] The proposal will contribute to the long-term sustainability of the existing operations by increasing the economic viability thereof and subsequently safeguarding employment and associated socio-economic benefits.
LDP 9 - Development Setting, Layout and Design Policy LDP 9 states that "the Council will require developers and their agents to produce and execute a high standard of appropriate design" under the following headings: • Development setting; • Development layout and density; and • Development design.	The proposal involves the expansion of an existing farm. The relevant criteria with which to regard layout and density include that the layout will take account of the location and sensitivity of the area. To assess this, the EIA Report relies on the conclusions of the landscape and visual appraisal (Appendix 9) which concluded that additional landscape and visual effects from the proposed expansion are expected to be minimal and are mitigated by the development's regular layout, low profile and dark matt colours; siting of feed barge in the middle of the cage group on the shore side; alignment with the coastline; its position at the northern edge of the expansive view from Ganavan Sands beach; and its scale not appearing dominant in elevated expansive views from Ben Lora forest paths.

[2] Argyll and Bute Council (2019) Argyll and Bute in Numbers [online]: https://www.argyll-bute.gov.uk/sites/default/files/Unknown/argyll_and_bute_in_numbers_v6_0.pdf accessed on 27/10/2020.

Argyll and Bute Aquaculture Planning Guidance

Argyll and Bute Council adopted guidance to supplement the Local Development Plan in December 2016. The specific guidance relevant to the proposal is SG LDP AQUA 1: Aquaculture Development.

It provides additional detail to policies LDP 4 - Supporting the Sustainable Development of our Coastal Zone and LDP 5 – Supporting the Sustainable Growth of Our Economy. The proposal has been considered against the relevant planning guidance, refer to Table 3-4.

Table 3-4 Consideration of the proposal against the relevant planning guidance (2016)

Policy guidance	Consideration of proposal
SG LDP AQUA 1 In determining proposals, the Council will consider positive and negative effects relating to both the locational and operational characteristics of the development on the following criteria**:** • Landscape/seascape and visual amenity; • Isolated coast and wild land; • Historic or archaeological sites and their settings; • Priority habitats/species (including wild migratory salmonids) and designated sites for nature conservation; • Ecological status of water bodies and biological carrying capacity; • Commercial and recreational activity; and • Amenity, arising from operational effects (waste, noise, light and odour); and economic impact. Policy SG LDP AQUA 1 also states that aquaculture proposals will be supported if significant adverse effects in relation to locational characteristics of the development are avoided; and the risk of potential impacts relating to the operation of the site can be minimised or mitigated.	The site is located in an area where fish farming is already established. In terms of water quality assessments, lower Loch Linnhe is uncategorised for the combined nutrient enhancement and benthic impact risk by Marine Scotland (Locational Guidelines, January 2020) as it is an open-ended channel with unrestricted flow. The proposal has been considered against the National Marine Plan and is aligned with the strategies outlined therein (refer to Table 3-2). There are no regional or local marine plans applicable to the proposal. The site is located out-with any Marine Protected Area, however there is potential for interactions with specific Priority Marine Features namely local wild sea trout and Atlantic salmon (refer to Section 7.4), and the benthic habitat biotope is representative of the wider Priority Marine Feature 'Burrowed Mud' (refer to Section 7.2). This EIA Report assesses the potential impacts and effects of the proposal on the criteria listed and demonstrates the mitigation measures already in place as well as the additional mitigation measures proposed to render significant effects unlikely (refer to Section 7.1). The landscape and visual appraisal (Appendix 9) defined the landscape character as well settled and well frequented and with a distinct seascape context. However, due to the long-standing presence of the existing fish farm site, the landscape is considered to be of low sensitivity to change in regard to aquaculture expansion. The proposal does not lie within areas of isolated coast or wild land. Mitigation and management plans have been produced and appended to this EIA Report including an Environmental Management Plan to coordinate management over sites within the Farm Management Area. The proposal will increase the economic viability of the operations and safeguard employment benefits arising from sustainable industry growth.

3.3 DEVELOPMENT RATIONALE

The Dunstaffnage development proposal is an important part of the SSF growth plan to increase production across our three farming regions and will contribute to the long-term sustainability of the existing operations by increasing the economic viability thereof and subsequently safeguarding employment and other associated socio-economic benefits. The proposal adheres to the legislative requirements and benefits from general support from national and local planning policy, which together recognise the contribution of the aquaculture sector to the rural economy and which seek to support sustainable economic development. These support the expansion of marine fish farming where it can take place in environmentally sustainable locations, where it does not exceed carrying capacity of the water body within which it is to be located, and where it does not give rise to significant adverse effects upon nature conservation, wild fish, historic environment or other commercial or recreational users.

3.4 REFERENCES

- Scottish Government 2015. Scotland's National Marine Plan. http://www.gov.scot/Resource/0047/00475466.pdf
- Scottish Government 2014. Scottish Planning Policy. https://beta.gov.scot/publications/scottish-planning-policy/documents/00453827.pdf
- Argyll and Bute Council 2015. Local Development Plan. https://www.argyll-bute.gov.uk/ldp
- Argyll and Bute Council 2016. Guidance: Aquaculture. https://www.argyll-bute.gov.uk/sites/default/files/supplementary_guidance_2_document_adopted_december_2016.pdf
- Scottish Government 2020. Economic Recovery Implementation Plan. https://www.gov.scot/publications/economic-recovery-implementation-plan-scottish-government-response-to-the-advisory-group-on-economic-recovery/pages/2/

4 ALTERNATIVES CONSIDERED

4.1 CULTURE TECHNIQUE ALTERNATIVES

4.1.1 Land-based farming

In recent years it has been increasingly suggested to diversify the sector through Recirculating Aquaculture Systems (RAS) as a way of mitigating many of the environmental impacts from conventional salmon farming. However, it should be noted that all proposed developments, whether on land or within the marine environment, have the potential to result in adverse environmental impacts based on the nature, location, and scale of the proposal. Therefore, land-based farming may not necessarily result in fewer negative environmental impacts.

Producing larger more robust smolts through utilising freshwater Recirculating Aquaculture Systems has been proven. Knowledge of the biological requirements of post-smolts in closed containment systems however is lacking and the feasibility of the method as an alternative to open-cage farming is yet to be fully demonstrated.

Comparable Recirculating Aquaculture Systems would require extensive onshore development, putting increased pressure on land resources which are already significantly limited due to population growth and associated increased development. In addition, land-based facilities would likely be sited closer to Scotland's central belt, due to the availability of brownfield sites and easier access to major transport links and the labour market, which would mean the loss of the economic benefits the sector brings to rural Scotland. These facilities may also be sited out-with Scotland altogether.

Open cage farming at sea benefits from oxygen-rich seawater and natural currents which provide swimming resistance to increase fish fitness and disperse wastes. In an artificial Recirculating Aquaculture System environment, the pumping, oxygenating and treating of the water is required to replicate salmon's natural environment. These are energy-intensive processes translating into comparably high operating costs. The costs and environmental impacts related to the disposal of the waste generated also have to be considered.

The space constraints as well as high capital and operational costs associated with the technique require significantly higher stocking densities to ensure commercial viability which may have implications for fish welfare. The option of increasing production through farming on land was ruled out as not being feasible due to the lack of commercial viability and poor sustainability profile of the technique.

4.1.2 Open-cage farming

Open-cage marine farming remains the most widespread and reliable way to produce salmon. The technique is well established and has proven successful. Open-cage farming keeps investment and economic benefits in the region, and it is sustainable with significant environmental effects avoided through farming in an appropriate location and with appropriate management and equipment. Investment in a freshwater Recirculating Aquaculture System hatchery has allowed SSF to produce 10 million smolts in its first year (2020) which are going to sea larger and more robust than before leading to a shorter production time at sea. The site alternative assessment was therefore progressed on the basis that farming would continue using open cage systems.

4.2 SITE ALTERNATIVES

4.2.1 Offshore

SSF have started investigating the option of farming offshore, also known as open ocean aquaculture, which is an emerging approach to marine farming. However, the option of increasing production through new ocean farms requires further research and development to ensure that it is a viable alternative and is therefore being investigated in conjunction with inshore projects.

4.2.2 Inshore

The expansion of an existing farm has been assessed for this proposal rather than assessing areas for new sites. The rationale for not considering new areas is that Argyll and Bute encompasses many salmon farms across the region, with many key sites already developed and a limited availability of suitable areas for new sites. However, the advantages of expanding an existing farm to its optimal potential within the environmental capacity include that it is located within an area where fish farming development is already established, and monitoring data are available for the existing farm to inform the EIA and decision-making process.

Dunstaffnage was chosen by SSF for development as it has historically performed well with regards to seabed impacts, sea lice management, fish health and production. It is situated in open water and is well flushed, with no barriers to water exchange. There is therefore scope for a biomass increase here within the assimilative capacity of the environment, and physical space for expansion of the site.

4.3 Site Layout Alternatives

Different modelling scenarios were undertaken to identify the preferred site layout assessed in this EIA Report (refer to Figure 2-2). Available spatial information on environmental sensitivities (seabed habitats, seal haul out sites) and commercial/recreational activities adjacent to the farm did not identify sensitivities which influenced site layout. Modelling criteria included various cage configurations and stocking densities, using measured tidal flow and depth. The modelling outputs identified the most suitable cage size, number and micro-siting of the cages for optimum biomass for the site. Data obtained from acoustic doppler current profiler meters previously deployed to survey the tidal hydrodynamics of the site were utilised to support the modelling. The preferred layout and optimal biomass were informed by the local tidal velocities and water depth and was identified as having the most favourable attributes in terms of the location's assimilative capacity for salmon aquaculture.

The Planning Authority requested that the feed barge not be located at the southwest end of the cage group to minimise the visual impact on the beach and houses at Ganavan. The preferred siting of feed barge, namely in the middle of the cage group on the shore side, was therefore selected.

Top nets are installed over stocked cages to prevent predation, primarily by diving birds. The existing netting support design is installed on a circular structure in the centre of the cage, referred to as a 'hamster-wheel'. However, an alternative netting support design has been chosen as the preferred option for the proposal. The alternative involves suspending the top nets from poles attached to the perimeter of the cage walkway. These nets are secured at the cage rails with poles and tensioned to prevent bird entanglement. This structure will be at a height to ensure that the nets are kept at a safe distance from the water and do not impede farming equipment or operational activities. The rationale for selecting pole-mounted top nets over the traditional hamster-wheel design is to facilitate increased operational efficiency as it allows better access to the cages and to reduce the potential for fish coming into contact with the central floating hamster wheel support. NatureScot issued guidance in the form of a technical briefing note issued in September 2020 highlighting the need to consider the risk of pole-mounted top nets to some bird species that could become entangled within or entrapped under the ceiling nets. The guidance indicated that NatureScot consider that likely significant effects should be concluded with respect to gannet qualifying features of Special Protection Areas for all marine finfish farms involving deployment of pole-mounted top net systems with ceiling net mesh sizes of 200mm or greater. SSF therefore initially proposed the use of ceiling nets and side panels with a mesh size of 150mm and sought advice from NatureScot in this regard. NatureScot then advised that SSF should seek to adopt as small a ceiling mesh size as possible, preferably of 100mm or under, to reduce the potential risk of damaging interaction with gannets if using pole-mounted top nets as well as a smaller mesh (ideally 50mm) for panels at the base of side nets to reduce the risk to gulls, and other birds that may perch on netting (e.g., European shags, cormorants, and herons). Smaller mesh size however correlates with increased net weight. Increased net weight can have adverse effects on safe working as well the structural integrity of a cage. We are aware that one company has proposed a 75mm mesh size for both the side

and ceiling panels but as this is still to be trialled and its performance yet to be established, especially in more exposed locations where wind is a greater contributing factor. After consulting with manufacturers and taking the above into consideration, a ceiling mesh of 100mm and a side panel mesh of 75mm is proposed as a feasible alternative to prevent adverse effects on birds whilst maintaining the structural integrity of the cages and safe working conditions.

4.4 Do – Nothing Alternative

Should the development not go ahead, the expansion of the existing farm to its optimum production capacity would not be realised and any environmental impacts and associated effects of the proposal (outlined in Section 7) would also not occur.

The design and assessment process adopted by SSF has represented a good practice approach to responsible development. All potential areas of interaction between the proposal and the environment have been assessed, resulting in suitable site selection and a well-designed development incorporating appropriate measures to mitigate potential significant effects. The development complies with, and is supported by, the aims and objectives of both national and local planning policy and would make a valuable contribution towards the ambitious growth targets set for the aquaculture industry as well as contribute towards economic recovery and ensuring food security. The proposed development would increase the sustainability of the operations and contribute to safeguarding the associated socio-economic benefits.

5 CONSULTATION

In addition to EIA screening (as detailed in 1.4.1), pre-application consultation was conducted with the Planning Authority as well as the following statutory consultees:

- Scottish Natural Heritage, now NatureScot.
- The Scottish Environment Protection Agency (SEPA).
- Marine Scotland.
- The Crown Estate Scotland.
- The Northern Lighthouse Board.
- The Argyll and Lochaber District Salmon Fishery Boards/Fisheries Trusts.
- The West Coast Regional Inshore Fisheries Group.

Additionally, both Oban and Dunbeg Community Councils were informed of the proposed development and comments invited. Refer to Table 5-1 for a consultation summary.

Table 5-1 Pre-application consultation summary

Consultee	Date	Form	Advice	[Relevant section of this document where addressed]
Argyll and Bute Council	13/10/2015	Meeting (Richard Kerr, Mark Steward)	The proposed site is more symmetrical than existing. Views from Ben Lora unlikely to be significantly affected, impact may be more on ferry traffic. Barge should not be situated at south (Ganavan) end. Argyll District Salmon Fishery Boards will have concerns - substantial biomass increase, and site close to rivers of wild fish importance. Engage with Craig Macintyre at earliest opportunity.	Impact assessment – Section 7.1 and Section 7.4
Scottish Natural Heritage / NatureScot	09/06/2017	Meeting (Jane Dodd)	No landscape concerns regarding this proposal. Wild fish will be main concern.	Impact assessment – Section 7.1 and Section 7.4
Scottish Natural Heritage / NatureScot	12/06/2017	Email (Jane Dodd)	Wild fish will pass site when entering/leaving Loch Etive. Noted that Dunstaffnage has not had a bath treatment in >6 years, indicating effective control by other methods (e.g., cleaner fish). Would like to see detailed consideration of sea lice management to ensure this continues. Noted that wider fish health reporting region (Awe to Nell) does not appear to be managing lice as effectively, so suggest a strategy be devised to show this is not reflective of Dunstaffnage specifically.	Impact assessment – Section 7.4 Sea lice management strategy (Appendix 13) Sea lice attestation (Appendix 14)
Argyll District Salmon Fisheries Board/Fishery Trust	13/03/2017	Meeting (Craig Macintyre)	State of wild fisheries not very good at present. If lice numbers on a farm go up and come back down again, that is ok - problems arise where site is in exceedance of Code of Good Practice for several consecutive months. Key is to demonstrate effective sea-lice control. Communication between companies and District Salmon Fishery Boards/Fisheries Trusts could be improved.	Impact assessment – Section 7.4 Sea lice management strategy (Appendix 13) Sea lice attestation (Appendix 14)

Consultee	Date	Form	Advice	[Relevant section of this document where addressed]
Marine Scotland	03/06/2017	Email (Anna Donald)	Requirements include biomass and medicines modelling; Equilibrium Concentration Enhancement modelling; sea lice efficacy statement; confirmation of location, cage number and size, max biomass, net depth, mort removal and disposal; details of how predator interactions will be minimised; escapes contingency plan; evidence that equipment is fit for purpose; sea lice treatment plan, including bath treatment method; Farm Management Statement; information as to how overall increase in biomass (for Argyll) does not increase risk to wild fish. Suggestions: Details of any Farm Management Area; whether site will be managed within principles of Code of Good Practice /ISLM; details of sea-lice control plans, including targets/absolute numbers; info regarding local wild fish catches; evidence of effective sea lice control at existing site.	Project description – Section 2.3.5 Impact assessment – Section 7.4 Biomass and Medicine Modelling report (Appendix 3) Equilibrium Concentration Enhancement assessment (Appendix 7) Predator Exclusion Plan (Appendix 8) Farm Management Statement (Appendix 10) Sea Lice Efficacy Statement (Appendix 12) Sea Lice Management Strategy (Appendix 13) Sea lice attestation (Appendix 14) Environmental Management Plan (Appendix 16) Escapes Prevention and Recapture

Consultee	Date	Form	Advice	[Relevant section of this document where addressed]
				Strategy (Appendix 18) Equipment attestation (Appendix 19) Emergency Plan for Storms (Appendix 22)
Northern Lighthouse Board	06/06/2017	Email (Steven Driver)	No major navigational issues identified; Northern Lighthouse Board will provide marking and lighting recommendations to the Council and Marine Scotland.	Project description – Section 2.3.5 Impact assessment – Section 7.1
SEPA	27/06/2017	Meeting (Barbara Gritten, Margaret Conaghan)	This would be viewed as a technical variation to the existing CAR licence, rather than a new application. No history of benthic failures/problems. Site is situated in burrowed mud, tall sea pens likely to be present.	Legislative requirements – Section 3.1 Impact assessment – Section 7.2
Argyll and Bute Council	28/06/2017	Meeting (Richard Kerr, Mark Steward, Sandra Davies)	Demonstrate good sea lice control (cleaner fish, thermolicer) and provide evidence with planning application if possible.	Sea lice management strategy (Appendix 13) Sea lice attestation (Appendix 14)
Oban and Dunbeg Community Councils	04/09/2017	Email to Sean MacIntyre (Dunbeg) and Marri Malloy (Oban)	No responses received.	NA
Crown Estate	12/05/2017	Email (Alex Adrian)	No issues identified.	NA
Lochaber District Salmon Fisheries Board/Fishery Trust	13/12/2017	Meeting (Jon Gibb, Diane Baum)	Serious concerns regarding SSF proposed biomass increase in Argyll - will have to object due to potential impacts on wild fish.	Impact assessment – Section 7.4

Consultee	Date	Form	Advice	[Relevant section of this document where addressed]
Argyll District Salmon Fisheries Board/Fishery Trust	23/02/2018	Meeting (Alan Kettle-White and Roger Brook)	Wild salmon under great pressure - used to be 20-30% of smolts returning, now more like 5% (east coast) and 1% (west coast). Even if aquaculture is responsible for only 1% of decrease, this could be significant. Companies need to be able to demonstrate lice control before any biomass increase can be allowed.	Impact assessment – Section 7.4
West Coast Regional Inshore Fisheries Group	30/06/2020	Email (Elaine Whyte)	Member objected to the proposed fish farms, especially around Lismore, as the area is currently heavily populated with creels and for mobile fishermen this area represents about the only prawn trawl left to pursue in the marine area. Loss of fishing ground to indigenous wild fishermen - The local fishing community are becoming increasingly concerned with the increasing loss of grounds to natural wild fishers. We are of the opinion that the current level of fish farms already in the area are already in excess of what seems sensible. We are not in any way against sustainable fish farming, but we do feel it should be in balance with existing activities. Please note that indigenous wild fishing lose space to various projects from cable laying, MPAs, NTZs, leisure pursuits, the Royal Navy and frequently expanding aquaculture. We wish to be good neighbours supportive of other businesses and activities, but we cannot continue to lose fishing ground in all directions. Fishing can only happen in particular areas, we firmly want to ensure we continue to have a strong fishing sector as well as other sectoral development, to do this we must start to moderate the loss of space. This particular proposal will take away significant safe fishing grounds for prawn fishing. Loss of sheltered/safe grounds and economic loss - The location of fish farms is frequently in safe fishing areas, when the weather is poor if sheltered areas are increasingly dedicated to fish farms fishermen either face a choice of no safe areas to fish and so may tie up, or they are forced to take unreasonable risks to remain economically viable. We do not support this extension as it will encroach further into safe wild fishing grounds. Chemical pollution and sewage - Fishing members have gotten in touch to express that they already have concerns over current fish farms in respect to effects on fishing due to sewage and chemical pollution. Any extension of this site would be unacceptable to our fishing members. Recent SEPA findings in respect to the impact of fish farming and its impact on the surrounding eco-system is of a concern and we would seek to see a current halt to future developments of new fish farms or an extension to existing farms until the findings of the SEPA report in terms of damage to species etc. is fully considered in terms of chemicals etc.	Impact assessment – Section 7.5

Consultee	Date	Form	Advice	[Relevant section of this document where addressed]
NatureScot	10/11/2020	Email (Claire Masson)	The Proposal is located within the mean maximum foraging range of the qualifying features of the Ailsa Craig S Special Protection Area which are: breeding seabird assemblage, gannet (breeding), common guillemot (breeding), herring gull (breeding), kittiwake (breeding), and lesser black-backed gulls (breeding). Furthermore, for gannets, kittiwakes, lesser black-backed gulls and guillemots, the Proposal is within their mean foraging distance from the Ailsa Craig SPA. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the 'Habitat Regulations') or, for reserved matters, The Conservation of Habitats and Species Regulations 2017 apply. The proposal may have a likely significant effect on the qualifying features of the Ailsa Craig Special Protection Area (with the exception of Kittiwake where no likely significant effect is predicted). Consequently, the competent authority, is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest(s). However, NatureScot advised that on the basis of the information provided, if the proposal is undertaken strictly in accordance with the following mitigation then the proposal will not adversely affect the integrity of the site. On theoretical grounds, potential entrapment and entanglement risk to gannets may be reduced by having a smaller ceiling mesh size of 100mm or less. However, we currently lack robust empirical information against which to assess both actual level of risk represented by 150mm mesh ceiling nets and the efficacy of reducing this mesh size. With respect to gulls, the proposed side panel mesh size of 150mm might theoretically be anticipated to increase potential entanglement risk, while possibly reducing entrapment risk relative to larger mesh sizes (e.g., 200mm or more). Based on our experience with hamster-wheel systems, the incorporation of a smaller (e.g., 50mm) mesh in the lower parts of the side panels, nearest to the handrails could potentially reduce this risk. NatureScot advised that SSF should seek to adopt as small a ceiling mesh size as possible, preferably of 100mm or under, to reduce potential risk of damaging interaction with gannets if using pole-mounted top nets as well as a smaller mesh (ideally 50mm) for panels at the base of side nets to reduce the risk to gulls, and other birds that may perch on netting (e.g., European shags, cormorants, and herons). NatureScot provided the full advice in the annex which included the recommended adaptive management measures as per the guidance issued in September 2020.	Impact assessment – Section 7.1

6 EIA METHODOLOGY

The EIA process followed complies with the requirements of the EIA Regulations and EIA best practice, such as guidance provided by the Chartered Institute of Ecology and Environmental Management (2019) and Scottish Natural Heritage (2018).

The following definitions were assumed for the purposes of this EIA:

Assessment	Process of considering, in detail, the potential areas of interaction between a proposed development and the environment with the aim of identifying any potential impacts and resultant effects as well as the significance thereof.
Environmental receptor	Specific feature of the environment likely to be impacted by a proposed development such as the water column, benthos, visual landscape, fisheries, natural heritage etc.
Baseline	State of an environmental receptor in the absence of, or prior to, the commencement of a proposed development.
Impact	Changes to the baseline caused by an aspect or activity related to a proposed development. For example, deposition and accumulation of medicinal residues in the benthos from utilising medicinal lice treatments.
Effect	Consequence caused by an impact. For example, a decrease in benthic biodiversity caused by deposition and accumulation of medicinal residues in the benthos.
Significant	Where a change to the baseline or consequence thereof exceeds the ability of the environmental receptor to absorb or accommodate such a change or consequence resulting in a notable outcome which should be taken into consideration during decision making.
Standard mitigation	Mitigation measures inherent to successful fish farming or measures implemented in fulfilment of regulatory requirements and as such, included as a standard part of operations.
Additional mitigation	Mitigation measures to be implemented in addition to standard mitigation measures.

A qualitative approach has been taken to the assessment informed by the Screening Opinion and advice received by statutory consultees. To ensure that the EIA Report is both proportionate and fit-for purpose, a high-level assessment has been undertaken to identify the potential interactions between the development and receptors as well as any potential impacts (the change which occurs as a result of the development) or effects (the consequence of the change) likely to be significant to be considered in further detail in the EIA process.

A common approach has been used for the assessment:

- Establishing the **baseline conditions** through a combination of desk review using existing information as far as possible, consultations and site surveys or technical reports.
- Identifying potential interactions between the development and receptors as well as any **potential environmental impacts and resultant potential for significant effects to arise**. Where no likely significant effects are anticipated, those topics are addressed at an appropriate level of detail. Under the EIA regulations, such impacts or effects may be of little or no significance for the development in question and, if included in the EIA Report, would need only very brief treatment to indicate that their possible relevance has been considered. Where there is the potential for likely significant effects to arise, those topics are progressed for further detailed assessment.

- Identifying **mitigation** measures (both standard and additional, where required) to avoid, reduce and, where possible offset any impacts which could either by themselves, or in combination with other impacts have a significant adverse effect.
- Assessing the level of significance of any **residual effects** after the implementation of mitigation measures (both standard and additional). The level of significance is only assessed for residual effects, rather than both prior to and post mitigation, as most of the standard mitigation measures to avoid or minimise potential adverse environmental impacts and effects are inherent to successful fish farming. It would therefore not be practical to assess the level of significance of an impact and associated effects without their implementation as it is improbable that this would ever be the case.

Significance is not defined in the EIA Regulations. The definition of a significant effect which was adopted in this assessment is one which the project team considered to be material to the decision-making process. Significance is a matter of professional judgement. However, in general it is arrived at from an analysis of:

- The weighting of the receptor in terms of the importance of preserving the baseline due to the role of the receptor in a wider context and/or its capacity to accommodate the effects of the development (refer to Table 6-1 for an overview of the weighting criteria considered).
- The nature of the effects of the development, often referred to as the magnitude, which encompasses the sensitivity of the receptor to the development; severity, extent and duration of the effect; as well as the likelihood of the effect occurring (refer to Table 6-2 for an overview of factors which inform magnitude determination).
- Refer to Table 6-3 for an overview of how receptor weighting and magnitude of the effect of the development are overlaid to inform the level of significance of the effect. Residual effects of moderate or major significance are considered **likely significant effects**.

The tables provide a guide and are not intended to be prescriptive as impacts and effects are complex and may therefore not conform to the criteria.

Table 6-1 Feature/receptor weighting criteria overview

Feature / Receptor	High Weighting	Medium Weighting	Low Weighting
Benthic habitat	• An internationally designated habitat or species (listed in OSPAR List of Threatened and/or Declining Species and Habitats, Annex I of the Habitats Directive, Special Area of Conservation) • Habitat or species of a nationally important designated site (MPA)	• A regularly occurring habitat or substantial population of a nationally important species (as listed in UK BAP, Scottish Priority Marine Feature, Scottish Biodiversity List)	• Habitat or species of national importance but which are only present infrequently or in very low numbers within the study area • Widespread or common habitats or species of local importance
Water column	• Vulnerable water bodies (enclosed loch or areas with poor hydrodynamic conditions) • Areas classified as Category 1 according to the Locational Guidelines	• Water bodies with limited assimilative capacity • Areas classified as Category 2 according to the Locational Guidelines	• Relatively unconstrained water bodies with moderate to high assimilative capacity • Areas classified as Category 3 according to the Locational Guidelines • Unclassified according to the Locational Guidelines (open water)
Natural heritage	• An internationally designated site (Natura Sites - Marine Special Protected Areas and Marine Special Areas of Conservation, Ramsar Site) • An internationally designated habitat or species (listed in OSPAR List of Threatened and/or Declining Species and Habitats, Annex I of the Habitats Directive, Annex I of the Birds Directive, European Protected Species listed under Annex IV of the Habitats Directive)	• A nationally designated site (Marine Protected Area and Site of Special Scientific Interest) • Sites designated under the Marine (Scotland) Act • A regularly occurring habitat or substantial population of a nationally important species (as listed in UK BAP, Scottish Priority Marine Feature) • Habitat or species categorised under 'Conservation action needed' or 'Avoid negative impacts' in the Scottish Biodiversity List	• A locally designated site • Habitat or species of national importance but which are only present infrequently or in low numbers within the study area
Navigation, anchorage, commercial and other maritime uses	• Major anchorage, frequently used or important for safety	• Conflicts with or restricts access to important anchorage	• Areas of local importance for fisheries as a source of revenue and employment • Areas of low intensity commercial shipping

Feature / Receptor	High Weighting	Medium Weighting	Low Weighting
	• Conflicts with major passenger ferry route • Recognised international shipping lane • Fishery area of international or national commercial significance as a source of revenue or employment • Areas licensed to other sea users • Exclusion areas	• Recognised shipping lanes or military practice / exercise areas • Areas of regional importance for fisheries or high local importance as a source of revenue and employment	
Landscape and visual amenity	• Coastal areas or seascapes which may be covered by scenic designations (National Scenic Area or National Parks) • Intricate coastal edge with dramatic and/or diverse features such as cliffs, skerries, islands, highly patterned estuaries, and narrow firths • Strongly contained small scale seascapes • Built and natural coastal landmark features • Seascapes with a notably scenic composition resulting from juxtaposition of diverse landscape, coast and sea or particularly wild, remote, and rugged coasts	• Seascapes where there may be some sensitivities such as areas comprising smaller inlets or bays where scale may be adversely affected but where existing development or small areas of simpler coastline may be present • Areas with simpler coastlines and a more expansive maritime component but which are less developed and have some qualities of wildness • Coastal areas or seascapes which may be covered by scenic designations but where susceptibility is reduced to some degree because of any of the factors noted above	• Seascapes where some sensitivities are present for example where smaller or occasional more diverse coastal features are present but where a simpler coastal edge predominates • Coastal areas with a larger scale where the scale of open water is increased • Few or no landmark features • Coastal areas or seascapes which are not formally valued • Coastal areas/seascapes which are more developed and/or busier in terms of marine activity
Cultural heritage	• World heritage site or other cultural heritage asset of international importance	• Cultural heritage asset of national importance (Scheduled ancient Monuments, Historic Naval Battles, Designated Wrecks and Historic National Marine Plan Areas)	• Sites of regional / local importance (local list of architecturally or historically important buildings and conservation areas)
Socio-economic, recreation and tourism	• International status recreational / tourism site • High visitor numbers	• National status receptor recreational / tourism site • High visitor numbers	• Regional / local status receptor recreational / tourism site • High visitor numbers

Feature / Receptor	High Weighting	Medium Weighting	Low Weighting
	• Affect a high number of people at a national level • Site may host or be important for international events	• Affect a high number of people at a regional level • Site may host or be important for national events	• Affect a high number of people at a local level • Site may host or be important for regional / local events

Table 6-2 Determination of the magnitude of effect: criteria overview

Characteristics of the potential effect	Likelihood of occurrence	Magnitude
• Result in a major loss or fundamental alteration of baseline (pre-development) character, attributes, or composition • Result in major consequences within a wider context • Result in unknown consequences or a high level of uncertainty due to gaps in current knowledge (precautionary approach) • Effect at a regional or national scale • Result in long-term or permanent effects • Irreversible in nature	• Probable or definite likelihood of occurrence • Possible or likely to occur • Unknown occurrence (precautionary approach)	High
	• Improbable or unlikely to occur	Medium - Low
• Result in a moderate loss or alteration of baseline (pre-development) character, attributes, or composition • Result in moderate consequences within a wider context • Effect at a local or regional scale • Result in medium-term to long-term effects • Reversible in nature	• Probable or definite likelihood of occurrence • Possible or likely to occur	Medium
	• Improbable or unlikely to occur	Low
• Result in a minor loss or alteration of baseline (pre-development) character, attributes, or composition • Result in minor consequences within a wider context • Effect limited to the site or local scale • Result in short-term to medium-term effects • Reversible in nature	• Probable or definite likelihood of occurrence • Possible or likely to occur • Improbable or unlikely to occur	Low

Table 6-3 Impact or effect significance determination matrix

	Magnitude		
Receptor Weighting	**High**	**Medium**	**Low**
High	Major	Moderate	Minor - moderate
Medium	Moderate	Minor - moderate	Minor
Low	Minor - moderate	Minor	Negligible

7 IMPACT ASSESSMENT

7.1 OVERVIEW OF ENVIRONMENTAL FEATURES / RECEPTORS ASSESSED

An initial high-level assessment was undertaken to: -

- provide an overview of the environmental features / receptors that the development may interact with and potentially exert an impact on;
- identify impacts with the potential to result in significant effects to be progressed for further detailed assessment; and
- provide a proportionate assessment of the impacts which are unlikely to result in a significant effect thereby preventing excessive detail relating to issues that are considered irrelevant or of little importance to the decision.

Table 7-1 Findings of high-level assessment

Features (Receptors)	Level of assessment and rationale
Benthic habitat	Seabed habitats below and in proximity to the proposed farm are representative of the wider Priority Marine Feature 'Burrowed Mud'. **Due to the presence of the Priority Marine Feature, presence of *Nephrops* habitat important in terms of commercial fishing interests and the known potential for the discharge of waste from farms to alter benthic communities within a farm's depositional footprint, it was progressed for further assessment (refer to Section 7.2).** The assessment was informed by monitoring surveys of the benthic conditions within the existing site footprint undertaken to ensure compliance with the SEPA CAR licence (Appendix 2), a visual seabed survey carried out within the proposed development area adjacent to the existing site (Appendix 6) as well as biomass and chemotherapeutant modelling undertaken for the proposal to inform the SEPA CAR Licence variation application (Appendix 3).
Water column	In terms of water quality assessments, lower Loch Linnhe and the Firth of Lorn are uncategorised for the combined nutrient enhancement and benthic impact risk by Marine Scotland (Locational Guidelines, January 2020) as it is an open-ended channel with unrestricted flow. **Due to the potential for marine aquaculture developments to affect the water column in general and the potential for cumulative effects as a result of the wider SSF Loch Linnhe development proposal it was progressed for further assessment (refer to Section 7.3).** The assessment was informed by the hydrographic reports (Appendix 4), Equilibrium Concentration Enhancement assessment which considered all existing farms and the wider SSF Loch Linnhe development proposal (Appendix 7) as well as biomass and chemotherapeutant modelling undertaken for the proposal to inform the SEPA CAR Licence variation application (Appendix 3).

Interaction with predators	Seals Two species of seal live and breed in Argyll and Bute waters; the grey seal (*Halichoerus grypus*) and the harbour seal (*Phoca vitulina*), which is also known as the common seal. The nearest designated seal haul out is 15km from the site. Seals have been noted at the existing site, but since the installation of 'Seal Pro' netting at the farm in 2018 no significant incidences of seal predation have been recorded and the use of acoustic deterrent devices have not been required. It is therefore proposed to install 'seal pro' polyethylene cage netting across all cages, using sinker tubes to provide a high level of tension, and not use acoustic deterrent devices at this farm. The proposed expansion is not expected to increase the existing level of interaction with seals. Otters The cages are approximately 450m from the nearest area of mainland shoreline. Otters tend not to forage further than 100m from the coast[3] and therefore there is little potential for otters to interact with the fish farm infrastructure. Seabirds Various piscivorous bird species may be present in the area and although they will not actively predate large salmon, many are opportunists and may be attracted to smolts or other smaller fish aggregating near the cages and could be at risk of accidental entanglement in the absence of mitigation. Wildlife can become entangled in netting either because the mesh is not adequately sized or due to inadequate maintenance practices where holes in netting have gone unrepaired or nets are not sufficiently tensioned. The use of top nets discourages and prevents cage surface attack by birds. Top nets will be supported and tensioned by fiberglass poles extending 5.3m above the water level and constructed of dark grey mesh with side panels having a 75mm mesh size and ceiling panels having a mesh size of 100mm (refer to Attachment C1 and C2). In response to the sector increasingly seeking to utilise pole-mounted top nets for marine cages, in place of the traditional hamster-wheel design to improve fish welfare, NatureScot issued draft guidance in September 2020 highlighting the need to consider the risk of pole-mounted top nets to some bird species that could become entangled within or entrapped under the ceiling nets. The Proposal is located within the mean maximum foraging range of the qualifying features of the Ailsa Craig Special Protection Area which are: breeding seabird assemblage, gannet (breeding), common guillemot (breeding), herring gull (breeding), kittiwake (breeding), and lesser black-backed gulls (breeding). Furthermore, for gannets, kittiwakes, lesser black-backed gulls and guillemots, the Proposal is within their mean foraging distance from the Ailsa Craig SPA. The use of pole-mounted top nets poses a potential entanglement risk to birds, including species of conservation interest. The proposal may have a likely significant effect on the qualifying features of the Ailsa Craig Special Protection Area (with the exception of Kittiwake where no likely significant effect is predicted). However, currently there is a lack of robust empirical information against which to assess the level of risk presented by the use of specific designs and mesh size of pole-mounted top nets. NatureScot was consulted in this regard (refer to Section 5) and stated that on theoretical grounds, given gannet body dimensions, they anticipate that smaller ceiling mesh sizes, particularly of 100mm or under, are less likely to pose risk of entrapment or entanglement. However, they do not yet understand how gannets may perceive and respond to these new style top nets, which typically are constructed of finer gauge netting than those supported on the more traditional hamster-wheel type central supports. They will need to evaluate more empirical data from a wider range of sites and top net configurations before coming to any firm conclusions with respect to effect of mesh sizes or other characteristics, including colour, on risk to gannets, and other birds, in pole-mounted top net systems. NatureScot advised that if the proposal is undertaken strictly in accordance with the

Features (Receptors)	Level of assessment and rationale
	recommended mitigation then the proposal will not adversely affect the integrity of the site. As such, the following mitigation measures (which are aligned with those recommended by NatureScot) have been proposed: • SSF propose a design of the recommended 100mm mesh on the ceiling panel and 75mm on the side panel which, although not as small as the ideal recommended (50mm for the protection of perching birds), is as small a mesh size as we consider appropriate to ensure a safe working net design. In addition, the pole-mounted top nets are more flexible than the hamster-wheel design they are constantly moving and therefore birds are less likely to perch on the structure. After using this design for the first farm cycle its effectiveness will be reviewed and design altered where required. To manage the uncertainty regarding the potential risk the following monitoring and adaptive management measures are proposed: • Maintain daily records of wildlife entanglement / entrapment using a standardised format and submit six-monthly returns to the Planning Authority copied to NatureScot. • Immediately notify the Planning Authority and NatureScot in event of any significant entrapment or entanglement (e.g., involving three or more birds of any named species on any one day and/or a total of ten or more birds in the space of any seven-day period and/or or repeat incidents involving one or more birds on four or more consecutive days). Monitoring and reporting of entanglement/entrapment data will help to develop a robust evidence base which can be used to improve understanding of the nature and extent of bird interactions with pole-mounted top nets. • Implement adaptive management approaches based on monitoring findings (as agreed with the Planning Authority in consultation with NatureScot), such measures may include: ○ If entanglement records show significant entrapment or entanglement occurring then consider appropriate alterations to the top net design including changes in mesh size, net colour and marking the top nets to make them more visible to birds; and ○ If bird entanglement continues despite alterations, top net design could be changed to the traditional hamster-wheel system. <u>Conclusion</u> A site-specific plan (Predator Exclusion Plan attached as Appendix 8) will be implemented which details preventative measures to avoid and minimise the risk of adverse interactions such as entanglement of predatory species. The Predator Exclusion Plan includes measures to deny predator access and reduce attraction to cages. Use of cage nets made from polyethylene, which is markedly stronger than nylon and retains its strength in water, with a small mesh size (20mm) provides better protection from seal attacks and due to the mesh size and tensioning do not pose a risk of entanglement to wildlife. The Predator Exclusion Plan does not include seal management as a last resort and it is our intention not to use acoustic deterrent devices at this farm, but in the unlikely event that significant issues with seal predation arise, acoustic deterrent devices which are a low risk to cetaceans would be considered through a separate licensing process. Implementation of the measures detailed in the Predator Exclusion Plan will ensure that all potential impacts are minimised to prevent significant effects. **As no likely significant effects are expected, no further assessment was considered necessary.**

3 Kruuk, H., Hewson, R, (2009). Spacing and foraging of otters (Lutra lutra) in a marine habitat. Journal of Zoology, 185(2) pp205-212 available [online] at: https://www.researchgate.net/publication/230025334_Spacing_and_foraging_of_otters_Lutra_lutra_in_a_marine_habitat accessed on 27/10/2020.

Features (Receptors)	Level of assessment and rationale
Natural heritage (designated sites and species or habitats of conservation importance including wild salmonids)	Effects on benthic habitats and species of conservation importance are assessed under benthic impacts (refer to Section 7.2). The Dunstaffnage farm does not lie within any natural heritage designated sites. The site is located within 3km of the Inner Hebrides and the Minches Special Area of Conservation selected for harbour porpoise. However, as the use of acoustic deterrent devices is not proposed there will be 'no likely significant effect' on the qualifying feature of the Special Area of Conservation, harbour porpoise, and therefore no further consideration of this designation is required. The proposal is located within the mean foraging range and mean maximum foraging range of the qualifying features of the Ailsa Craig Special Protection Area. The use of pole-mounted top nets poses a potential entanglement risk to birds, including species of conservation interest. The potential effects on the integrity of the Special Protection Area have been assessed above, under 'Interaction with Predators'. Although the site is not located within a designated site in terms of conservation importance for wild salmonids, the proposed biomass increase has the potential to impact Atlantic salmon and sea trout which are listed as Priority Marine Features. The site is also located close to rivers of wild fish importance. **Due to the potential impacts the proposal may have on species of conservation importance as well as the statutory consultees highlighting this as their main concern regarding the proposed development it was progressed for further assessment (refer to Section 7.4).** The assessment was informed by site specific sea lice management trends included in the sea lice attestation (Appendix 14) and sea lice dispersal modelling undertaken for the wider programme of developments within Loch Linnhe (Appendix 15).

Features (Receptors)	Level of assessment and rationale
Navigation, anchorage, commercial and other maritime uses	Pre-application consultation was undertaken through the West Coast Regional Inshore Fisheries Group on four proposals for expansion of existing sites in the Linnhe region. Clyde Fishermen's Association expressed concerns over the proposals, including Dunstaffnage, stating that the planned expansion will take away significant safe fishing grounds for prawn fishing, with members increasingly concerned with the loss of grounds to natural wild fishers from a variety of activities. Concerns were also expressed over perceived impacts from the release of fish waste and medicines. **The potential effects on *Nephrops* habitat from discharge of waste and medicines are addressed under benthic impacts (refer to Section 7.2). Due to the concerns raised in terms of loss of fishing ground, specifically with regards to the potential for cumulative effects as a result of the wider SSF Loch Linnhe development programme, the issue was progressed for further assessment (refer to Section 7.5).** The proposal will not have any impact on local ferry traffic. The nearest ferries are from Oban travelling to Mull, Tiree and Lismore. The Mull and Tiree ferries remain at least 2.7km to the west of the farm and the Lismore ferry passes at approximately 1.5km to the west of the farm. There is sufficient space for the passage of smaller recreational craft between the outer site boundary and shoreline. The scale of the expanded footprint of the farm is unlikely to significantly affect safe navigation, with the moorings area increasing in extent by 130m and the cage group by 225m to the north-east (i.e., the farm will not extend closer to the shore or into deeper water). There should be no obstruction or significant effects to other sea users and their activity due to the expansion of the fish farm (location and servicing) as the following mitigation measures will be adhered to: • Navigational marking and lighting will be installed as recommended by the Northern Lighthouse Board to ensure safe navigation in proximity of the proposed fish farm. • The development will not be installed until a variation of the marine licence from Marine Scotland is granted, and the location of the farm will then be marked on navigational charts and almanacs when they are next updated. • SSF will issue a Notice to Mariners of intended construction period when undertaking cage towage and laydown of moorings to ensure vessels can safely navigate around such activity. • The skipper and crew of SSF vessels are responsible for adhering to safe navigational conduct and SSF management protocols and procedures, including adherence to the Scottish Wildlife Watching Code. **As no likely significant effects are expected, no further assessment was considered necessary.**

Features (Receptors)	Level of assessment and rationale
Noise	As the proposed development involves the expansion of an existing site, the additional contribution in terms of noise exposure is not expected to be significant as the proposal does not involve any additional noise sources. Main sources of noise at the existing site are from vessel activity and the operation of machinery on the feed barge. Vessel activity associated with the existing operations (and the proposal) include daily work boat movements for staff transfer and occasional larger vessels (deliveries to and collections from the feed barge; and well-boats for stocking, harvest or treatment). Noise sources on vessels include boat engines, hydraulic power-packs and associated machinery. On board pumps on well-boats and other equipment used in non-medicinal treatment of fish also produce noise. Effects of noise from vessel activity are however transient and variable nature and therefore not anticipated to result in nuisance noise. The primary fixed source of noise is the operation of machinery on the feed barge. This will include cranes, generators and associated hydraulic systems, all of which sound like diesel engines. Noise on the feed barge will also occur due to feeding operations, with feed blowers on the barge introducing a background noise of a fan, comparable to a large air conditioning unit. The feed passing down pipes will manifest as an audible rattle (the degree of audibility varying with feeding depth). Feed selectors that serve to connect the feed outflow from the barge to the appropriate delivery pipe may introduce an occasional metallic thump (impulse) to the sound from the site. The current C-Cap feed barge will be replaced with a new larger boat like feed barge. However, as the replacement barge and equipment will be based on newer technology and noise sources will be housed in internal or enclosed compartments, the noise levels are not expected to be significant when compared to noise levels from existing operations. SSF is committed to ensuring that every effort is made to keep operations as unobtrusive as possible by the use of noise insulation on relevant equipment and by restricting and adjusting hours of construction and operational activity as far as is practicable to limit the potential for nuisance. Construction activities will be temporary (for a period of up to six weeks) and will be limited to daylight hours. All noise on site normally ceases during the period between 18h00 and 06h00. Generally, noise is intermittent and confined to the working hours of the site and is unlikely to be a nuisance to sensitive receptors along the coast taking into consideration background noise. **As no likely significant effects are expected, no further assessment was considered necessary.**
Cultural heritage	There is no evidence of recorded or unrecorded marine archaeological features within the operational footprint of the existing site or the proposed expansion area. The proposed development is therefore not considered likely to result in significant effects on marine cultural heritage interests. The nearest on land cultural heritage interest is Dunstaffnage Castle and Chapel which are over 1km from the proposed farm cages and out-with the coastal setting of these Scheduled Ancient Monuments. The location of the existing farm and its expansion is therefore not considered likely to affect the setting and experience of local cultural heritage interests. **As no likely significant effects are expected, no further assessment was considered necessary.**

Features (Receptors)	Level of assessment and rationale
Landscape and visual amenity	Dunstaffnage is located within the Firth of Lorn, aligned with and adjacent to the coast between Dunbeg and Ganavan. Landscape receptors along this stretch of coastline are few, although some new houses proposed for development between Dunstaffnage and Dunbeg in elevated positions may have visibility of the farm. The site is partially visible from Ganavan beach but is not overly intrusive as views are of half of the cage group at a distance of around a kilometre and is not central or dominant to the view. The southern end of the farm is visible from this location and the expansion of the cage group is to the north, out-with the visibility from Ganavan Beach. The site will continue to be viewed by walkers on the coastal path between Dunbeg and Ganavan and is visible but not dominant from elevated viewpoints on the Ben Lora forest paths some 6km away. It will also be visible from passing boat traffic, including passenger ferries travelling in and out of Oban Bay to Mull and Lismore, and recreational vessels. Visual impacts from boat traffic would be partly mitigated by the low profile and dark colour of surface equipment with the farm being viewed against a dark rocky shoreline from the public ferries. The existing site and the proposed expansion lie out-with the Lynn of Lorn National Scenic Area. Advice received from the Planning Authority was that the proposed site will be more symmetrical than the existing one, and that views from Ben Lora are unlikely to be significantly affected, although there may be an increased impact on ferry users. They also requested that the barge should not be located at the southwest end of the cage group, to minimise the visual impact on the beach and houses at Ganavan, which was taken into consideration when assessing the site layout alternatives and informed the preferred feed barge siting. The proposed location of the feed barge in the middle of the expanded cage group will be out of view from Ganavan beach. The new feed barge will also be painted with dark matt colours to minimise reflections as requested. Scottish Natural Heritage were also consulted and raised no concerns regarding landscape for this proposal. Additional landscape and visual effects from the proposed expansion are expected to be minimal and are mitigated by the development's regular layout, low profile and dark matt colours; siting of feed barge in the middle of the cage group on the shore side; alignment with the coastline; its position at the northern edge of the expansive view from Ganavan Sands beach; and its scale not appearing dominant in elevated expansive views from Ben Lora forest paths. These conclusions are supported by the landscape and visual appraisal (including scaled diagrams and photomontages) included as Appendix 9. **As no likely significant effects are expected, no further assessment was considered necessary.**

Features (Receptors)	Level of assessment and rationale
Socio-economics, recreation and tourism	The proposal will contribute to the long-term sustainability of the existing Dunstaffnage operations, and SSF farms in the Linnhe region, by increasing the economic viability thereof and subsequently safeguarding employment and other associated socio-economic benefits. There will be continued positive economic effects with existing staffing levels and indirect supply chain benefits being maintained. Existing employment provides local opportunities for training and up-skilling of locals, and rural year-round permanent employment of six staff members at an annual cost to company of approximately £160k. As most of the employees live locally other local businesses benefit, and the employment provided contributes to the general sustainability of local communities. In addition, the increase in cages as a result of this proposal and the wider programme of proposed Linnhe developments (should they be approved), it will make it feasible to employ an internal net support team for the area to fulfil this function, which is currently outsourced. This would equate to an additional four full time staff members at a cost of in the region of £140K per year cost to company. As well as providing local jobs directly, management and support functions within fish farming companies generate significant employment in Scotland through manufacture of equipment and feed. The industry also supports significant employment in the haulage, engineering and technical sectors. There is therefore an indirect positive effect on secondary employment levels both locally and further afield. The investment in new equipment and associated construction and installation costs for the proposal is estimated at £3.5 million. Annual operating costs for the existing farm are in the region of £1.35 million annually resulting in direct economic benefits to the regional and national supply chain. This operational spend is likely to increase as a result of the expansion to around £2.8 million annually with at least 20% of this spend within Argyll. Ongoing spend on replacement of farm equipment (cages, nets and moorings) over a 20-year period is estimated to be around £1.5 million higher should the expansion be approved. **As likely socio-economic effects are positive in nature, no further assessment was considered necessary.** Potential negative socio-economic effects include possible effects associated with the loss of commercial fishing ground which are addressed under commercial fishing in Section 7.5. According to the Marine Recreation and Tourism Survey, 2015 heat map[4] the Dunstaffnage site is located in an area of moderate to high importance for tourism and recreational activities overall. It is considered of high importance for wildlife watching, scuba diving, sea angling from shore and private or chartered vessel, power boating, motor cruising, sailing and kayaking. It is of moderate importance for yacht racing and low importance for watercraft and water skiing. As the development involves the expansion of an existing site, no significant effects have been identified in relation to tourism or marine recreation as users have been utilising the area in conjunction with fish farming at this location since 1987. There is sufficient space for the passage of smaller recreational craft between the outer site boundary and shoreline. The proposal will entail the moorings area extending 130m and cage group 225m to the north-east and not extending closer to the shore or into deeper water. Any sailing vessels will keep to the north-west of the farm when passing. Therefore, the proposal is unlikely to significantly effect recreational users. **As no likely significant effects are on tourism or recreation are expected, no further assessment was considered necessary.**

4 Scottish Government (2015) Marine Recreation and Tourism Survey [online]: Marine Scotland National Marine Plan Interactive https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1341 accessed on 24/09/2020.

7.2 BENTHIC IMPACTS

7.2.1 Introduction

Salmon farms may exert impacts on benthic habitats primarily through solids deposition and discharge of medicinal residues. Benthic impacts of fish farms are regulated by SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) which requires fish farms to be operated under a site-specific CAR licence. Marine Scotland Locational Guidelines provide guidance on the sensitivity of restricted water bodies, such as sea lochs, to benthic impact.

The collection of solids beneath the cages comprises faeces and, to a lesser extent, waste feed; both are carbon rich and affect the biogeochemistry of the sediments. Increased organic food source for microbial and infaunal organisms leads to increased metabolic activity, which in turn can create a high biological oxygen demand. If oxygen demand is greater than the supply of oxygen, then sediments can become increasingly reduced in available oxygen, the redox potential of the sediments decrease, and anaerobic processes can replace aerobic ones. This change in sediment chemistry can lead to changes in the infaunal community as opportunistic polychaetes such as *Capitella capitata* become dominant and species diversity is reduced. Further oxygen reduction may occur within the sediment if bioturbatory activity decreases as a result of the changing benthic community structure.

Medicinal residues can arise from the use of veterinary medicines and mineral elements within feed. SSF's Fish Husbandry Manual includes the potential use of four therapeutic medicines for sea lice treatment, all of which have been modelled with BathAuto (for bath treatments) or AutoDEPOMOD (for in-feed treatments) to determine the recommended consent limits. Bath treatment medicines modelled are azamethiphos (Salmosan Vet/Azasure), cypermethrin (Excis) and deltamethrin (AMX/Alphamax); and in-feed medicine emamectin benzoate (SLICE). The SEPA CAR licence variation outlines these consent limits for medicine use. The chemical elements copper and zinc are requisite trace elements within the salmonid diet and are therefore present within the feed (3.5 – 25 mg/kg)[5].

Residues can reach the benthos through direct deposition – as would be the case for feed mineral elements – or dissolution within the water column and eventual uptake by benthic organisms from the sediment/water interface.

7.2.2 Baseline

Baseline visual seabed survey

The proposal involves the extension of the cage group by 225m to the north-east, and corresponding increase in the benthic footprint area from 62641m^2 to 109445m^2. A Visual Seabed Survey collecting seabed video and images along two parallel transects, as agreed with SEPA and Scottish Natural Heritage, within the potential expansion area was conducted in April 2018 (Aquatera, 2019 in Appendix 6) to provide an assessment of the environmental condition of the proposed site prior to commencement of development activities. Refer to Figure 7-1 below.

5 Scottish Government (2002) Review and synthesis of the environmental impacts of aquaculture [online] at: www.gov.scot/publications/2002/08/15170/9409 accessed on 22/09/2020.

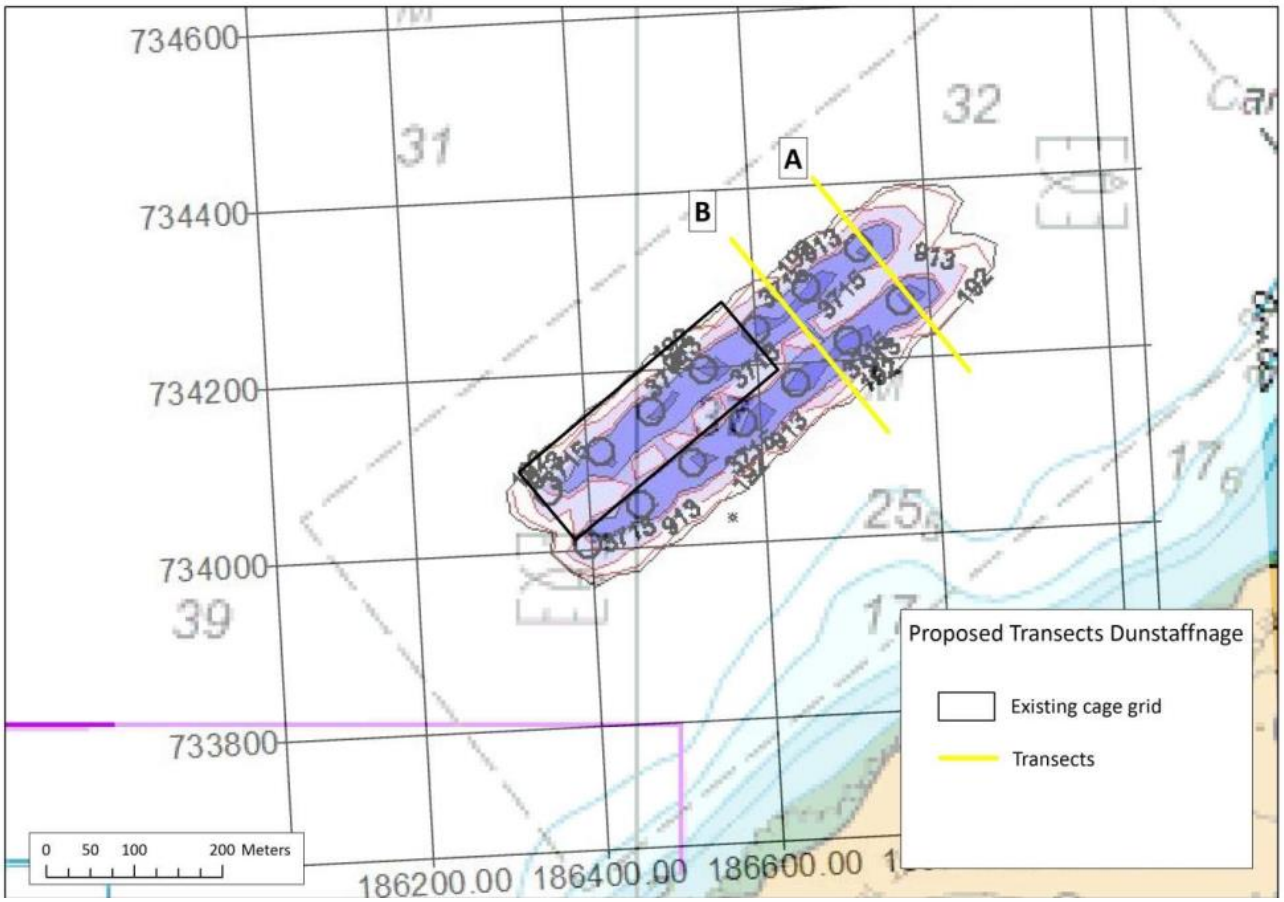


Figure 7-1 Location of transects for Remotely Operated Vehicle benthic survey

There was little variation in seabed characteristics throughout the survey site, with water depths ranging from approximately 35–45m. Sediments across the area were dominated by soft muds, with the occasional scattering of shell debris and uneven sandy mounds.

Numerous *Nephrops norvegicus* burrows were observed throughout the soft muds of the survey area. The squat lobster *Munida rugosa* was commonly observed on the sediment surface or retreating into these burrows. Although difficult to distinguish species, smaller pale-coloured crustaceans noted in the Remotely Operated Vehicle footage could possibly be shrimp *Callianassa subterranea* and/or *Calocaris macandreae*. The sea pen *Pennatula phosphorea* was widespread in low densities across the survey area, with numbers most concentrated along the first half of transect A, whereas *Funiculina quadrangularis* was sparsely distributed across both transects. Other benthic fauna observed during the survey included the burrowing anemone *Cerianthus lloydii* and two small teleosts at approximately 37m.

Some areas of the soft, muddy habitat throughout the survey area shared characteristics with the **SS.SMu.CFiMu.SpnMeg** (sea pen and burrowing megafauna in circalittoral fine mud) biotope. The first half of transect A (approximately 40 m depth) displayed burrows thought to belong to Nephrops and a larger number of *P. phosphorea* sea pens than the rest of the transect. *C. lloydii* was infrequently spotted in the survey area, which is a characterising species of this biotope as recognised by the Joint Nature Conservation Committee.[6]The biotope **SS.SMu.CFiMu.SpnMeg**

6 JNCC (2015). The Marine Habitat Classification for Britain and Ireland Version 15.03. Available [online]: http://jncc.defra.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00001218 (Accessed 04/09/2018).

is listed on the OSPAR List of Threatened and/or Declining Species and Habitats[7]. This habitat is also identified as a Priority Marine Feature in Scotland[8].

The Priority Marine Feature species *F. quadrangularis* was also present but sparsely distributed throughout the soft muds, therefore no specific part of the seabed could be reliably classified further into the **SS.SMu.CFiMu.SpnMeg.Fun** (sea pen, including *F. quadrangularis*, and burrowing megafauna in undisturbed circalittoral mud) biotope.

The fauna observed in this report align with a previous survey conducted in 2013 by Scottish Natural Heritage of the wider Firth of Lorn area including between the islands of Lismore and Kerrera[9]. Biological analysis revealed that Burrowed Mud was widely distributed across the northern region of the Firth of Lorn, with observations of *N.norvegicus*, *C. macandreae*, and *M. rugosa* in soft muds. During EIA screening, Scottish Natural Heritage confirmed that this Priority Marine Feature habitat is widely distributed and as any potential impacts are likely to be of local significance only, the proposal is unlikely to result in any significant impacts upon its national status.

Benthic survey

The latest benthic survey at the existing site was carried out in September 2019 in line with SEPA requirements under licence CAR/L/1009031, i.e., collecting benthic samples from four stations along a transect to the northeast of the cage group and two reference stations at sufficient distance to represent background conditions for comparison (reported by SSF, 2019 in Appendix 5). Following discussion with SEPA with reference to the proposed site expansion, two extra stations were also sampled at 50m and 100m southwest of the cage group. Three replicate grabs were collected at each station for faunal analysis, and a fourth for geochemistry (loss on ignition and particle size analysis).

The resultant species data were then analysed with univariate techniques to obtain biological indices and Infaunal Trophic Index (ITI)[10] scores and by multivariate techniques to examine the similarity between stations and to identify any existing environmental stress factors. A total of 148 taxa were recorded across the survey area. Although an impact was observed at the cage edge, the cage edge station passed the SEPA fish farm manual criteria as it contained two polychaete taxa and organic enrichment polychaetes in densities exceeding 1,000 per m^2. There was evidence of an effect from the Dunstaffnage fish farm on the surrounding sediments. However, all of the north-easterly transect stations passed SEPA's criteria for number of taxa, abundance of enrichment polychaetes, diversity and ITI score when compared with both reference stations. The 100m south-westerly station passed the criteria for number of taxa, diversity and ITI score when compared with both reference stations and also abundance of enrichment polychaetes when compared with reference station 2. The 50m south-westerly station passed the criteria for diversity when compared with both reference stations and also number of taxa when compared with reference station 1 and abundance of enrichment polychaetes and ITI score when compared with reference station 2.

All benthic data are available in Appendix 5. During pre-application consultation, SEPA also confirmed that the site has no history of benthic failures or problems.

Residues

No SLICE sediment exceedances have been noted in over 7 years. The last SLICE treatment at Dunstaffnage in the last cycle/for which sediment residue results are available took place from 29/08/2019 to 04/09/2019, benthic samples for residue analyses were collected on 19/02/2019 and reported on 31/05/2019. No exceedances were noted.

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7 OSPAR List of Threatened and/or Declining Species and Habitats. (Reference Number: 2008-6).

8 Howson, C. M., Steel. L., Carruthers, M. & Gillham, K. (2012). Identification of Priority Marine Features in Scottish territorial waters. Scottish Natural Heritage Commissioned Report No. 388.

9 Moore, C.G. (2013). Biological analyses of underwater video from research cruises in Lochs Kishorn and Sunart, off the Mull of Kintyre and islands of Rum, Tiree and Islay, and in the Firth of Lorn and Sound of Mull approaches. Scottish Natural Heritage Commissioned Report No. 574.

10 The ITI gives an indication of the degree of disturbance of a site and is explained further in the SSF (2019) report in Appendix 5.

7.2.3 Assessment

Potential impacts and associated effects on the benthic environment from salmon farms include:

- Changes to habitats and species due to nutrient enhancement and smothering; and
- Changes to habitats and species due to deposits of medicinal residues on seabed sediments.

Standard mitigation measures to avoid or minimise effects are detailed in Section 7.2.4.

7.2.3.1 Changes to habitats and species due to nutrient enhancement and smothering

Solids deposition comprises faeces and waste feed and represents an increase in organic material to the underlying sediments. The incoming solids and fine particles affect the physical particle size distribution of the sediment and can also lead to the depletion of oxygen levels within the surface sediment layer due to microbial degradation of the organic material.

Biomass and chemotherapeutant modelling using AutoDEPOMOD (SSF, 2019 in Appendix 3) calculated that the receiving hydrological environment can support a maximum biomass of 2500T at a stocking density of 14 kg/m^3. However, subsequent SEPA modelling using NewDEPOMOD identified a biomass limit of 2350T, which has been imposed by condition in the CAR licence variation for the proposed site expansion (CAR/L/1009031 VN06).

The increased deposition of organic material may lead to the degradation of benthic communities directly beneath the cages and a lesser degree of community structure modification within the Allowable Zone of Effect, as high levels of organic material can cause the sediment to become enriched and potentially oxygen-depleted. In such conditions, diversity of the invertebrate infauna is predicted to fall, and the number of opportunistic species (short-lived, opportunistic detritus feeding polychaetes) will rise both in species numbers and abundance of individuals.

The seabed directly beneath the cages is predicted to receive solids deposition at the rate of 7114.3g/m^2/yr. The carbon solids waste from this maximum level of input will generate an Allowable Zone of Effect [11] of 109,445 m^2 overlapping with the existing footprint. The Allowable Zone of Effect is the area where ITI values of below 30 (indicating that the benthic community is degraded) are forecast by the model. The predicted Allowable Zone of Effect for the proposed site extends out to a maximum distance of 112m from the cages in a north-easterly direction as shown in Figure 7-2. Within the Allowable Zone of Effect changes in community structure are acceptable under CAR on the basis that sediment re-workers remain in sufficient abundance to maintain aeration and carbon turn-over.

The Burrowed Mud habitat is considered to have a medium sensitivity to organic enrichment and siltation changes[12]. Burrowing species associated with the Burrowed Mud habitat are generally able to burrow through the additional layer of sediment associated with siltation in a relatively short time (hours to days) therefore recoverability is considered to be medium. Certain component seapen species are able to withdraw rapidly into the sediment to avoid smothering effects, and others may be less likely to be affected by smothering due to their height. Feeding efficiency of suspension filter feeders may also be impacted by high siltation levels. Component species of 'Seapens and burrowing megafauna

11 Allowable Zone of Effects are defined as "the area (or volume) of seabed or receiving water in which SEPA will allow some exceedance of a relevant Environmental Quality Standard". Restrictions on the chemotherapeutant quantities that can be used within a specific time period or the rate of release are then incorporated into the consent. SEPA has implemented a new regulatory framework for finfish farms with changes to modelling and monitoring requirements. As part of the new framework Allowable Zone of Effect is replaced with a Mixing Zone which is defined as "the area of seabed immediately under and extending outwards from a fish farm in which the discharge from the fish farm is likely to have an adverse impact on the environment". The CAR application for the proposal was submitted under the previous regulatory framework and therefore the modelling undertaken and terminology used is in accordance with that of the previous framework.

12 Marine Scotland FEAST tool. Available at: https://www.marine.scotland.gov.uk/FEAST/ accessed on 22/09/2020.

in circalittoral fine mud' may also have a high intolerance to substratum loss, displacement, changes in oxygenation and extraction of other species[13].

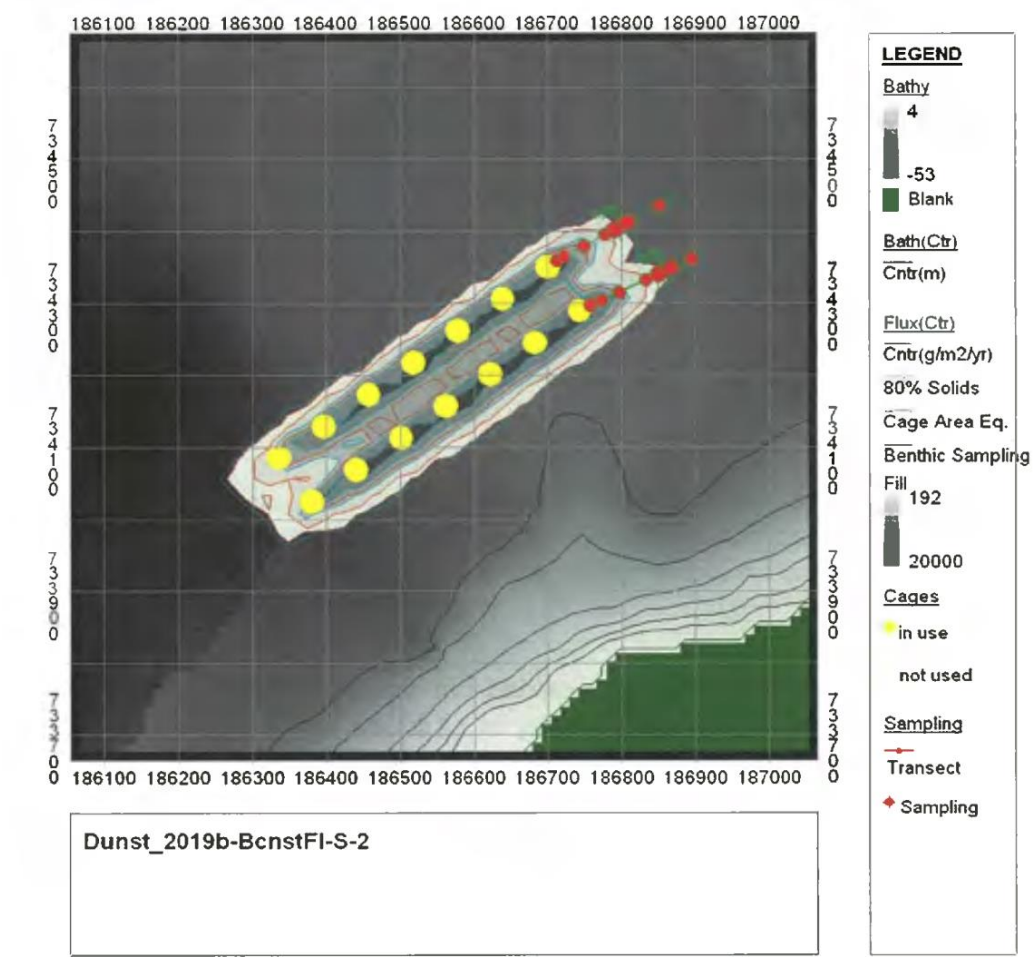
The modelled footprint for the expanded site mostly overlaps with the existing one, resulting in an overall increase in area from 62,641m^2 to 109,445m^2. A crude estimation of the possible extent of Burrowed Mud habitat in Loch Linnhe has been taken from spatial records of this habitat and species available on National Marine Plan interactive (NMPi)[14]. This data shows a wide extent of a high number of records across Loch Linnhe. A rough estimate of the extent of the area, which encompasses these records in Loch Linnhe within a 20km radius of the proposal is 200km^2. This concurs with the Scottish Natural Heritage Commissioned report describing Scottish Priority Marine Features, which states that Burrowed Mud is extensively distributed along the Scottish west coast (SNH 2016)[15]. The additional area of seabed predicted to be affected by deposition of 0.05km^2 represents approximately 0.03% of the predicted local extent of Burrowed Mud, which is relatively small compared to the wider receiving environment. The existing site has been operational since 1987 and managed by SSF for 19 years, and SEPA has confirmed that the site has no history of benthic failures or problems. Therefore, the overall magnitude of the effect is considered to be **low** and the proposal will not result in a significant impact on the national status of the Burrowed Mud Priority Marine Feature.

The location of other salmon farm sites in proximity to the Dunstaffnage proposal can be viewed in Figure 1-2. The distances between sites preclude any overlap of each farm's Allowable Zone of Effect / Mixing Zone, thus there is no mechanism for cumulative impacts resulting from overlap of depositional footprints to arise.

13 MarLIN, 2018. Seapens, including funiculana quadrangularis and burrowing megafauna in undisturbed circalittoral fine mud. Available at: https://www.marlin.ac.uk/habitats/detail/239 accessed on 22/09/2020

14 NMPi [online] at: https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1137 accessed on 01/11/2020.

15 Scottish Natural Heritage (2016) Descriptions of Scottish Priority Marine Features (PMFs) [online] at: https://www.nature.scot/sites/default/files/Publication%202016%20-%20SNH%20Commissioned%20Report%20406%20-%20Descriptions%20of%20Scottish%20Priority%20Marine%20Features%20%28PMFs%29.pdf accessed on 01/11/2020.



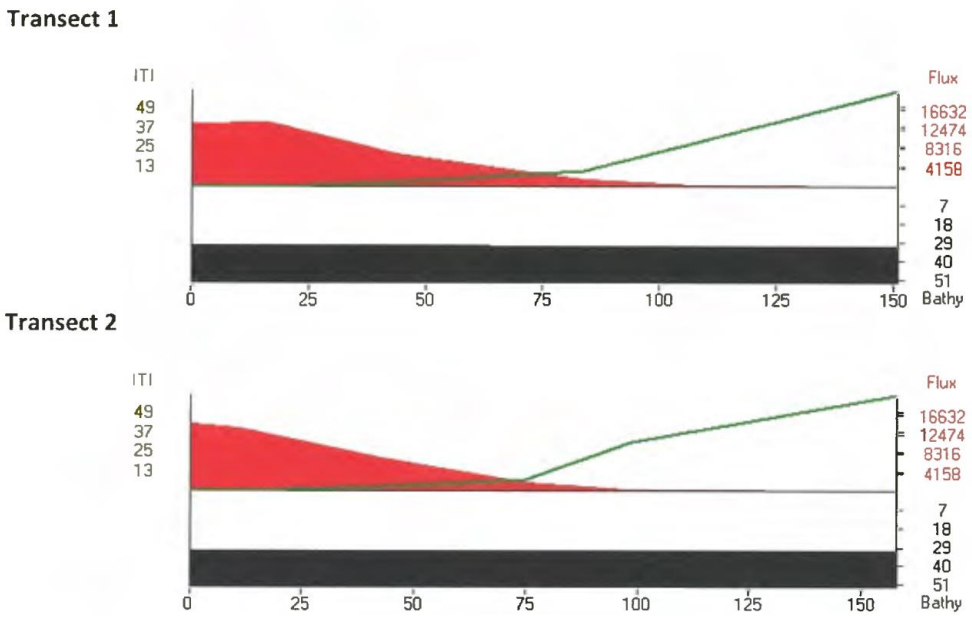


Figure 7-2 Model output of solids deposition at Dunstaffnage (source: SSF, 2019)

7.2.3.2 Changes to habitats and species due to deposits of medicinal residues on seabed sediments

SSF's Fish Husbandry Manual (Appendix 20) includes the potential use of four therapeutic medicines for sea lice treatment, for three bath treatment medicines: Azamethiphos (Azasure/ Salmosan Vet), cypermethrin (EXCIS) and deltamethrin (Alphamax); and the in-feed medicine emamectin benzoate (SLICE). All of which have been modelled with either BathAuto or AutoDEPOMOD, as appropriate, to determine the recommended consent limits (Appendix 3). The approved SEPA CAR licence variation (Appendix 2) outlines these consent limits for medicine use.

Azamethiphos is an organophosphate which remains in the aqueous phase until broken down into non-toxic derivatives, for which a half-life of 8.9 days has been applied.[16,17]

The pyrethroid bath treatments (cypermethrin and deltamethrin) are hydrophobic (not water soluble). They are quickly removed from the aqueous phase by readily binding to organic particles and other solids and are incorporated into sediments. Although benthic organisms closely associated with the sediment are therefore potentially at risk, the pyrethroids bind strongly to the particulates and to organic particles especially, thereby becoming less bio-available in organically enhanced environments such as directly beneath the cages. The respective half-lives of cypermethrin and deltamethrin are 35-80 days and 140 days in sediments. The rapid degradation indicates low environmental risk. [16,17]

Modelling has been carried out for use of the in-feed sea lice treatment emamectin benzoate, and recommended consent masses proposed. The model output (SSF, 2019 in Appendix 3) showed that 74% of the mass released is retained within the model grid. This indicates that there is going to be limited export of released solids from the grid and dispersion of material will primarily occur within the deposition footprint. The active ingredients of emamectin benzoate have low water solubility and bind preferentially to sediment particles. They are therefore available for uptake by sediment feeding benthic organisms and to a lesser extent by filter feeders. Within the near-field Allowable Zone of Effect, some deposition of SLICE residues will occur following treatments for lice, if and when they are required to be administered. The active chemical ingredient emamectin benzoate is toxic to crustacea, and whilst mobile crustacea are likely to move away from the near-field Allowable Zone of Effect due to particle size change and potential for smothering, the smaller burrowing amphipods are likely to be impacted. A recent review by the Scottish Association for Marine Science[17] highlighted that the key receptors most sensitive to emamectin benzoate were scavengers, particularly crustaceans. Burrowed mud habitats containing sea pen and burrowing megafauna are identified as a Priority Marine Feature likely to be impacted. However, SEPA has made changes to the regulation of emamectin benzoate in-feed treatments to ensure they meet more precautionary environmental standards. The Scottish Association for Marine Science review emphasises the precautionary nature of SEPA's Environmental Quality Standard and indicates that the threats to Priority Marine Features should be minimal so long as standards and procedures are adhered to. The overall magnitude of the effect is considered to be **low.**

In addition, due to the SEPA policy changes above, the predicted affected area of limited exported material from the expanded site is 3.0km^2 which is less than the affected area of the existing site (3.1km^2). Residual current meter data indicates that any material exported from the grid will likely be transported north-eastward along the coast to be dispersed within the wider area of the Firth of Lorn, but in such a limited nature as not to breach any sediment Environmental Quality Standard. There are no nearby skerries or features likely to cause an obstruction to wider dispersal of material. Therefore, it is considered unlikely that any significant accumulation of emamectin benzoate residue will occur out-with the modelled footprint.

16 SEPA (2008) Annex G: Models for assessing the use of chemicals in bath treatments. In: Regulation and monitoring of marine cage fish farming in Scotland – a procedures manual, v2.2. [online]. Available from: https://www.sepa.org.uk/media/114774/ffm_anx_g.pdf accessed on 24/09/2020.

17 SAMS Research Services Ltd (2018) Review of the Environmental Impacts of Salmon Farming in Scotland. Issue 1.

7.2.4 Mitigation

- Minimisation of feed waste will be achieved by use of visual monitoring of feeding by camera, thereby allowing feeding to be terminated when the fish are satiated; and feed pellet size appropriate to the size of fish will be selected. High digestibility feed will also be used to minimise faecal production.
- Benthic impacts at the cage edge and the surrounding area will be regularly monitored in accordance with the conditions of the CAR Licence. Suitable transects and sampling stations for compliance monitoring will be agreed with SEPA, informed by model outputs. Routine monitoring will involve the collection of seabed samples which are analysed for indicators of organic enrichment, benthic community disturbance and in-feed medicinal residues. As a result of the survey regime, a site can be assessed for its compliance with the relevant environmental standards, and consented biomass and/or medicines can be adjusted accordingly through a licence variation process.
- Medicinal residues on seabed sediments will be minimised through adherence to the Sea Lice Management Strategy (Appendix 13) which seeks to prevent, monitor and control sea lice so that intervention measures are not required on the farm. Should lice levels rise to levels which require intervention then the strategy prioritises non-medicinal measures (focused deployment of cleaner fish and physical delousing measures) to limit the use of medicinal treatments where possible. Where medicinal treatment is required the SEPA CAR Licence limits will be adhered to (Appendix 2).
- Any medicinal treatments administered will be solely in accordance with the limits specified in the SEPA CAR licence, as deemed appropriate for the location.

7.2.5 Assumptions and uncertainties

Modelling submitted with the application yielded a maximum biomass of 2500T, where the actual maximum biomass at the expanded site will be 2350T, in accordance with the CAR licence as subsequently issued by SEPA. The modelling presents a worst-case scenario and is therefore aligned with the precautionary approach. The impacts have been assessed based on SEPA's modelling, which assumes an artificially high feed load, and extended periods of stocking at maximum biomass. The models predict that the site will be able to be consented at the maximum tonnage proposed, and that in-feed and bath treatments can be supported subject to conditions of the licence and enhanced monitoring for medicine residues. The worst-case scenario impacts and effects have been predicted not to exceed SEPA's Environmental Quality Standards. Whilst the worst-case situation is modelled, biomass and feed inputs in the real farming situation will be considerably less. Peak biomass will only be approached near the end of the production cycle and then biomass will decrease through harvesting. It is therefore unlikely that seabed impacts, and effects would ever approach the levels and extents predicted by the model.

7.2.6 Summary

There are habitats and species of conservation interest within the additional area of seabed predicted to be affected by benthic deposition as a result of the proposed expansion. The Burrowed Mud Priority Marine Feature (biotope sea pen and burrowing megafauna in circalittoral fine mud) was present and the Priority Marine Feature species *F. quadrangularis* was recorded, although sparsely distributed, within the area to be affected. Numerous *Nephrops norvegicus* burrows were also observed throughout the soft muds of the area surveyed which are of importance in terms of commercial fishing interests (further addressed in Section 7.5).

The benthic community covering 109,445 m^2 (the Allowable Zone of Effect) of seabed in the immediate vicinity of the fish cages will be degraded due to the deposition of organic material, extending out to a maximum distance of 112m from the cages in the main direction of deposition (63°). However, the footprint mostly overlaps with the existing footprint as the proposal involves the extension of the cage group by 225m to the north-east, which results in additional footprint area of 46,804m^2, which is relatively small compared to the wider receiving environment (approximately 0.02% of a basic prediction of the local extent of Burrowed Mud). The existing site has been operational since 1987, 19 years

under SSF, and SEPA confirmed that the site has no history of benthic failures or problems. Therefore, the overall magnitude of the effect is considered to be **low**. The distances between existing farms and the wider SSF Loch Linnhe development programme preclude any overlap of each farm's Allowable Zone of Effect / Mixing Zone. While the mud habitat is a Priority Marine Feature, it is not a feature of a designated site at this location with a higher level of protection and Scottish Natural Heritage confirmed that the Priority Marine Feature habitat is widely distributed, and that the proposal was therefore unlikely to have a significant effect on its national status. The magnitude of the potential cumulative impact in terms of degradation of Burrowed Mud habitat as a result of the proposal in addition to the impacts already being exerted on Burrowed Mud habitat by fish farming is considered to be **low**.

The use of the in-feed sea lice treatment emamectin benzoate has the potential to negatively impact sensitive receptors, particularly crustaceans and burrowed mud habitat has been identified as being particularly sensitive. However, SEPA has made changes to the regulation of emamectin benzoate in-feed treatments to ensure they meet a more precautionary Environmental Quality Standard, minimising the threat to the Priority Marine Features and crustaceans. Therefore, the overall magnitude of the effect is considered to be **low**. In addition, the predicted affected area of limited deposited material from the expanded site is 3.0km^2 which is less than the affected area predicted for the existing site (3.1km^2) and due to the absence of features likely to cause an obstruction to the wider dispersal of material, it is considered unlikely that any significant accumulation of emamectin benzoate residue will occur out-with the modelled footprint.

The benthic impacts of the proposal are required to be assessed by SEPA, through the process of determining the CAR Licence. The effects have been predicted not to exceed the appropriate benthic Environmental Quality Standard and SEPA have issued a CAR Licence variation in respect of medicinal treatments and discharges from the site for the proposed biomass (2350T).

7.2.6.1 Significance of residual effect

The receptor (benthic habitat) is considered to have **medium weighting** due to the presence of the Priority Marine Feature habitat but this habitat not being afforded additional protection at this location, as a feature of a designated area. The effects arising from the proposal on the benthic community will generally be limited to the site and a local scale (within the Allowable Zone of Effect which overlaps with the existing footprint), be long-term, and the consequence minimal, taking into account the wider habitat availability to support the national status on the mud habitat Priority Marine Feature. The effects are therefore determined as having a **low magnitude** overall. The standard mitigation measures are considered adequate to minimise the effects to an acceptable degree. It is anticipated that residual effects will therefore be of **minor significance**. Refer to Table 7-2 for a summary of the potential impacts and effects.

Table 7-2 Summary of potential benthic impacts and effects

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
Direct Impacts – Dunstaffnage Proposal Only				
Fish faeces and to a lesser extent waste feed	Potential for nutrient enhancement and smothering	Degradation and modification of benthic community assemblages	Restrict biomass in accordance with the SEPA CAR Licence limits and minimise waste feed to ensure the depositional footprint does not extend past the regulated acceptable area	The Allowable Zone of Effect / Mixing Zone has been defined to prevent the occurrence of unacceptable effects. Therefore, significant effects are rendered unlikely post mitigation **(residual effect of minor significance)**.
Medicinal lice treatments	Potential for deposition of medicinal residues on seabed sediments		Minimise the management of sea lice through medicinal measures and when used comply with the SEPA CAR Licence chemotherapeutant limits to ensure residues remain below the Environmental Quality Standards	The Environmental Quality Standards have been set to ensure that doses or concentrations in the environment for specific chemicals remain below the threshold at which unacceptable effects are expected to occur. Therefore, significant effects are rendered unlikely post mitigation **(residual effect of minor significance).**
Cumulative Impacts – existing farms and wider SSF Loch Linnhe development programme				
The distances between sites preclude any overlap of each sites expected area of effect. As the affected area falls out-with an area designated for the conservation of the Priority Marine Feature habitat and Scottish Natural Heritage confirmed that the Priority Marine Feature habitat is widely distributed and that the proposal was therefore unlikely to have a significant effect on its national status, the magnitude of the potential cumulative impact in terms of degradation of Burrowed Mud habitat as a result of the proposal in addition to the impacts already being exerted on Burrowed Mud habitat by fish farming is considered to be **low**.				

7.3 WATER COLUMN IMPACTS

7.3.1 Introduction

As with benthic impacts, water column impacts as a result of fish farms are regulated by the SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) which requires fish farms to be operated under a site-specific CAR Licence, advised by the Marine Scotland Locational Guidelines, which provide guidance on the sensitivity of restricted waterbodies, such as sea lochs, to water column impacts.

Impacts on the water column as a result of salmon farms arise primarily as a result of nutrient enrichment and chemical residues. Whilst the majority of faeces and uneaten food sink to the seabed, a small component will be suspended or dissolved and then transported within the water column. Carbon, nitrogen and phosphorus are the main nutrient components of discharged material, with nitrogen considered to be a limiting nutrient for phytoplankton growth. In addition to dissolved nutrients, some medicines are administered topically using bath treatments. On completion of the treatments, medicinal residues are released into the water as a dissolved plume. This assessment considers the potential impacts on the water column arising from both nutrient enrichment and medicinal bath treatments from the proposal.

7.3.2 Baseline

7.3.2.1 Regional hydrographic conditions

The study area (Figure 7-3) encompasses the northern portion of the Firth of Lorn and lower Loch Linnhe as it includes the assessment of the potential impacts of the Dunstaffnage proposal as well as the cumulative impacts of the existing fish farms and the wider programme of SSF developments proposed within Loch Linnhe (Figure 7-4).

Loch Linnhe is one of the largest sea lochs on Scotland's west coast, stretching approximately 60km. The loch receives large freshwater inputs from the surrounding catchments and connects to the open ocean at the southwest end via the Sound of Mull and Firth of Lorn (Figure 7-3). The loch itself can be regarded as having a fjordic character where interactions between meteorological forcing, freshwater input and seabed topography control the circulation.[18] Loch Linnhe and the Firth of Lorn are uncategorised within the Locational Guidelines and as such are unrestricted and considered low risk in terms of sensitivity to anthropogenic activities.

The main feature of the non-tidal circulation in the area is a northward residual drift along the west Scottish coast at typical rates of 105$m^3.s^{-1}$.The flow up the Firth of Lorn towards Loch Linnhe and the Sound of Mull is a small portion of the main flows, around 103$m^3.s^{-1}$; in a channel of width 2km and average depth 50m such as the Sound of Mull, such a flow corresponds to a westward residual current of only about 0.01 m.s-1; in the wider Firth of Lorn it is even less. In the upper parts of the water column, this coastal circulation is enhanced by the upper outflows from Loch Linnhe, estimated as about 2000$m^3.s^{-1}$. Typical tidal ranges in this area are about 1.5m (neap) to 3.9m (spring), with an average of about 2.7m. Speeds in the deep water of Loch Linnhe vary tidally whereas the upper water is clearly a mixture of tidal and wind driven. Residual currents[19] near the surface (13m) tend to the west-southwest at speeds about 0.03$m.s^{-1}$ whereas residual deep currents flow towards the northeast at about 0.06$m.s^{-1}$. Such a flow pattern (outwards in the upper layers, landwards in the deep water) is consistent with a normal fjordic estuarine circulation (Edwards, 2018 in Appendix 7).

Currents within the study area are mainly semidiurnal tidal with speeds reaching a decimetre per second or so; there can be considerable difference between currents and residuals at various depths, suggesting strong topographic influences and the effects of some stratification. There is a strong tendency for surface residuals of a few $cm.s^{-1}$ to direct

18 Berx, B., Gallego, A., Heath M. and the MASTS Community. (2015). Loch Linnhe and Firth of Lorn MASTS Case Study Workshop Report. Scottish Marine and Freshwater Science Vol. 6 No 1. Published by Marine Scotland Science DOI: 10.7489/1539-1. ISSN: 2043-7722.

19 The residual current is the underlying mean current which remains when transitory wind currents and tidal oscillations have been removed.

to the southwest, consistent with a normal near-surface estuarine outflow in the Loch Linnhe system (Edwards, 2018 in Appendix 7).

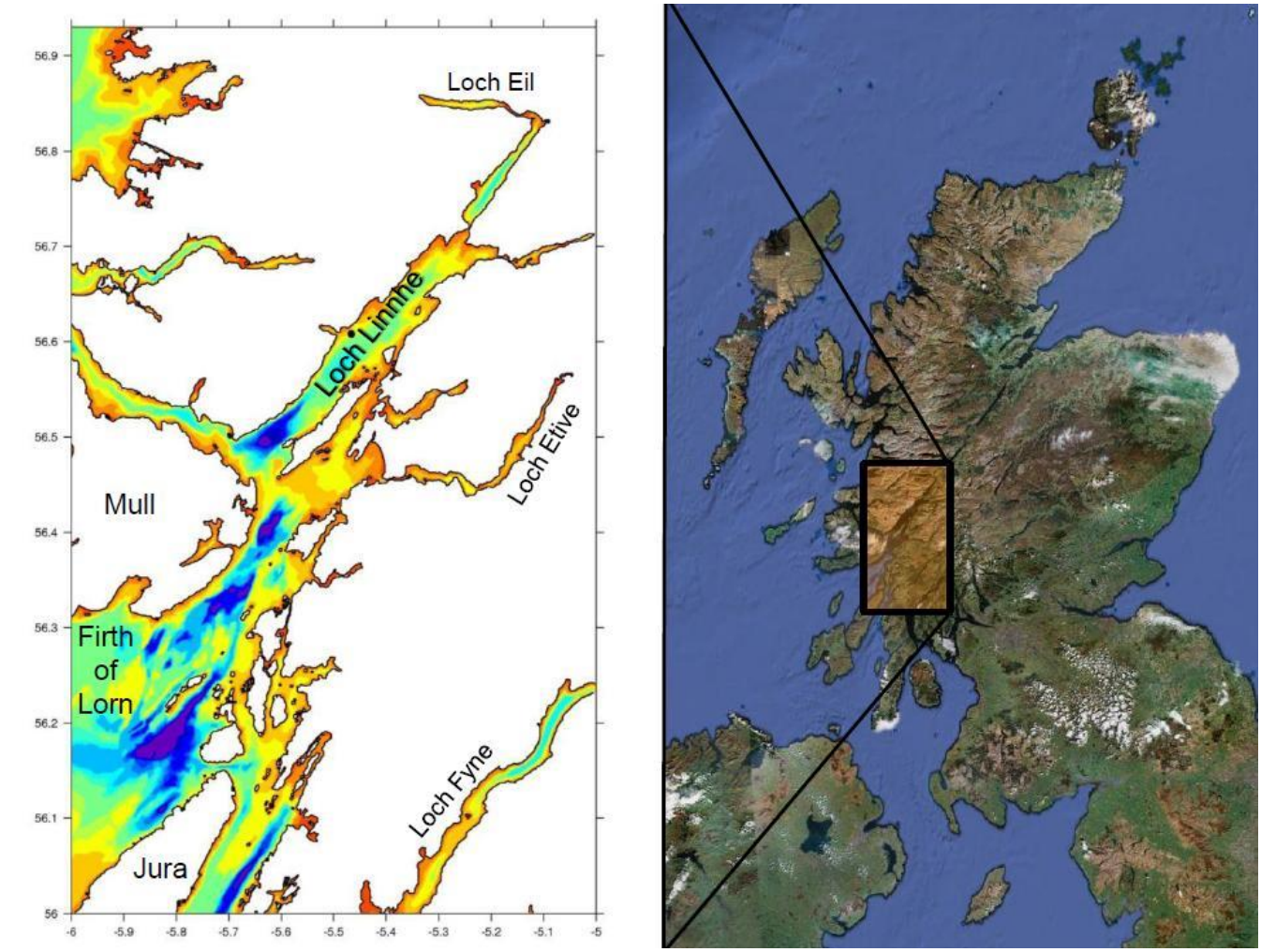


Figure 7-3 Assessment area (source: Berx *et al.* 2015)

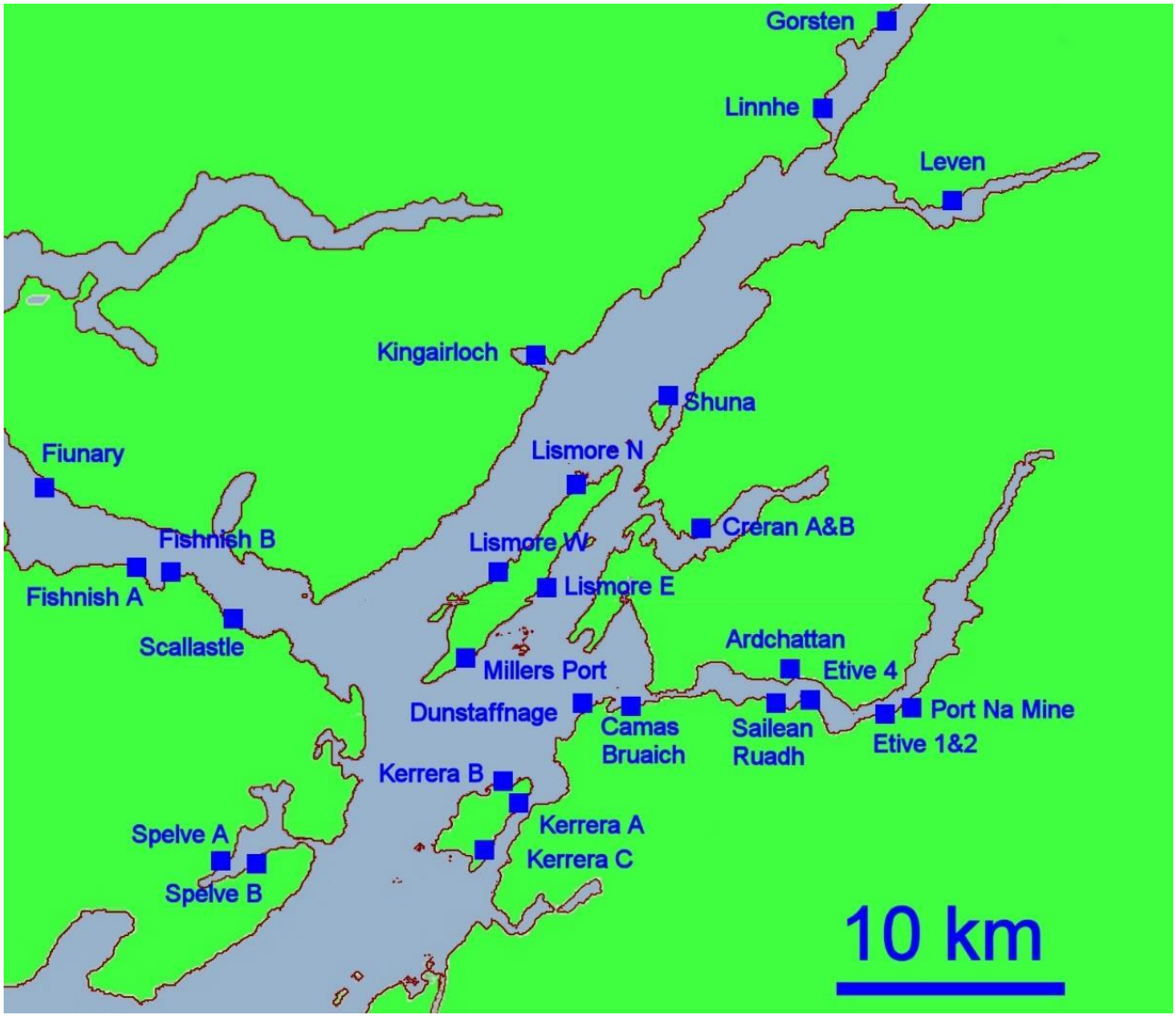


Figure 7-4 Farms in the Loch Linnhe area included in the Equilibrium Concentration Enhancement assessment[20]

7.3.2.2 Water Framework Directive status

The proposal is located within the Firth of Lorn (North) water body (Water Framework Directive water body ID 200066), adjacent to the Loch Linnhe (South) water body (Water Framework Directive water body ID 200081). In the 2018 classification scheme both water bodies are classified as having "Good" overall status, "Good" overall ecological status and an overall chemical status of "Pass". Table 7-3 presents the full list of water classification data (covering a range of physical, chemical and biological parameters) for the Firth of Lorn (North) and Loch Linnhe (South) water bodies.[21]

20 It should be noted that the Equilibrium Concentration Enhancement assessment considers a worst-case scenario. Millers Port, Camas Bruaich, Kerrera A and Kerrera C still have CAR licences but do not have other consents so cannot be developed. The CAR licences in Loch Etive (Ardchattan and Etive 1) and Spelve A have also been relinquished so no longer exist. Both Loch Creran farms have been considered together when only one farm can be stocked at any one time. The Equilibrium Concentration Enhancement assessment lists the total potential biomass in the Linnhe system as 29188 tonnes whereas the actual potential biomass is closer to 24300 tonnes.

The reference baseline concentration of winter Dissolved Inorganic Nitrogen in west Scottish coastal water is < 10µM and the threshold 15µM. Increases are therefore limited to 5µM (70µgN.litre-[1]) (Edwards, 2018 in Appendix 7).

Table 7-3 Water classification data for surrounding water bodies[21]

Parameter	Firth of Lorn (North) 2018 classification	Loch Linnhe (South) 2018 classification
Overall status	Good	Good
Overall ecology	Good	Good
Physico-chemical	High	High
Dissolved oxygen	High	High
Dissolved inorganic nitrogen	High	High
Biological elements	Good	Good
Invertebrate animals	Good	Good
Benthic invertebrates (Infaunal Quality Index; IQI)	Good	Good
Phytoplankton	High	High
Specific pollutants	Pass	Pass
Unionised ammonia	Pass	Pass
Hydromorphology	High	High
Morphology	High	High

7.3.2.3 Dunstaffnage site conditions

The proposal is located in an open water location (Firth of Lorn). The hydrography of this site is considered suitable for a development of the size and nature of the proposal. The area around Dunstaffnage is characterised by relatively uniform bathymetry with comparatively simple hydrography and is considered to be a weakly to moderately flushed site (SSF, 2019 in Appendix 3).

7.3.3 Assessment

Potential impacts and associated effects on the water column from salmon farms include:

- Nutrient enhancement from leaching of nutrients into the water column from waste discharges; and
- Discharge of medicinal residues to the water column from bath treatments.

Standard mitigation measures to avoid or minimise effects are detailed in Section 7.3.5.

During and following an in-feed treatment emamectin benzoate enters the marine environment through uneaten feed and excreted with the faeces. It is readily adsorbed to particulate matter and has low solubility in seawater (maximum 5.5mg l_{-1}).[22] This was confirmed in a study using silt traps deployed around a fish farm only 1% of the total emamectin benzoate in the traps was measured in the water.[23] Therefore, it anticipated that there will be minimal between emamectin benzoate and the water column and therefore no likely significant effects on the water column will

21 Water Classification Hub [online]. Available from: https://www.sepa.org.uk/data-visualisation/water-classification-hub/ accessed 23/09/2020).

22 WRc, 2017. Review of the Environmental Quality standard for Emamectin Benzoate. February 2017.

23 Environment Canada (2005). Use of Emamectin Benzoate in the Canadian Finfish Aquaculture Industry – A review of Environmental Fate and Effects. Available online at: http://publications.gc.ca/collections/Collection/En4-51- 2005E.pdf

arise from its use at Dunstaffnage and other fish farms within the Farm Management Area. Discharge of medicinal residues to the water column from in-feed treatments has therefore not been progressed for further assessment.

7.3.3.1 Nutrient enhancement

Nutrient enrichment from the decay of solid organic matter (faeces and to a lesser degree, waste feed) and dissolved available forms of nitrogen can result in eutrophication of the water column, where increased nutrient concentrations stimulate accelerated algal growth to produce an undesirable disturbance in the balance of organisms and water quality degradation.[27]

The Firth of Lorn is located in an open water location and as such is uncategorised within the Locational Guidelines. Therefore, there are no defined nutrient enhancement or benthic impact indices available for the proposal. SSF commissioned a report into the effects of existing and proposed fish farms in the area on local nutrient concentrations using the Equilibrium Concentration Enhancement approach developed for the Marine Scotland Locational Guidelines (Edwards, 2018 in Appendix 7).

The equation estimates the enhancement of nitrogen above background levels which occurs as a result of aquaculture, assuming that all the released nitrogen is conserved in the environment and only removed by tidal flushing. The Equilibrium Concentration Enhancement model considers dissolved nitrogen but also emissions of particulate nitrogen and nitrogen which has re-dissolved into the water column from the seabed.

Equilibrium Concentration Enhancement = S * M /Q

Where:

S = Source Rate (kgN.tonne production^{-1}.year^{-1})

M = Total Consented Biomass (tonne)

Q = Volume Flow Rate (m^3 year^{-1})

Source rate is calculated through the budgets discussed above, and biomass is known, but to assess site specific nutrient enrichment, the hydrographic conditions of the loch system must also be considered.

The estimates of enhancement of nitrogen concentration should be assessed against quality standards to assess the potential effect.

The SEPA Environmental Quality Standard for dissolved available inorganic nitrogen is 168µgN.litre-1.[24]

The resulting predicted level of enhancement is also compared to reference baseline values and threshold values for the winter mean concentration of Dissolved Inorganic Nitrogen (Dissolved Inorganic Nitrogen; the sum of ammonium, nitrate and nitrite), developed by the UK Technical Advisory Group on the Water Framework Directive (UKTAG) for coastal and transitional waters. In Scotland, SEPA are directed with regard to the application of environmental standards by The Scotland River Basin District (Standards) Directions 2014. Table 7-4 presents the reference and threshold values from both sources.

24 Working Arrangement Requirements of Statutory Consultees SEPA, Nature Scotland, Marine Scotland Science and the District Salmon Fisheries Boards) and consultation protocol for marine aquaculture planning applications (July 2010).

Table 7-4 Reference baseline and threshold values for winter mean Dissolved Inorganic Nitrogen concentration in coastal and transitional waters

Source	Class boundaries for winter mean Dissolved Inorganic Nitrogen concentration (µM)			
	High (Reference)*	Good	Moderate	Poor
UKTAG, 2008	12	18	27	40.5
Scottish Government, 2014	10	15	22.5	33.75

* In the Water Framework Directive , the term 'reference' is used to define conditions that are close to pristine.

For both sets of standards, the deviation of the threshold from 'High' to 'Good' status is triggered by a DIN concentration increase of 50% above the reference baseline. This rule is applied for the deviation of thresholds from 'Good' to 'Moderate' and 'Moderate' to 'Poor' statuses.[25]

The predicted level of nitrogen enhancement across all farms within the wider Loch Linnhe area (Figure 7-4) has been investigated as shown in Table 7-5.

Table 7-5 Total nitrogen enhancement inputs within the Loch Linnhe system[26]

Site	Nitrogen enhancement		% of reference baseline Dissolved Inorganic Nitrogen concentration		% of SEPA Environmental Quality Standard (168µgN.litre-1) (12µM)
	µg.L^{-1}	µM	UKTAG, 2008 (12µM)	Scottish Government, 2014 (10µM)	
Dunstaffnage	6	0.43	3.57	4.28	3.57
Shuna	9	0.64	5.35	6.43	5.35
Lismore North Port na Morlachd	16	1.14	9.52	11.42	9.52
Lismore North Dubh Sgeir	52	3.71	30.94	37.13	30.94
Lismore West	5	0.36	2.97	3.57	2.97
Charlottes Bay	6	0.43	3.57	4.28	3.57
Oban Bay	6	0.43	3.57	4.28	3.57
Kerrera C	4	0.29	2.38	2.86	2.38
Lismore East	2	0.14	1.19	1.43	1.19

25 UKTAG (2008) UK Environmental Standards and Conditions (Phase 2): Final (SR1 – 2007) [online]. Available from: http://wfduk.org/sites/default/files/Media/Environmental%20standards/Environmental%20standards%20phase%202_Final_110309.pdf accessed on 23/95/2020.

26 The values in the table provide estimates of the nutrient enhancement at the current maximum consented biomass for all farms apart from Dunstaffnage where the proposed biomass is considered and for Lismore North (DS), Lismore West and Shuna the potential increases in biomass proposed by SSF but not yet approved. The worst-case cumulative impact is therefore assessed.

The predicted enhancement values for each farm adheres to the SEPA Environmental Quality Standard for dissolved available inorganic nitrogen of 168µgN.litre-1 and since they are less than 50% of the DIN reference baseline, in relation to Water Framework Directive waterbody classification, no deviation from 'High' to 'Good' Dissolved Inorganic Nitrogen status is triggered for the Firth of Lorn (North) water body and Loch Linnhe (South) water body.

The cumulative impact relating to the total potential biomass in the Linnhe system with a corresponding potential source rate of 55.5gmN.s-1 was also determined. Three different estimates of enhancement were made according to the different flows that are present in the system namely tidal flow only (5µgN.litre-1), residual flows only (22µgN.litre-1) and Sound of Mull flows only (19µgN.litre-1 or less). Each of these three enhancement estimates pertains to one process acting alone. On the scale of Loch Linnhe, all processes are at work and the enhancement will be correspondingly less than any of the estimates. The range of cumulative enhancement is therefore likely to be between 5µgN.litre-1 to much less than 22 µgN.litre-1.

Noting the conservative nature of the assumptions made in the Equilibrium Concentration Enhancement estimates, the predicted enhancements in the average nitrogen concentration of the study area are low in relation to all standards. The magnitude of the effect of the predicted enhancements on the nutrient status of the water bodies as a result of each site (including Dunstaffnage) in isolation or cumulatively are therefore considered to be **low**. Full details of the Equilibrium Concentration Enhancement assessment are provided in Appendix 7.

7.3.3.2 Effects on water column from bath treatments

A topical 'bath' treatment for the treatment of sea lice, is where the water in which the salmon are contained is dosed, and the medicinal concentration is maintained for a prescribed period. Typically, this entails reducing the volume of a pen by lifting the base of the nets, enclosing it in tarpaulin to create a 'bath', and maintaining the dosed volume for a defined time period. The active ingredients used in bath treatments namely Azamethiphos, Cypermethrin and Deltamethrin are regulated under the SEPA in the CAR Licence. The SEPA consented quantities are a function of the topographic and dispersive properties of the location. Bath treatments usually result in a release of the treatment chemical in solution when the tarpaulins are removed, creating a surface plume of medicine residues that gradually disperses as it is carried away from the site on tidal currents.

Topical sea lice medicines that are used in marine cage fish farms are typically rapidly broken down or bind to particles in the water, making them unavailable to marine life.[16] The small numbers of studies investigating potential effects arising from the use of bath medicine chemicals conducted around fish farms to date have found no evidence of measurable impacts to the surrounding water column and biota therein.[27]

Residual concentrations are required to meet the Environmental Quality Standard set by SEPA for each therapeutant. All bath treatments are modelled according to the assimilative capacity of the receiving waters. No likely significant effects are expected from the use of bath treatments as prescribed in the Dunstaffnage SEPA CAR Licence (Appendix 2) as these chemical therapeutants are licenced by SEPA and their use is restricted such that prescribed Environmental Quality Standards will not be breached. With controlled administration only in the event that medicinal treatment is necessary, and continuous water circulation in the area, it is considered that impacts arising from the use of bath medicines will therefore be transitory and that residual medicine plumes will rapidly disperse in the receiving marine environment resulting in in minimal effects. Therefore, the magnitude of the effect of administering bath treatments at the Dunstaffnage site as well as the cumulative effect in terms of the administration of bath treatments at existing sites within the Farm Management Area are considered to be **low**.

7.3.4 Assumptions and uncertainties

- These Equilibrium Concentration Enhancement estimates are conservative, because they ignore large scale tidal dispersion and wind driven circulations, both of which may be expected to increase dilution both locally and generally in Loch Linnhe, reducing the estimated enhancements. In addition, the Equilibrium Concentration

Enhancement assessment included several CAR licences that have been relinquished and a number of licences which cannot be used without gaining additional consents.

- The level of nitrogenous waste estimated to be released from the proposal can be considered a worst-case scenario as a maximum biomass of 2500T was modelled and it has been assumed that all the nitrogen will be dispersed in the surrounding waters at mean low water spring tidal levels. Additionally, the source rate includes both dissolved and particulate nitrogen; however, the Environmental Quality Standard is only set for dissolved available nitrogen, with the result that a higher nitrogen loading has been used for comparisons with the SEPA Environmental Quality Standard.
- Persistence of biocidal sea lice medicines in the marine environment could have potential to create pressures on populations of non-target species and habitats. However, due to a lack of experimental data it is difficult to adequately predict diffuse and far-field effects of sea lice medicines on the water column.[27]

7.3.5 Mitigation

- Feeding is carefully controlled to prevent overfeeding and minimise the discharge of waste feed. This is achieved through the use of a complex feeding system for each cage which monitors feed levels, and the fish during feeding using cameras, to ensure optimum feeding rates and termination of feeding when the fish are satiated. Feed pellet size appropriate to the size of fish will also be selected to minimise waste feed and feed with high digestibility will be used to minimise faecal production.
- Routine compliance monitoring, stipulated in the SEPA CAR Licence, will be carried out to ensure the Environmental Quality Standards are adhered to. As a result of this sampling regime, a site can be assessed for its assimilative capacity and biomass can be adjusted accordingly.
- Medicinal residues will be minimised through adherence to the Sea Lice Management Strategy (Appendix 13) which seeks to prevent, monitor and control sea lice so that intervention measures are not required on the farm. Should lice levels rise to levels which require intervention then the strategy prioritises non-medicinal measures (focused deployment of cleaner fish and physical delousing measures) to limit the use of medicinal treatments where possible. Where medicinal treatment is required the SEPA CAR Licence limits will be adhered to (Appendix 2).

27 SRSL (2018) Review of the Environmental Impacts of Salmon Farming in Scotland: Executive Summary and Main Report [online]: http://www.parliament.scot/S5_Environment/General%20Documents/20180125_SAMS_Review_of_Environmental_Impact_of_Salmon_Farming_-_Report.pdf accessed on 24/09/2020.

7.3.6 Summary

The water column impacts of the proposal have been assessed by SEPA, through the process of determining the CAR Licence. The effects have been predicted not to exceed the Environmental Quality Standards and SEPA have issued a CAR Licence variation in respect of medicinal treatments and discharges from the site for a proposed increased biomass (2350T).

The EIA study area encompasses the northern portion of the Firth of Lorn and lower Loch Linnhe as it includes the assessment of the potential effects of the Dunstaffnage proposal as well as the cumulative impacts of the existing fish farms and the wider programme of SSF developments proposed within Loch Linnhe. The Loch Linnhe and the Firth of Lorn water bodies are uncategorised within the Locational Guidelines. The predicted enhancements in the average nitrogen concentration of the study area are low in relation to all standards and since the predicted enhancement values are less than 50% of the Dissolved Inorganic Nitrogen reference baseline, in relation to Water Framework Directive waterbody classification, no deviation from 'High' to 'Good' Dissolved Inorganic Nitrogen status is triggered for the Firth of Lorn (North) and Loch Linnhe (South) water bodies. The magnitude of the effect of the predicted enhancements on the nutrient status of the water bodies as a result of each site (including the Dunstaffnage proposal) in isolation or cumulatively are therefore considered to be **low**.

The magnitude of direct or cumulative effects from the use of bath treatments as prescribed in the Dunstaffnage SEPA CAR Licence and the SEPA CAR licences for fish farms within the Farm Management Area are considered to be **low**. This is because these chemical therapeutants are typically rapidly broken down into non-toxic derivatives or bind to particles in the water or sediment reducing their bioavailability and as such no measurable impacts to the surrounding water column and biota are anticipated. These chemical therapeutants are licenced by SEPA and their use is restricted such that prescribed Environmental Quality Standards will not be breached ensuring that no significant effects arise. With controlled administration, only in the event that bath medicine is necessary, and continuous water circulation in the area, it is considered that impacts arising from the use of bath medicines will be transitory and that medicine residues will rapidly disperse in the receiving marine environment.

7.3.6.1 Significance of residual effects

The receptor (water column) is considered to have a **low weighting** due to the relevant waterbodies being unclassified according to the Locational Guidelines (open water) and being unconstrained with a high assimilative capacity. The effects arising from the proposal on the water column will generally be at a local to regional scale (within 3km^2), be short-term (due to the medicinal residues rapidly breaking down or binding to the sediment, making them unavailable to uptake by biota) and reversible in nature, and the consequence will be minor taking into account the assimilative capacity of the receiving environment, therefore the effects are determined as having a **low magnitude** overall. The standard mitigation measures are considered adequate to minimise the effects to an acceptable degree. It is anticipated that residual effects will therefore be of **negligible significance**. Refer to Table 7-6 for a summary of the potential impacts and effects.

Table 7-6 Summary of potential water column impacts and effects

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
Direct Impacts – Dunstaffnage Proposal Only				
Fish faeces and to a lesser extent waste feed	Potential for nutrient enhancement	Degradation of water quality and impacts on marine biota	Restrict biomass in accordance with the SEPA CAR Licence limits and minimise waste feed to minimise nutrient enrichment	The potential nutrient enhancement is considered minimal due to the high assimilative capacity of the receiving environment. Therefore, significant effects are rendered unlikely post mitigation **(residual effect of negligible significance)**.
Medicinal lice bath treatments	Potential for pollution by medicinal residues		Minimise the management of sea lice through medicinal measures and when used comply with the SEPA CAR Licence chemotherapeutant limits	The Environmental Quality Standards have been set to ensure that doses or concentrations in the environment for specific chemicals remain below the threshold at which unacceptable effects are expected to occur. Therefore, the significant effects are rendered unlikely post mitigation **(residual effect of negligible significance).**
Cumulative Impacts – existing farms and wider SSF Loch Linnhe development programme				
Measures to mitigate direct effects as described above will serve to mitigate any cumulative effects. The potential nutrient enhancement is considered minimal due to the high assimilative capacity of the receiving environment. With controlled administration (as prescribed in the Dunstaffnage SEPA CAR Licence and the SEPA CAR licences for fish farms within the Farm Management Area) and continuous water circulation in the area, it is considered that impacts arising from the use of bath medicines will be transitory and that residual medicine plumes will rapidly disperse in the receiving marine environment and the anticipated cumulative impacts are minimal.				

7.4 INTERACTION WITH WILD SALMONIDS

7.4.1 Introduction

Wild salmonids play an important role in the ecosystem, are an indicator of water quality and overall health of an ecosystem and have high conservation value. Fishing for salmon and trout is an important part of local heritage within the west coast of Scotland and is a popular pursuit with anglers, including visitors who contribute to the local rural economy.

Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) are listed as Scottish Priority Marine Feature as part of Marine Scotland's Nature Conservation Strategy. The multi-sea-winter component of the Atlantic salmon population is also a UK Biodiversity Action Plan priority fish species.

The Atlantic salmon is found in the temperate and arctic regions of the northern hemisphere and the species range stretches over both sides of the North Atlantic and to the Baltic sea. As an anadromous species, salmon live in freshwater as juveniles, then migrate to sea before subsequently returning as adults to spawn in their natal river. Spawning typically occurs at the end of the year, between November and December but may also occur from October up to February depending on the area. Salmon eggs will usually hatch in early spring and from there the species go through a number of life stages in the river, before migrating to the sea as smolts in late spring after 2-3 years.[28]

Atlantic salmon migrate throughout the west coast. Scottish post-smolts have been shown to migrate to areas to the north and west of Scotland. They likely follow major ocean currents, migrating north along the Norwegian coast, before turning west and following the east Greenland coastline south, yet the exact route taken by post-smolts is not known.[29] Nevertheless, high densities of post-smolts have been observed off the west and north west coasts of Scotland.[30] Tagging studies indicate that Atlantic salmon do not necessarily follow a prescribed migratory route and have large distributional ranges.[31]

The Moray Firth Tracking Project, launched in Spring 2019 with 850 tagged smolts across seven project rivers feeding into the Moray Firth on the east coast of Scotland, reported initial findings that show salmon smolts move rapidly out to open sea taking a range of routes. In one case, a tagged smolt covered 200 km in two weeks. Higher than expected losses of smolts were recorded, with 50% lost in freshwater before reaching the sea, and a further 15% loss in inshore waters. Further research is underway to understand whether these are natural losses, additional predation, or related to river conditions[32].

Salmon may return after one year at sea (known as one-sea-winter salmon or grilse), or after up to four years (known as multi-sea-winter salmon). Multi-sea winter salmon migrate to areas that include the coast of West Greenland and the area around Faroe, however, the exact distribution is not known. Salmon return to the Scottish coast from a range of directions with a northerly and westerly bias and then migrate to their natal river.[30]

Brown/sea trout have a native range stretching from Iceland and the White Sea to the Atlas Mountains in Morocco and in Scotland the species is found in both rivers and lochs.[33] Trout have two possible life cycles where they may either

28 SNH (2019) Atlantic salmon. [online] : https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/atlantic-salmon accessed on 14/09/2020.

29 Dadswell, M.J., Spares, A.D., Reader, J.M., & Stokesbury, M.J.W. (2010). The North Atlantic subpolar gyre and the marine migration of Atlantic salmon Salmo salar: the 'Merry-Go-Round' hypothesis. Journal of Fish Biology. doi: https://doi.org/10.1111/ j.1095-8649.2010.02673.x

30 Malcolm, I. A., Godfrey, J. and Youngson, A. F. (2010). Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables. Scottish Marine and Freshwater Science, 1: 1-72.

31 Godfrey, J. D., Stewart, D. C., Middlemas, S. J. and Armstrong, J. D. (2014). Depth use and migratory behaviour of homing Atlantic salmon (Salmo salar) in Scottish coastal waters. ICES Journal of Marine Science, fsu118.

32 Atlantic Salmon Trust (2020). Moray Firth Tracking Project Update [online] : https://atlanticsalmontrust.org/ accessed on 14/09/2020.

33 SNH (2019). Brown trout. [online] : https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/brown-trout accessed on 14/09/2020.

stay in freshwater all their life in which case they are known as 'Brown trout' or migrate to the sea to feed and mature there and are then known as 'Sea trout'. Similar to salmon, sea trout return to freshwater rivers to spawn.

Whilst sea trout and brown trout are the same species (*S. trutta*), the brown trout form do not migrate into marine waters. Brown trout will, however, undertake significant migrations between freshwater habitats, moving from nursery areas to lochs and between feeding areas in the summer. Sea trout, the anadromous form of brown trout, migrate to the marine environment and as such, have access to a greater supply of food and are typically much larger than brown trout.[33]

The initial spawning and life stages of this species are similar to that of Atlantic salmon. Spawning occurs in winter with the species going through the same life stages, with similar timings and sensitivities as Atlantic salmon as alevin, fry and then parr. After two to three years parr will either remain in the freshwater habitat as brown trout or migrate to sea, undergoing morphological changes to become sea trout smolts. The smolts will typically shoal together at night during this migration with this normally occurring in spring[33,34].

Scottish coastal waters support significant populations of sea trout. Brown trout have a range of migratory behaviour that is believed to be influenced by both genetics and environment and may include migration to the marine environment where they become known as sea trout. Overall, genes and environmental factors (including anthropogenic) contribute about equally to the variability in migration versus residency in trout and the principal environmental factor involved is feeding quantity and quality.[35] Sea trout will migrate to the sea for part of its life cycle, returning to certain freshwater burns to spawn.

In contrast with salmon, sea trout post-smolts do not migrate rapidly out to sea from inshore coastal areas but tend to stay mostly in coastal waters and use near shore sea lochs, where available. Some post-smolts can return to rivers after only a few weeks or months at sea (smaller trout known as finnock), however, there is significant uncertainty regarding the movement of sea trout after the initial few months at sea.[30]

7.4.2 Baseline

7.4.2.1 National wild salmonid populations

Scottish waters provide important habitat for both Atlantic salmon and sea trout. A recently published report by Scottish Government[36] state that populations of wild salmon and sea trout are currently at critically low levels and that the reasons for this are complex and not yet fully understood.

The Scottish Government has collected, and published, the catches of sea trout and salmon reported by rod fisheries each year since 1952. Rod catches of wild salmonids in rivers reached the lowest numbers on record in 2018, dropping significantly since 2010 (refer to **Figure 7-5**).

34 WTT (2019) Brown Trout/Sea Trout Lifecycle | Wild Trout Trust. [online] : https://www.wildtrout.org/content/trout-lifecycle https://www.wildtrout.org/content/sea-trout accessed on 14/09/2020.

35 Ferguson, A., Reed, T.E., Cross, T.F., McGinnity, P. and Prodöhl, P.A. (2019). Anadromy, potamodromy and residency in brown trout Salmo trutta: the role of genes and the environment. Journal of Fish Biology, 2019: 1–27. DOI: 10.1111/jfb.14005.

36 Report of the Salmon Interactions Working Group. [online] : https://www.gov.scot/publications/report-salmon-interactions-working-group/pages/3/.

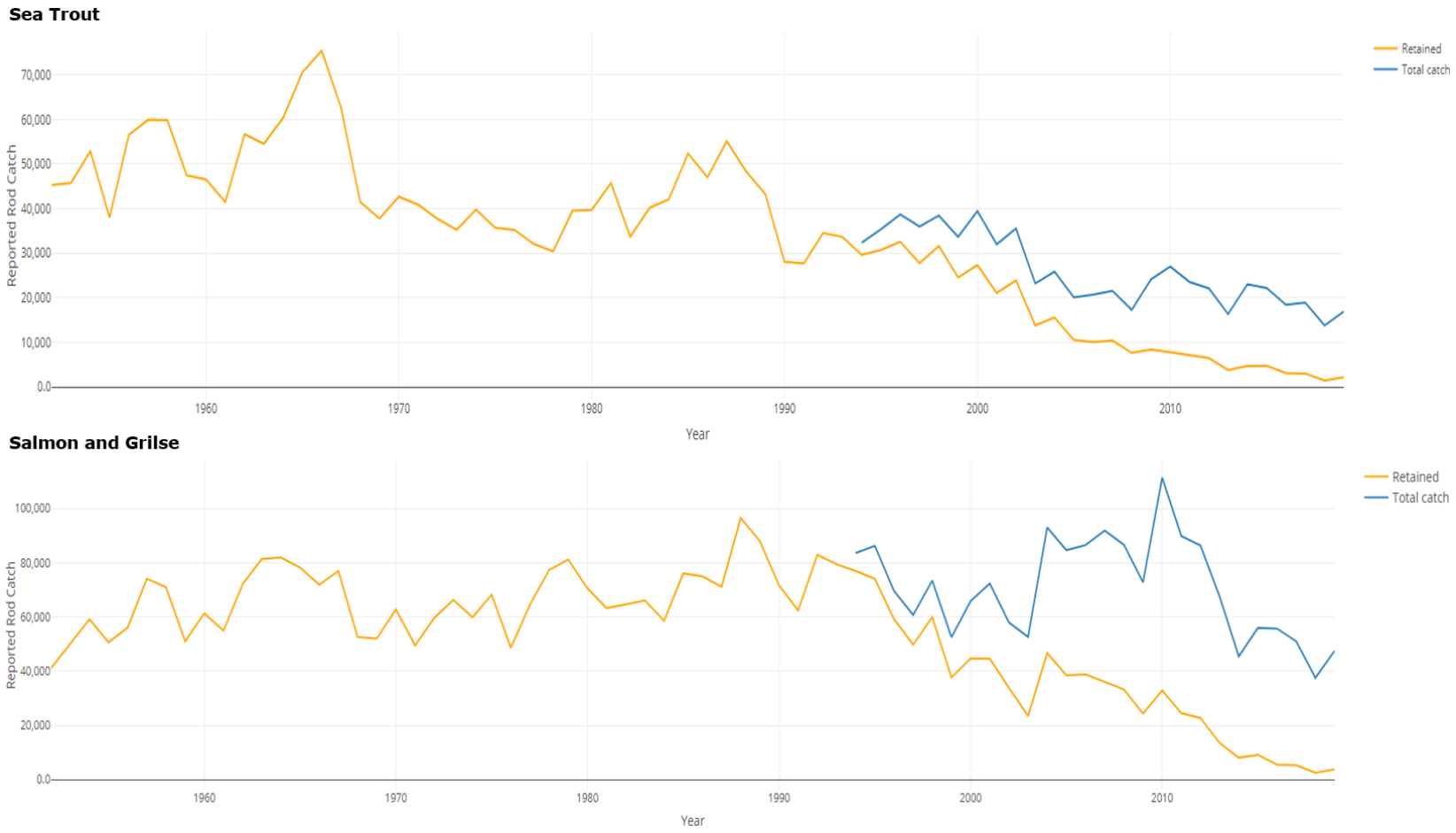


Figure 7-5 Reported rod catches of sea trout and salmon in Scotland 1952-2018. Retained means that the fish was killed and removed from the population .[37]

37 Marine Scotland. 2020. Salmon and Sea Trout fishery statistics: 2019 Season - reported catch and effort by method. DOI: 10.7489/12280-1

Rod catches provide a limited indication of population trends, which can be further illustrated by considering the estimated numbers of salmon returning to the Scottish coast from their oceanic feeding grounds (refer to **Figure 7-6**). These data illustrate a longer sustained reduction in numbers than is apparent from rod catches. It is estimated that the number of Atlantic salmon returning to Scottish rivers has been decreasing since at least the 1970's (when salmon returns reporting began) and that there continues to be a downward trend across the North Atlantic region[36]. In the past 50 years there has been a decline in salmon returning to home waters in the species range[38]. Wild salmonid numbers are in decline across Scotland (along both the East and West coasts)[39], with many rivers recognised as having a poor conservation status.

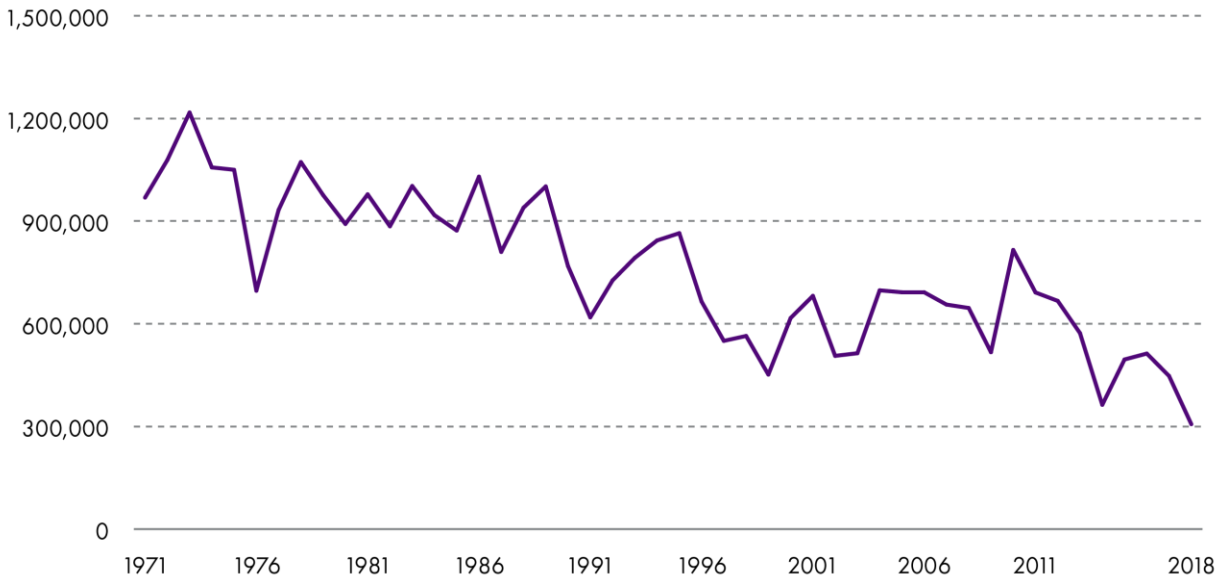


Figure 7-6 Trend in the estimated number of salmon returning to the Scottish coast (data sourced from the International Council for the Exploration of the Seas Working Group on North Atlantic Salmon)[40]

Wild salmonids face a wide range of pressures in both the freshwater and marine stages of their anadromous life cycle. The North Atlantic Salmon Conservation Organization, which enables six Governments and the European Union to co-operate to conserve wild Atlantic salmon, have highlighted the following pressures[41]:

- Water quality – acidification; point-source pollution; diffuse pollution; other pollution; eutrophication; oligotrophication.
- Water quantity – abstraction; flow regulation; upland/agriculture land-use and drainage; changing rainfall patterns; forestry drainage.
- Thermal habitat - loss of shading; over-shading; changing temperature patterns; thermal discharge; impoundment modification; other.
- Instream habitat – sedimentation; loss of sediment transfer; lack of, or excessive, large woody debris; canalisation/dredging/boulder removal.

38 Chaput G. (2012). Overview of the status of Atlantic salmon (Salmo salar) in the North Atlantic and trends in marine mortality. ICES Journal of Marine Science 69 (9): 1538–1548DOI: 10.1093/icesjms/fss013.

39 Green D.M., Penman D.J., Migaud H., Bron J.E., Taggart J.B., McAndrew B.J. (2012). The Impact of Escaped Farmed Atlantic Salmon (Salmo salar L.) on Catch Statistics in Scotland. PLoS ONE 7(9): e43560 [online]: https://doi.org/10.1371/journal.pone.0043560 accessed on 14/09/2020.

40 Scottish Parliament, SPICe Briefing Wild Salmon [online] : https://sp-bpr-en-prod-cdnep.azureedge.net/published/2019/8/19/Wild-Salmon/SB%2019-48.pdf

41 NASCO Implementation Plan for the period 2019 – 2024 [online] : NASCO "Implementation Plan" for 2013-18 (www2.gov.scot)

- Riparian habitat - loss of natural riparian vegetation; conifer afforestation.
- Barriers to migration - upstream passage (consider cumulative impacts); downstream passage; dams/weirs/large water bodies; other.
- Coastal and marine - inshore commercial fisheries; developments – including wind/wave/energy projects; other including aquaculture.
- Predation and competition – piscivorous birds; piscivorous fish; seals; dolphins; other.

Marine Scotland have also published a list of high-level pressures on Atlantic salmon[42] which are aligned with the above but also identify exploitation (angling and netting) and for aquaculture further specify pressures as; fish health aspects because of disease, sea lice and other parasites from fish farms and genetic introgression from farmed escapes.

7.4.2.2 Salmon farming and wild salmonid interactions

The presence of fish farms in coastal waters has become a topical issue and is regularly highlighted as a key reason for declines in wild salmonids. However, no empirical data exists confirming a definitive causative population level effect in Scotland. The current summary of the science published by Marine Scotland[43] cites numerous research papers which investigate the interactions between fish farms, specifically sea lice and impacts on wild fish and whilst salmon farming may present a pressure on wild salmonids, the magnitude of any such impact in relation to overall mortality levels is not known for Scotland. Salmon farming is unlikely to be the determining factor in population declines. A similar conclusion was made during an evidence session of the Rural Economy and Connectivity Committee on 18 November 2020 where SEPA stated that they do not think that sea lice from farmed fish are responsible for the declines in wild salmonids seen over several decades.

The interactions between salmon farms and wild salmonids commonly highlighted as having the potential to result in significant effects are the potential increase in sea lice infestation, the potential for disease transfer and the potential effects of genetic interactions between wild and escaped farmed fish. These interactions are therefore considered in this impact assessment (refer to Section 7.4.3).

7.4.2.3 Local wild salmonid populations

The Dunstaffnage expansion proposal and the wider SSF Loch Linnhe development programme namely Lismore West, Shuna and Lismore North expansion proposals fall within the West Coast Region and the Awe Statistical District and is adjacent to the Creran Statistical District. The rivers in proximity to the proposal are known to have fisheries for Atlantic salmon and sea trout namely River Awe/Loch Awe/River Orchy, River Noe, River Kinglass, River Etive, River Nant and River Creran/River Ure.

The graphs in Figure 7-7 plot the rod catches for Atlantic salmon and sea trout from 1952 to 2019 for both the Awe and Creran statistical districts (Marine Scotland group these two data sets) which provide an indication of the general population status in rivers within the districts. The graphs show considerable inter-annual variability and overall declining catch trends. However, as the catch effort is variable and unknown these figures do not give an accurate indication of the population status. Marine Scotland has been compiling data regarding catches of wild salmonids since 1952 but 2019 was the first time that national data has also been collected on rod effort, which has not yet been incorporated into the interpretation of the data. The Argyll District Salmon Fishery Board also reports catch statistics for individual rivers in Argyll and the latest rod catch statistics (2019) shown in Figure 7-8, indicate that the highest number of rod catches were from river Awe.

42 High Level Pressures on Atlantic Salmon (www2.gov.scot)

43 Marine Scotland. (2018). Summary of information relating to impacts of salmon lice from fish farms on wild Scottish sea trout and salmon [online]: https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/Aqint/troutandlice accessed on 14/09/2020.

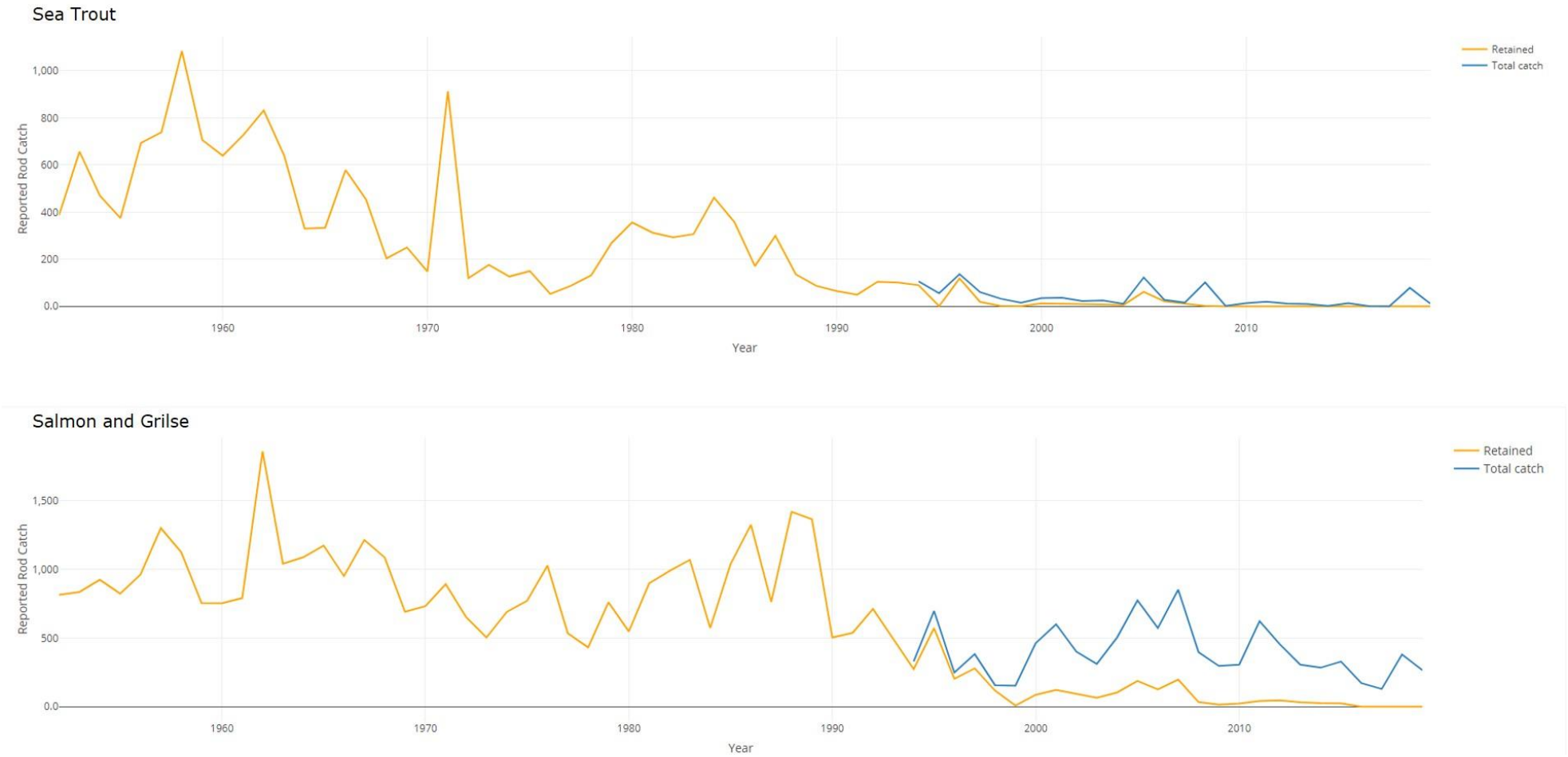


Figure 7-7 Rod catches for Atlantic salmon and sea trout from 1952 to 2019 for the Awe and Creran statistical districts. Retained means that the fish was killed and removed from the population.[44]

44 Marine Scotland. (2020). Salmon and sea trout fishery statistics [online]: https://scotland.shinyapps.io/sg-salmon-sea-trout-catch/ accessed on 11/09/2020.

RIVER	Argyll Catch 2019				5 yr. Avg. Salmon	5 yr. Avg. Grilse	5 yr. Avg. Sea Trout
	Salmon	Grilse	Sea trout	Finnock			
ADD	0	0	0	0	0.4	2	0.2
ARRAN	5	5	5	0	7	3.2	32.8
AWE	139	71	33	10	140.2	87.2	19.2
BUTE	0	0	0	0	0	0	0
CLYDE	0	2	17	0	1	10	121
CRERAN	1	0	5	22	4	7	9
FYNE	1	11	20	55	23	27	207
KINTYRE	0	0	13	0	15	29	147
NELL	9	4	0	20	8.6	5.4	1.8
RUEL	0	3	4	16	1	1.8	12.2
TOTAL	**155**	**101**	**103**	**127**	**200.2**	**172.6**	**550.2**

Figure 7-8 Rod catches for Atlantic salmon and sea trout from 2019 for individual rivers in Argyll[45]

The graph in Figure 7-9 plot the numbers of salmon and trout counted at the Awe barrage counter (obtained through the Argyll District Salmon Fisheries Board) which shows an overall declining trend in the numbers of salmonids returning to the river Awe, which aligns with the overall trend for Scotland as shown in **Figure 7-6**. It indicates that in the last decade the highest counts have been around 1500 fish, whereas in the 70's and 80's the highest counts were double this.

45 Marine Scotland. (2020). Salmon and sea trout fishery statistics [online]: http://argyll.dsfb.org.uk/files/2020/06/Argyll-DSFB-Annual-Report-2020.pdf accessed on 21/09/2020.

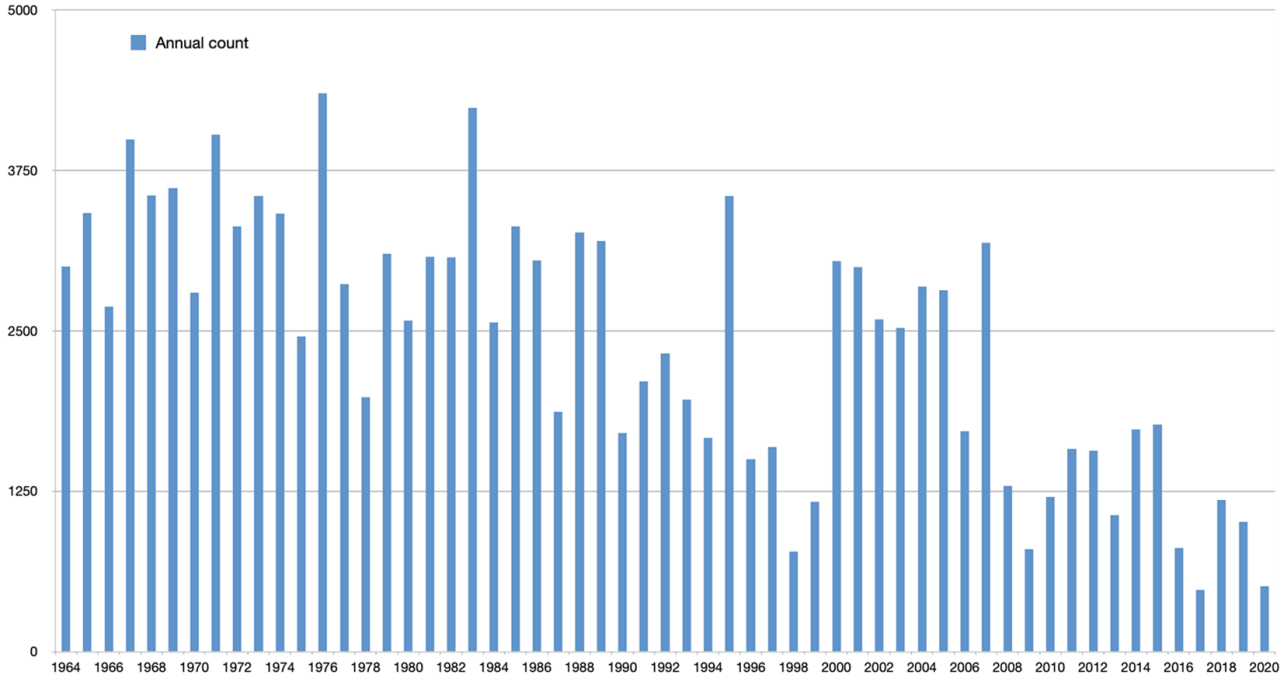


Figure 7-9 Fish counts from the Awe barrage counter (1964 to 2020)

Much of the behaviour of wild salmonids in the marine environment remains poorly understood, and therefore management efforts have focussed primarily on those factors that can be controlled including exploitation through angling. This is highlighted by the Scottish Government introducing a prohibition on the retention of salmon in coastal waters and only allowing salmon to be removed by fishermen in rivers where stocks are meeting conservation targets. Since 2016, Scottish rivers have received one of three grades during the salmon Conservation Status Assessment in accordance with the Conservation of Salmon (Scotland) Regulations 2016 (as amended). These grades are based on the probability of meeting a spatially varying egg deposition target indicative of maximum sustainable yield (Conservation Limit). The rivers important for Atlantic salmon and sea trout in Loch Linnhe, Firth of Lorn and Sound of Mull are all graded as Category 3[46], indicating that adult stocks have fallen below safe conservation limits. Category 3 rivers (the poorest grading) are associated with compulsory catch and release.

Recently the National Electrofishing Programme for Scotland data has been used to analyse the juvenile population conservation status to complement the adult conservation status data under the Conservation Regulations.[47]The data for Argyll (refer to Figure 7-10) show that juvenile salmon populations were sub-optimal for the region and have been

46 Marine Scotland. (2020). Salmon conservation assessment [online]: https://scotland.shinyapps.io/sg-salmon-conservation/ accessed on 11/09/2020.

47 In the Argyll region, 30 freshwater sites known to support Atlantic salmon and sea trout were randomly selected to form part of electrofishing surveys carried out by the Argyll Fisheries Trust under the National Electrofishing Programme for Scotland (NEPS). The primary driver for NEPS was the delivery of a juvenile assessment method that could complement the existing adult-based assessment method under the Conservation Regulations. NEPS uses a Generalised Random Tessellation Stratified (GRTS) survey design which provides spatial balance with a stochastic component, i.e. the samples cover the region of interest, but also incorporate randomness in the site selection, thereby striking a balance between systematic and random sampling. All electrofishing data were area delimited. Three metrics are available in the salmon regional / national analysis and only one (GRTS Observed) is available for trout. GRTS Observed is the mean density (per unit length of stream) of fry or parr estimated from the electrofishing data following analysis of the GRTS probability survey. Estimates can be derived and displayed at regional or national scales and are plotted together with their 95% confidence intervals. Benchmark is only available for salmon, which is the expected mean densities in a healthy river scaled to regional level using the digital river network (DRN). Grade is only available for salmon by comparing regional estimates of mean salmon density obtained from GRTS sampling with benchmark estimates, each region is given a grading (1 - 3) for fry and parr separately as well as combined to provide a single overall (fry/parr) grade for the juvenile salmon assessment using a rule-based system. As the data cannot be interpreted without a benchmark only the data for salmon were included in this report. Analyses were carried out for 2018 and 2019 separately and combined (2018_19) for a given life stage to provide an average estimate of abundance, and, in the case of salmon, status across years.

graded as Category 3 indicating that the upper 95% confidence limit of the mean observed density is below the benchmark.

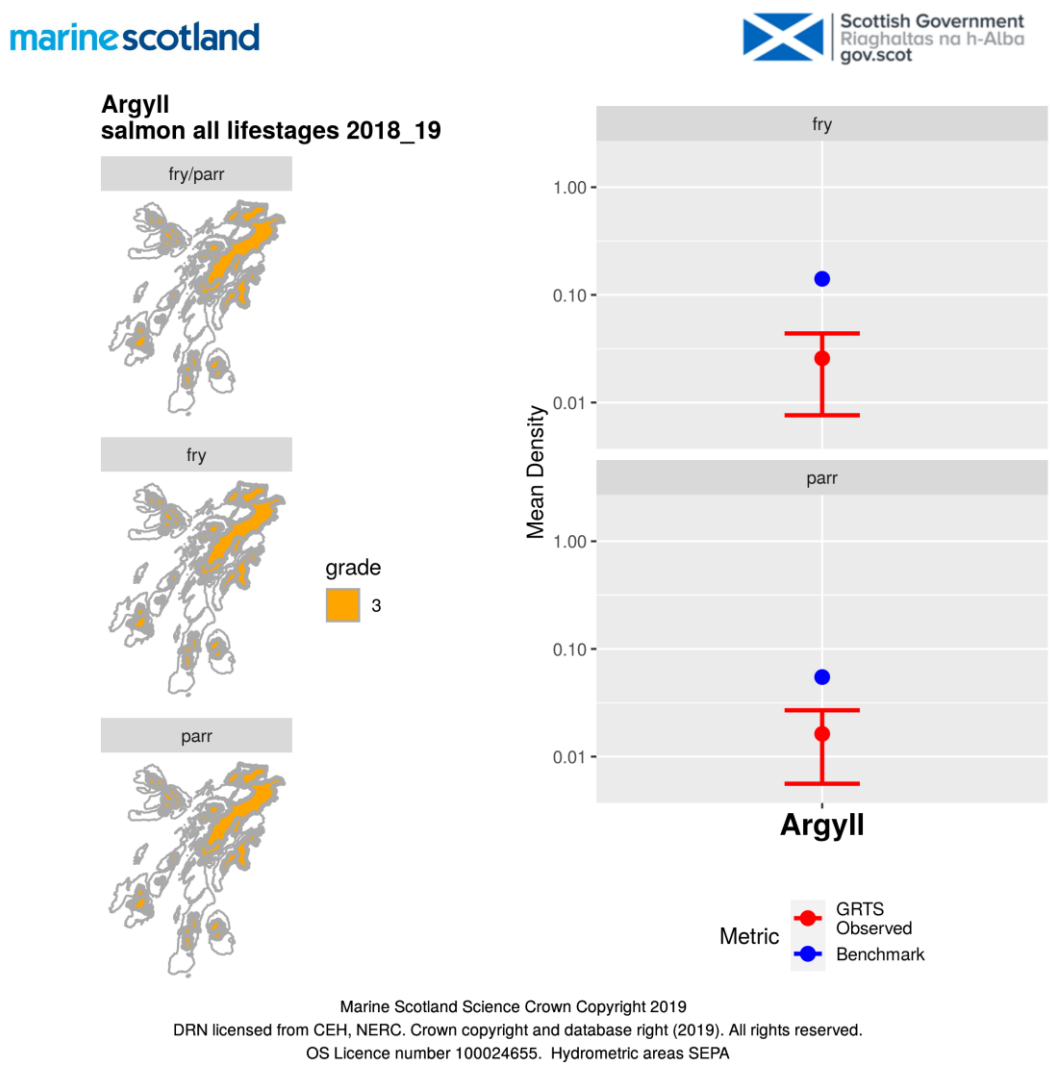


Figure 7-10 Argyll region juvenile salmon conservation status assessment for 2018 and 2019[48]

7.4.2.4 Local wild salmonid sea lice levels

The Argyll Fisheries Trust is a charity that was formed in 1995, and covers mainland Argyll (Linnhe, Lorn, Loch Fyne, Kintyre and the Kyles of Bute) and the islands of Mull, Islay, Jura and Arran. Most of the Argyll Fisheries Trust's work is focused on migratory fish species such as salmon and sea trout. Their projects focus on specific issues affecting migratory salmonids in the marine environment on the west coast of Scotland. The Argyll Fisheries Trust undertakes monitoring of sea lice burdens of sea trout through sweep netting at various coastal locations. The project is funded by Marine Scotland Science and commenced in 2002. Data from monitoring stations within Loch Linnhe or located in areas where salmon may migrate to and from the open sea through Loch Linnhe have been considered below. The Dunstaffnage station is the nearest monitoring station to the Dunstaffnage farm site (the monitoring station is located 3.5km away from the

48 Malcolm, I.A., Millidine, K.J., Jackson, F.L., Glover R.S. and Fryer, R.J. (2020). The National Electrofishing Programme for Scotland (NEPS) 2019. Scottish Marine and Freshwater Science Vol 11 No 9. Crown Copyright 2020. Figure exported from [online]: https://scotland.shinyapps.io/sg-neps-electrofishing-analysis-tool/ accessed on 16/09/2020.

farm). The Loch Etive station is located at Airds may close to the mouth of the river Awe and the Camus na Gaul station in upper Loch Linnhe, close to Fort William. Monitoring findings are summarised below and should be considered in the context that they are the only information currently available and will not necessarily represent sea lice burdens on local populations of wild salmon and sea trout.

Monitoring findings at Dunstaffnage (refer to Figure 7-11) indicate considerable inter-annual variability in intensity (all stages of lice) of infection.

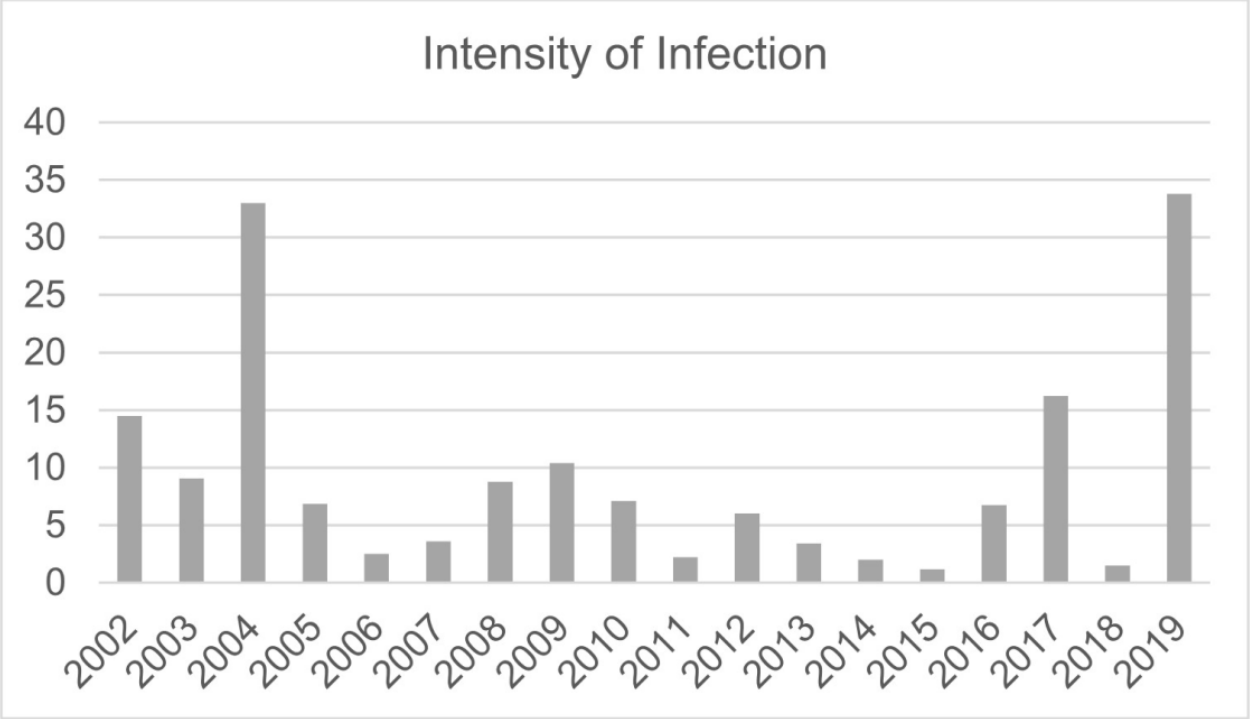


Figure 7-11 Intensity (average number of total lice per infected fish) of infection of sea trout sampled at the Dunstaffnage station from 2002 to 2019[49]

The Loch Etive monitoring station was only included in the monitoring programme in 2017 and as such there is limited data available from this site, in 2017 the intensity of infection (average number of total lice per infected fish) was 1[50] in 2018 it was 1[51] and in 2019 it was 5[52].

Monitoring findings at Camus na Gaul (refer to Figure 7-12) also indicate inter-annual variability with generally higher intensities of infection compared with those caught at Dunstaffnage and Loch Etive.

49 Data derived from Argyll District Salmon Fishery Board. (2019). Consultee response Dunstaffnage SEPA CAR Licence variation application [online]: https://www.sepa.org.uk/media/476309/1009031_consultee_response_argyll_dsfb.pdf accessed on 14/09/2020.

50 Argyll Fisheries Trust (2018) Sweep Netting Report [online]: http://fms.scot/wp-content/uploads/2018/05/180222-Aqua-Sweep-Netting-Report-2017.pdf accessed on 01/11/2020.

51 Argyll Fisheries Trust (2019) Biologist Report [online]: http://www.argyllfisheriestrust.co.uk/files/1415/4150/9580/AFT_Biologist_Report_2017-18.pdf accessed on 01/11/2020.

52 Argyll Fisheries Trust (2020) Biologist Report [online]: http://www.argyllfisheriestrust.co.uk/files/3716/0095/0059/AFT_Biologist_Report_March_2020.pdf accessed on 01/11/2020.

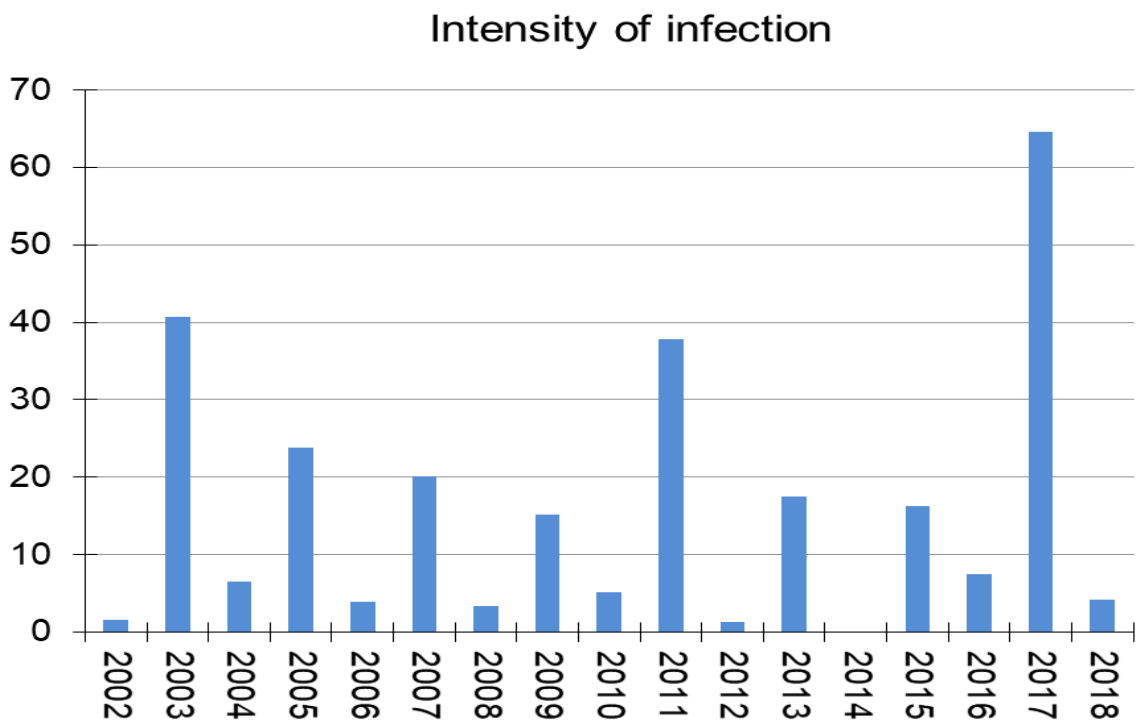


Figure 7-12 Intensity (average number of total lice per infected fish) of infection of sea trout sampled at the Camus na Gaul monitoring station from 2002 to 2018

7.4.2.5 Farm sea lice loading

Routine sea lice counts are conducted on the farms as outlined in the Sea Lice Management Strategy (Appendix 13). In order to demonstrate the performance of sea lice control measures the industry has been publishing weekly average sea lice data since 2013 and reporting has been on a farm-by-farm basis since 2018. The latest aggregated data presented for the industry (refer to Figure 7-13) indicates that sea lice levels have generally been decreasing in recent years. In 2018 the industry experienced the lowest annual sea lice averages since detailed records were first published and averages through 2019 and into 2020 have remained consistently low. This general decreasing trend can be attributed to the industry increasing resources and capacity for sea lice management and the introduction of new management measures.

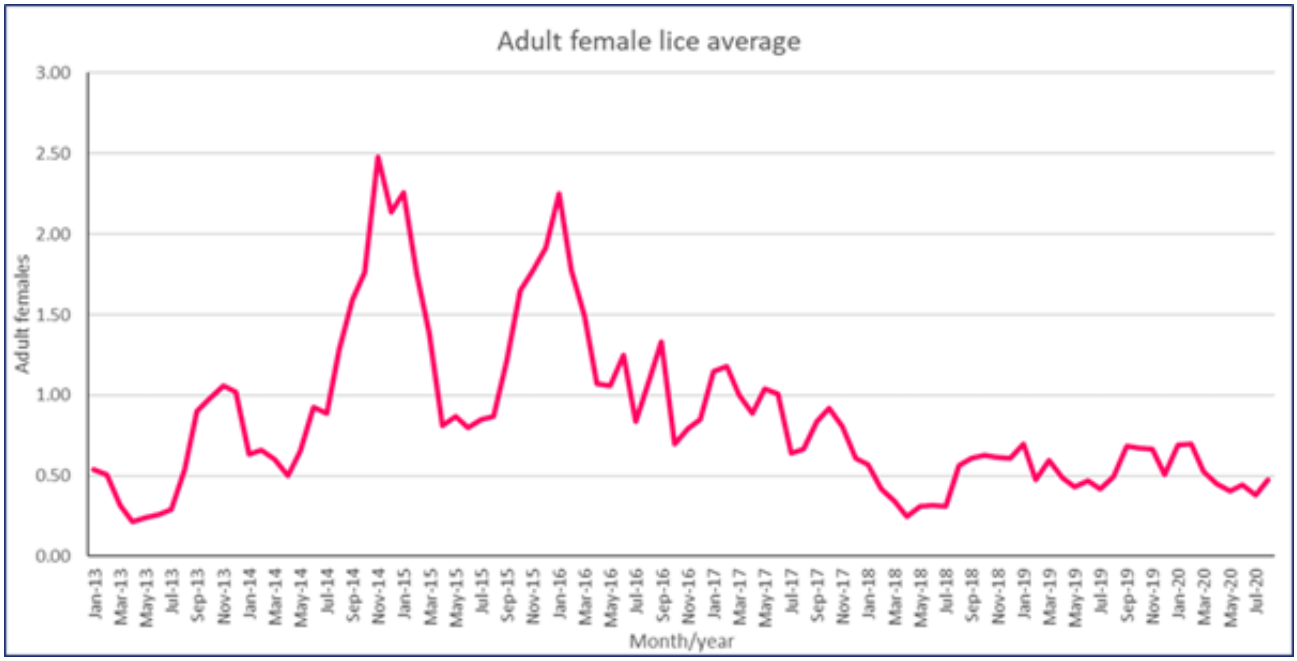


Figure 7-13 Aggregated monthly average adult female sea lice per fish for the industry for the period 2013 to 2020

Aggregated monthly average adult female sea lice counts for all SSF sites in the Linnhe Farm Management Area, FMA M-36 (refer to Figure 7-14) and generally indicates effective control of sea lice levels.

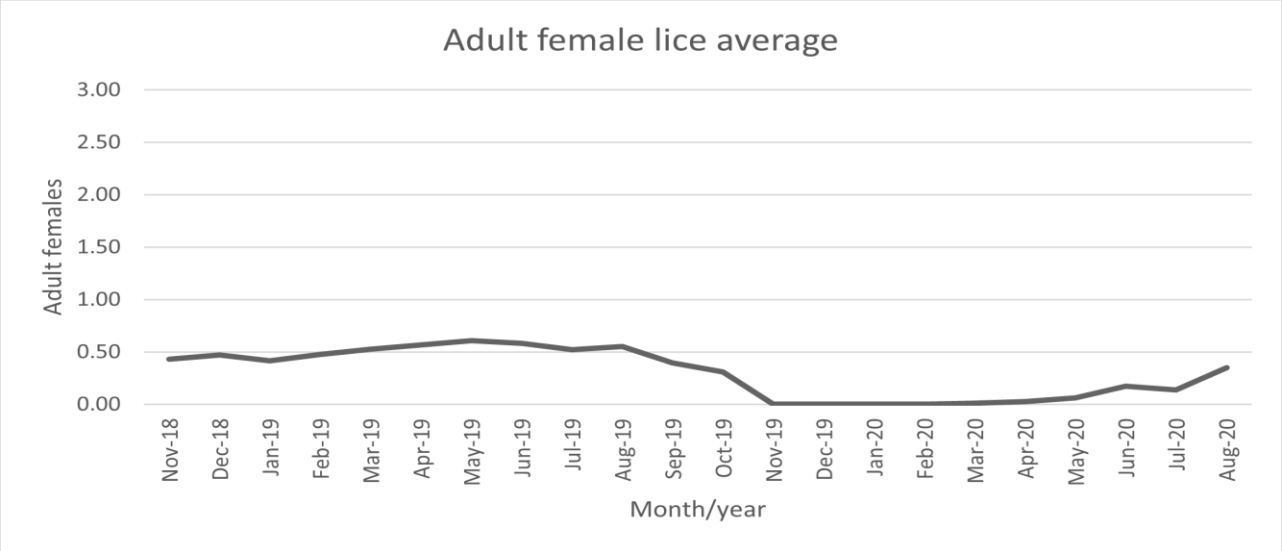


Figure 7-14 Aggregated monthly average adult female sea lice per fish for the SSF farms in the Linnhe Farm Management Area (FMA M-36) from 2018 to date[53]

In addition to the above reporting, the Aquaculture and Fisheries (Scotland) Act 2007, as amended in 2013, gives Scottish Ministers legal powers to carry out inspections, to look at sea lice records, and assesses the measures in place to prevent, control and reduce parasites on farms. These powers are exercised by Marine Scotland's Fish Health

53 SSPO (2020). [online]: https://www.scottishsalmon.co.uk/sites/default/files/2020-07/Insight%20Lice%20Report%20May%202020.pdf accessed on 14/09/2020.

Inspectorate and the failure by any Aquaculture Production Businesses to have satisfactory measures for the prevention, control or reduction of sea lice may result in the serving of an enforcement notice. Marine Scotland's policy with regards to satisfactory measures for the control of sea lice changed in July 2017, introducing reporting and intervention levels. The reporting level was initially 3 average adult female lice per fish, but it changed to 2 from 10th June 2019. Except for Creran for a single month in August this year, no SSF sites within the Linnhe Farm Management Area (FMA M-36) have exceeded the reporting levels to date.

To ensure that the Scottish aquaculture industry continue to demonstrate satisfactory measures are in place for the prevention, control and reduction of sea lice on farm sites, Aquaculture Production Businesses are required to report weekly average adult female sea lice numbers when a specified reporting level is reached. If a weekly average adult female sea lice count per fish of 2 (or above) is recorded on any fish farming site in Scotland, this number should be reported to the Fish Health Inspectorate within one week in arrears. Marine Scotland Science consider a weekly average adult female sea louse count per fish to be an average of all adult female sea lice count data per fish taken during a calendar week (a seven-day period from Monday to Sunday). Where the reporting level is reached, the Fish Health Inspectorate will increase the monitoring of that site and continue to do so until either the weekly average adult female sea lice count per fish is reduced to below the reporting level of 2, or an intervention limit of an average of 6 adult female sea lice per fish (or above) on any fish farming site is reached. Reaching the intervention limit requires the Aquaculture Production Business to take action which will reduce the weekly average number of adult female sea lice per fish at the site below the reporting level of 2. If satisfactory measures cannot be demonstrated, then enforcement action will be taken.

From early 2021, the industry will be required to publicly report lice levels on each farm on a weekly basis. The intervention limit will also be changing from 6 to 4 adult female sea lice per fish from next year.

In addition to the Marine Scotland reporting and intervention levels, Scottish finfish aquaculture has adopted world-class standards in the form of an industry Code of Good Practice which was introduced in 2006 and is independently audited. The industry Code of Good Practice prescribes a threshold level at which intervention to control sea lice should be implemented (no more than an average 0.5 adult female *Lep. salmonis* per fish in the period 1st February to 30th June inclusive and no more than an average 1.0 adult female *Lep. salmonis* per fish in the period 1st July to 31st January inclusive). SSF endeavour to maintain lice levels on our farms at or below the Code of Good Practice threshold for intervention throughout a farm production cycle. To do so, SSF regularly implement early intervention (i.e., before the threshold is reached) as soon as an increasing sea lice trend is noticed, and strictly implement intervention should the Code of Good Practice threshold be reached. SSF have also recently (from the start of the current production cycle in March 2020) adopted a more conservative intervention threshold of 0.5 adult female *Lep. salmonis* per fish all year round, which will facilitate earlier intervention on a cage-by-cage basis as well as farm basis compared with that of previous farm cycles.

7.4.3 Assessment

Potential impacts on wild salmonids from salmon farms include:

- Potential increased sea lice infestation;
- Potential for genetic introgression of wild salmonid populations, resulting from farm escapes; and
- Potential for transmission of disease from farmed salmon to wild salmonids.

Effects of salmon farms in general on wild salmonid populations from potential increased sea lice infestation are not yet fully understood due to gaps in available information and uncertainties, which are outlined in Section 7.4.3.3. As such, a precautionary approach has been applied in the assessment of the significance of residual effects on wild salmonid populations, taking cognisance of the uncertainties.

Standard mitigation measures to avoid or minimise any potential adverse effects to wild salmonids are detailed in Section 7.4.5. To address the uncertainties, SSF have committed to additional mitigation in the form of an Environmental Management Plan (refer to Appendix 16) to ensure mechanisms are in place to allow for adaptive management to be implemented in direct response to farm and wild fish monitoring and as and when new knowledge on interactions becomes available. Adaptive management is a structured process of robust decision making in the face of uncertainty, with an aim to reducing uncertainty over time through monitoring. Management objectives are regularly revisited and accordingly revised in response to new information allowing for continuous improvement in future management. A detailed and robust Environmental Management Plan has been developed and agreed in consultation with Fisheries Management Scotland and the local Fisheries Boards and Trusts (Fisheries Management Scotland and their member Boards and Trusts have the statutory remit to protect wild salmonids and the expertise to advise in these matters). A detailed discussion and negotiation was led by Fisheries Management Scotland and Argyll District Salmon Fisheries Board (with Argyll District Salmon Fisheries Board also representing Lochaber District Salmon Fisheries Board). Subsequently the Environmental Management Plan has been signed by Fisheries Management Scotland and Argyll District Salmon Fisheries Board. The Environmental Management Plan will establish ongoing monitoring of lice levels and lice loading from farmed fish and monitoring of population status and lice levels of wild salmonids (potentially expanding or building on the Argyll Fisheries Trust monitoring of sea lice burdens of sea trout referred to in Section 7.4.2.4), enable data sharing amongst stakeholders, and allow ongoing evaluation of mitigation measures in response to both farm and wild salmonid monitoring.

7.4.3.1 Potential increased sea lice infestation

Sea lice are ubiquitous in the marine environment and are a naturally occurring parasite on wild salmonids. The native salmon louse *Lepeophtheirus salmonis* is most relevant to wild and farmed salmonids in Scotland, although infestations of *Caligus* spp. (in particular, *C. elongatus*) also occur. The focus of the assessment is *Lepeophtheirus salmonis as C. elongatus* is not host specific to salmonids, infestations are less aggressive, and are of less concern for fish farms and do not pose a threat to wild stocks[54]. Salmon farming activities have not extended the geographic distribution range of sea lice, but because farmed salmon can also act as hosts, it may have the potential to result in adverse interactions with wild salmonids due to the high density of hosts providing increased opportunities for reproduction and transmission of sea lice and supporting an over-wintering population of sea lice, should sea lice not be adequately managed on a farm. This may create an environment conducive to shedding larvae at higher densities (compared with natural background densities) into the surrounding water column in proximity to the farms over a prolonged period[55]. Higher densities of sea lice larvae may increase sea lice infestation potential on local wild salmonids should Atlantic salmon or sea trout remain in higher density areas for prolonged periods. The consequences of increased sea lice levels on wild salmonid populations are unclear with the observed level of marine mortality of wild salmonids attributable to sea lice varying between studies (1%[56], 15%[57], 17%[58] and 33%[59]). However, it should be noted that these studies identify the impact of sea lice in general and do not identify the potential contribution of farm-derived lice to lice induced mortality

54 Costello M. J. (2009). How sea lice from salmon farms may cause wild salmonid declines in Europe and North America and be a threat to fishes elsewhere. Proceedings of the Royal Society B, 276: 3385–3394.

55 Torrissen O., Jones S., Asche F., Guttormsen A., Skilbrei T., Nilsen F., Horsberg T.E., and Jackson D. (2013). Salmon lice – impact on wild salmonids and salmon aquaculture. Journal of Fish Diseases 2013, 36, 171–194.

56 Jackson et al. (2013). Impact of *Lepeoptheirus salmonis* infestations on migrating Atlantic salmon, Salmo salar L., smolts at eight locations in Ireland with an analysis of lice—induced marine mortality. J Fish Diseases, 36, 273- 281.

57 Serra-Llinares R.M., Bjørn P.A., Finstad B., Nilsen R., Harbitz A., Berg M., Asplin L. (2014). Salmon lice infection on wild salmonids in marine protected areas: an evaluation of the Norwegian 'National Salmon Fjords'. Aquacult Environ Interactions Vol. 5: 1–16 2014.

58 Skilbrei O.T., Finstad B., Urdal K., Bakke G., Kroglund F. and Strand R. (2013). Impact of early salmon louse, Lepeophtheirus salmonis, infestation and differences in survival and marine growth of sea-ranched Atlantic salmon, Salmo salar L., smolts 1997–2009. Journal of Fish Diseases 2013, 36, 249–260.

59 Krkosek M., Revie C.W., Finstad B. and Todd C.D. (2013). Comment on Jackson et al. 'Impact of Lepeophtheirus salmonis infestations on migrating Atlantic salmon, Salmo salar L., smolts at eight locations in Ireland with an analysis of lice-induced marine mortality'. Journal of Fish Diseases 2013.

compared to natural lice levels. Studies[60,61] investigating sea lice infestation on sea trout in Scottish waters identified comparable levels of sea lice on sampled fish (prevalence and abundance) on the East coast where there is no salmon farming to sampled fish in locations in close proximity to fish farms. General representative data in this regard is not yet available for Scotland and the quantitative impact of the effect on wild salmonid populations remains controversial.

Tolerance to lice burdens generally increases with fish size. As a result, wild salmon and sea trout are expected to be most vulnerable to harm from sea lice infestations when they migrate as smolts to sea. Smolt migration is seasonal with the smolt migration period for salmon and sea trout being in the spring (April to May/June). This impact assessment therefore focuses on the effects of the potential increase in sea lice infestation on migrating smolts (salmon in particular due to the uncertainties regarding the distribution range and behaviour of sea trout in the marine environment).

Models have been developed to inform sea lice management. These models simulate the hydrodynamic properties of a specific area and account for sea lice biology to estimate sea lice numbers and dispersal patterns in the environment. These models can also be used to inform the potential interaction between farm-derived sea lice and wild salmonids. There is a degree of uncertainty around the impact range of sea lice originating from salmon farms, however, studies utilising sea lice dispersal modelling have suggested the level of farm-derived sea lice is very low beyond 30km from fish farms. Site specific factors such as prevailing wind and currents, and local topography can have a large impact on the direction and distance of lice dispersal.[62] Research based on salmon lice transport modelling in the Loch Linnhe system showed median dispersal distances of 6.1km and predicted that at least 97.5% of sea lice are not likely to be transported outwith 15km of fish farms within the modelled area.[62]

Sea lice dispersal modelling was undertaken for the proposal, considering existing farms as well as the wider SSF Loch Linnhe development programme namely Dunstaffnage, Lismore West, Shuna and Lismore North expansion proposals. The modelling involved surface layer sea lice transmission modelling of Loch Linnhe, where a hydrodynamic model was coupled with a biological particle-tracking model which considered key characteristics of planktonic sea lice. Simulations were undertaken for the period between March 2016 and May 2017 and took account of wind data for this period. Model particles are continually released from positions representing all the SSF farm locations within the Farm Management Area (FMA M-36), informed by fish stocking numbers and defined lice level scenarios (refer to Section 7.4.4 for the model assumptions). The model outputs presented in this impact assessment represent a worst-case scenario as the model assumes a continuous level of sea lice (0.5 adult female lice per fish) which is an overestimation as adequate management would ensure that levels are generally maintained below 0.5 adult female lice per fish. The model also conservatively assumes that all adult female lice are ovigerous when in reality only between 40 and 60% are at any one time (refer to Appendix 15 for further details on the sea lice dispersal modelling undertaken including the scale of increase modelled as a result of the proposals).

The model confirmed varying degrees of connectivity between sites in the Loch Linnhe system and that the dispersal area from each farm is limited as most particles remain within 10km of the source site. Plots from the lice modelling show that the proposal as well as the wider SSF Loch Linnhe development programme will not result in an increase in the extent of the area of predicted sea lice but may result in an increase in sea lice density in areas mostly in proximity to the farms (refer to Figure 7-15) due to the proposed biomass increases, should sea lice not be adequately managed on the farms. Plots also indicate that sea lice density decreases with increasing distance from the farms, with areas of the highest predicted sea lice densities in close proximity to the individual farms.

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[60] MacKenzie, K., Longshaw, M., Begg, G. S., and McVicar, A. H. 1998. Sea lice (Copepoda Caligidae) on wild sea trout (*Salmo trutta* L.) in Scotland. – ICES Journal of Marine Science, 55: 151-162.

[61] Urquhart, K., Pert, C. C., Fryer, R. J., Cook, P., Weir, S., Kilburn, R., McCarthy, U., Simons, J., McBeath, S. J., Matejusova, I., and Bricknell, I. R. 2010. A survey of pathogens and metazoan parasites on wild sea trout (Salmo trutta) in Scottish waters. – ICES Journal of Marine Science, 67: 444–453

62 Salama N.K.G., Murray, A.G. & Rabe B. (2016). Simulated environmental transport distances of *Lepeophtheirus salmonis* in Loch Linnhe, Scotland for informing aquaculture area management structures. Journal of Fish Diseases DOI: 10.1111/jfd.12375

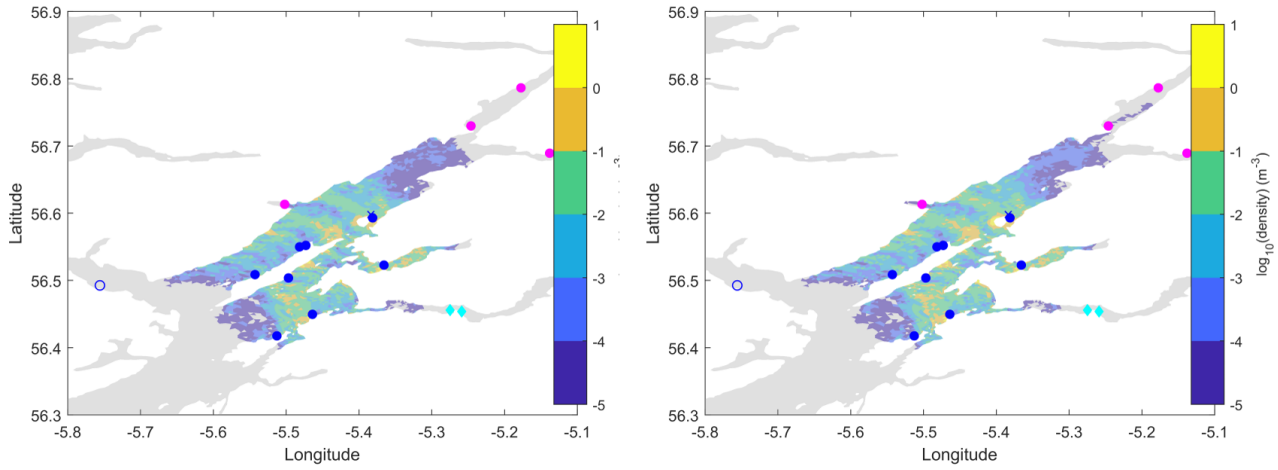

Figure 7-15 Plots from sea lice dispersal modelling conducted for Loch Linnhe indicating dispersal area and predicted sea lice (copepodid) densities based on a modelling scenario of 0.5 adult female lice per fish for the existing SSF sites (left) and taking into account the proposed increase in biomass at Dunstaffnage as well as the wider SSF Loch Linnhe development programme namely the Lismore West, Shuna and Lismore North proposals (right)

According to a study conducted to describe Atlantic salmon smolt behaviour and swimming trajectory in the nearshore marine phase of migration in Scotland, smolts exhibited a navigational ability to exit the river with a trajectory that would take them to the open sea and remained closer to the centre of the bay than the coast. Smolts also exhibited a greater swimming velocity in the marine environment (mean ± SD = 37.37 ± 28.20km/day) compared with the freshwater environment (mean ± SD = 5.03 ± 1.73km/ day).[63]

Salmon smolts from the Awe catchment will have to travel through Loch Etive before entering Loch Linnhe and taking a path around Mull or through the Sound of Mull to open sea. The journey is expected to take between 1.5 and 6 days based on estimated velocity (37.37 km/day) and a distance of approximately 60km from where the river enters Loch Etive and where the smolts would enter the sea to the northern exit of the Sound of Mull. Salmon smolts migrating from the Lochy catchment will have to first travel south-west through Loch Linnhe before travelling around Mull or through the Sound of Mull out to open sea. The journey is expected to take between 2 and 8 days based on estimated velocity (37.37 km/day) and a distance of approximately 80km from where the river enters Loch Linnhe and where the smolts would enter the sea to the northern exit of the Sound of Mull.

Migrating salmon smolts from the Awe catchment are expected to remain within the maximum extent of the SSF Loch Linnhe sea lice dispersal area (approximately 16km stretch of Loch Linnhe - refer to Figure 7-15) for less than half a day. It is anticipated that migrating salmon smolts may be exposed to the potential localised areas with the highest predicted lice densities for a matter of hours during their journey as they pass in proximity to farms. Migrating salmon smolts from the Lochy catchment are expected to remain within the maximum extent of the SSF Loch Linnhe sea lice dispersal area (approximately 30km stretch of Loch Linnhe - refer to Figure 7-15) for close to a day and may be exposed to the potential localised areas with the highest predicted lice densities for a matter of hours during their journey as they pass in proximity to farms.

The likelihood and probability of migrating salmon smolts remaining in areas with the highest predicted sea lice densities for prolonged periods is low. This is due to the anticipated rapid swimming velocity of the salmon smolts as well as the

63 Lothian A.J., Newton M., Barry J., Walters M., Miller R.C., Adams E. (2017). Migration pathways, speed and mortality of Atlantic salmon (*Salmo salar)* smolts in a Scottish river and the near-shore coastal marine environment. Wiley Ecology of Freshwater Fish. 2017;1–10.

limited extent of the predicted highest density areas potentially associated with each individual farm, which they may encounter along their migratory path to open sea.

As the value of 37km/day is the estimated mean velocity of migrating salmon smolts, if you apply the worst-case assessment (the potential impact on the slowest swimming smolts i.e., those travelling at 9km/day determined using the standard deviation of 28.20km/day) it is expected that the length of exposure of the slowest swimming smolts could be four times greater compared with the length of exposure of the average smolt.

Juvenile sea trout are likely to stay close to the coast during their most sensitive period when first leaving natal rivers and normally remain for extended periods (weeks, months or sometimes even a year or more) in near coastal areas.[64] Most sea trout generally seem to remain within 100km of their natal rivers, but some can migrate substantially larger distances.[65] While there is uncertainty around sea trout behaviour in the marine environment they are more likely to be exposed to potential increased sea lice levels for longer periods than Atlantic salmon.[64] This is further complicated by the adaptive response displayed by sea trout in response to sea lice infestation through their ability to choose to return to freshwater to recover from sea lice infestation as sea lice cannot survive in freshwater.[64,65]

Farm sea lice monitoring data for Dunstaffnage for the current and previous two farm cycles show that levels of adult female sea lice have not exceeded the applicable Marine Scotland reporting levels and were generally maintained below the industry Code of Good Practice threshold for intervention. Where exceedances of the Code of Good Practice threshold occurred, these have responded well to intervention measures and brought back below the threshold timeously. These exceedances therefore do not represent a failure to control sea lice, which would be characterised by lice remaining above the threshold for prolonged periods despite the implementation of management interventions. Refer to Appendix 14 for a sea lice attestation, covering the current and previous two production cycles.

Reported lice data (refer to Figure 7-14) also indicate effective management of sea lice levels at SSF sites in the Linnhe Farm Management Area (FMA M-36) with levels generally being maintained below the industry Code of Good Practice threshold for intervention. SSF are continuously adapting sea lice management strategies within the Company to ensure the most effective methods are implemented at each site (refer to Section 7.4.5). Increased resources and the implementation of lower intervention thresholds in 2020 is anticipated to maintain a continued decreasing trend in sea lice levels across SSF sites.

The magnitude of the potential effect of increased sea lice infestation on wild salmonid populations is assessed as **high** as a **precautionary** approach has been adopted due to gaps in current available knowledge resulting in uncertainty in extrapolating and assessing the potential effects on wild salmonid populations. To address the uncertainties, SSF have committed to additional mitigation in the form of an Environmental Management Plan (refer to Appendix 16) ensuring mechanisms are in place to allow for adaptive management to be implemented. A detailed and robust Environmental Management Plan has been developed and agreed in consultation with Fisheries Management Scotland and the local Fisheries Boards and Trusts. Detailed discussion and negotiation was led by Fisheries Management Scotland and Argyll District Salmon Fisheries Board (with Argyll District Salmon Fisheries Board also representing Lochaber District Salmon Fisheries Board). Subsequently the Environmental Management Plan has been signed by Fisheries Management Scotland and Argyll District Salmon Fisheries Board.

The Environmental Management Plan will establish ongoing monitoring of lice levels and lice loading from farmed fish and monitoring of population status and lice levels of wild salmonids, enable data sharing amongst stakeholders, and allow ongoing evaluation of mitigation measures in response to both farm and wild salmonid monitoring. The

64 Thorstad, E.B. and Finstad, B. (2018). Impacts of salmon lice emanating from salmon farms on wild Atlantic salmon and sea trout. NINA Report 1449: 1-22.

65 Eldøy, Sindre & Ryan, Diarmuid & Roche, William & Thorstad, Eva & Næsje, Tor & Sjursen, Aslak & Gargan, Paddy & Davidsen, Jan. (2020). Changes in growth and migration patterns of sea trout before and after the introduction of Atlantic salmon farming. ICES Journal of Marine Science. 10.1093/icesjms/fsaa125.

Environmental Management Plan encompasses all salmon farms within the Farm Management Area (FMA M-36) to facilitate a coordinated management approach. The above confirms SSF' commitment to effectively managing sea lice levels to ensure the contribution of an expanded Dunstaffnage farm in addition to existing salmon farms and other SSF expansion proposals within the Loch Linnhe, to potential effects on local wild salmonid populations are kept to the minimum degree possible.

7.4.3.2 Potential for genetic introgression of wild salmonid populations

A review of the current knowledge of genetic interaction between farmed and wild Atlantic salmon [66] indicated that escapes of farmed stock have the potential to exert an impact on wild salmon through genetic introgression from interbreeding which may lead to changes in life-history traits, reduced population productivity and decreased resilience of offspring. Apart from Norway, introgression in wild salmonid populations in major salmon producing countries including Scotland, remains unquantified. There have been investigations into the extent of hybridisation existing in the wild salmon population in Scotland[67], however findings remain inconclusive, and the population level effects of such hybridisation is still largely unknown. Another factor to consider when interpreting the findings of these investigations is the historical intentional stocking of rivers, by landowners and fishing proprietors, using fish of farmed origin, which is likely to have contributed to historic genetic introgression in wild salmonid populations. According to the latest data from Marine Scotland, a total of 20 fish of farmed origin were caught by all methods in 2019 representing 0.04% of the total Scottish catch in 2019. The distribution of farmed origin fish was highly uneven, with the North West region accounting for 70% of those reported.[68] Evidence[66] indicates that only a small proportion of escapees manage to survive and enter rivers. The actual numbers, however, can be expected to be dependent on both the stage of the life cycle and the time of the year at which they escape. In addition, not all escapees found in rivers will reproduce and hybridize with native fish as this will depend on their sexual maturity and behaviour after escape. Due to farming practices, farmed salmon that escape from sea cages are unlikely to be sexually mature and escapees may also ascend rivers outside the normal migratory times for wild salmon and even outside the spawning period reducing the potential risk further.

The potential also exists for farmed escapees to negatively impact wild salmonid populations through competition for food and habitat. However, studies in this regard are limited.

Aside from a single fish which escaped from Dunstaffnage due to a physical handling error in 2013, there has not been an escape event at an SSF farm in the Loch Linnhe Farm Management Area (FMA M-36) within the past 9 years[69]. Escapes prevention is a priority in order to avoid potential negative environmental effects and associated significant financial losses. To prevent escapes, SSF employs industry-leading fish farm design standards on cages, netting and moorings that meet or exceed the Scottish Technical Standard taking into account the worst weather conditions expected at the farm location and designed to minimise predator interactions which could result in damage and subsequent escapes. SSF also ensures that the integrity of the cages and nets is regularly inspected, and that timeous preventative or corrective action is implemented in response to any issues noted, as detailed in the Containment Plan (Appendix 17) and the Escapes Prevention and Recapture Strategy (Appendix 18). In the unlikely event that an escape occurs, SSF have measures in place to minimise the adverse effects thereof as detailed in the Escapes Prevention and Recapture Strategy (Appendix 18). Standard mitigation measures are deemed adequate in preventing escapes and the likelihood of escapes is considered low. The development will also result in new cage, moorings and net infrastructure being installed at the farm allowing the utilisation of ongoing technological advances and improvement in design and strength

66 Glover K.A., Solberg M.F., McGinnity P., Hindar K., Verspoor E., Coulson M.W., Hansen M.M., Araki H., Skaala Ø., Svåsand T. (2017). Half a century of genetic interaction between farmed and wild Atlantic salmon: Status of knowledge and unanswered questions. Fish and Fisheries. 2017;18:890–927.

67 Coulson, M. (2013) Managing Interactions Aquaculture Project 2011/12 Report on Genetic Tool Development for Distinguishing Farmed vs. Wild Fish in Scotland. RAFTS

68 Marine Scotland. (2020). Salmon and Sea Trout fishery statistics: 2019 Season - reported catch and effort by method. DOI: 10.7489/12280-1 [online]: https://www.gov.scot/publications/salmon-fishery-statistics-2019/ accessed on 14/09/2020.

69 Aquaculture Scotland [online]: http://aquaculture.scotland.gov.uk/data/fish_escapes.aspx accessed on 15/12/2020

compared with the existing infrastructure. The magnitude of the contribution from the Dunstaffnage site or cumulative contribution as a result of the wider SSF Loch Linnhe programme of developments to the effects of escapees on the wild salmonid population is considered to be **low** due to the record of effectively preventing of escapes.

7.4.3.3 Potential for transmission of disease from farmed salmon to wild salmonids

Salmon smolts stocked at marine farm sites are free from disease and parasites at the time of stocking and are at risk of the transfer of parasites and disease from wild fish and potentially other farms. Smolts are therefore vaccinated against common bacterial and viral infections. The impact of disease transfer on wild fisheries is controversial because there are few quantitative data demonstrating that wild species near fish farms suffer more from infectious diseases than those in other areas.[70] Studies investigating cases of viral and bacterial pathogens in farmed fish found few cases in wild fish and have indicated that the risk of transmission of pathogens from farmed to wild fish is low.[55]

The risk of transmission of diseases and parasites (other than sea lice) from farmed salmon to wild salmonids is managed through the Fish Husbandry Manual (Appendix 21) with contingency measures to deal with unexpected or unknown parasites and disease to ensure staff are prepared for any event. Existing SSF sites within Disease Management Area 15b (Loch Linnhe, Firth of Lorne, Sound of Mull and Loch Sunart), have not had any notifiable diseases (listed under the Aquatic Animal Health (Scotland) Regulations 2009) since 2010[71]. SSF' existing sites are inspected at least once a year by the Fish Health Inspectorate as part of their disease surveillance programme to ensure adequate fish health management. Therefore, the magnitude of the contribution to the effect of disease transmission from farmed fish at the Dunstaffnage site or cumulative contribution as a result of the wider SSF Loch Linnhe programme of developments on the wild salmonid population is considered to be **low.**

7.4.4 Assumptions and uncertainties

- There is uncertainty regarding the movement and migration patterns of any salmonid hosts both out from and back to any particular river or stream as well as the coastal distribution range and behaviour of sea trout. Consequently, there is an inherent uncertainty regarding the likely overlap of distribution of such hosts with the predicted dispersal of sea lice from farms and therefore likely exposure of hosts to farm-derived sea lice loads. There are also complex environmental factors that affect natural lice burdens on wild fish and many other non-aquaculture related pressures[72] that affect the mortality of wild fish. Wild salmonid populations in both freshwater and marine environments fluctuate as a result of interactions between many anthropogenic and natural biological and physical factors. The complexity of the interactions limits the ability to separate and quantify the effect of each factor in isolation. The Environmental Management Plan and its associated monitoring will facilitate an improved understanding of some of these uncertainties.
- The sea lice dispersal model used (refer to Appendix 15) is fit for purpose and the hydrodynamic aspects have been validated with the best currently available data to allow for the most accurate predictions possible. Assumptions are inherent to all modelling processes and therefore, outcomes are subject to change should any of the inputs or assumptions change. The following assumptions and limitations apply to the model :
    - To obtain density values, counts of particles released from SSF sites were scaled by:

70 Kevin D. Lafferty, C. Drew Harvell, Jon M. Conrad, Carolyn S. Friedman, Michael L. Kent, Armand M. Kuris, Eric N. Powell, Daniel Rondeau, and Sonja M. Saksida (2015) Infectious Diseases Affect Marine Fisheries and Aquaculture Economics Annual Review of Marine Science. Vol. 7:471-496 (Volume publication date January 2015) first published online as a Review in Advance on September 12, 2014 https://doi.org/10.1146/annurev-marine-010814-015646.

71 Scotland's Aquaculture. Movement restrictions. Data supplied by Marine Scotland [online]: http://aquaculture.scotland.gov.uk/data/movement_restrictions.aspx accessed on 17/09/2020.

72 Marine Scotland High Level Pressures on Atlantic Salmon [online]: https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/status/Pressures accessed on 17/09/2020.

        - fish stocking numbers,
        - an estimated number of larvae released per louse per day (28.2 divided by 24 to give an hourly rate),
        - three different lice thresholds (0.3, 0.5 and 1.0),
    - In the biophysical particle tracking model, sea lice larval particles inhabit the upper layer of the water column. Lice were assumed to be evenly distributed over the upper 5 m of the water column.
    - Particles move subject to the water currents. Particles become able to settle at a suitable habitat (another salmon farm) after 3.6 days (based on an assumed water temperature of 10 °C, experience a constant rate of mortality of 0.01 hr-1, and are removed from the simulation after 14 days).
    - Lice particles were able to infect multiple sites (they do not end their movement when an infection occurs).
    - Temperature or salinity dependence (and their potential impact on developmental or mortality rates) were not included in the model.
    - Copepodid particles moving within 500 m of a farm location were assumed to create a connection at the site.
    - The model uses a fixed development rate and lifespan for simulations at all times of the year.
    - The confidence level of the outputs decreases for areas of lower sea lice densities.
- The model outputs present a worst-case scenario as the model assumes a continuous level of sea lice which is an overestimation as adequate management would ensure that levels are generally maintained below 0.5 adult female lice. The model also conservatively assumes that all adult female lice are ovigerous, when only 40-60% are likely to be at any one time.

7.4.5 Mitigation

- Salmon farms operated within Farm Management Area (FMA M-36) will be stocked and managed on a single year class basis, in accordance with the Farm Management Area -wide Farm Management Statement (Appendix 10). This requires a target for a minimum four-week synchronous fallow across all salmon farms (operated by both SSF and Mowi) within the Farm Management Area before the next production cycle begins which will result in a period long enough to effectively break the sea lice life cycle on farms, as during a fallow period there are no additional hosts available and sea lice levels return to natural background levels. A risk assessment has also been prepared for non-synchronous stocking and fallow with the rainbow trout farms operated by Dawnfresh within Loch Etive (Appendix 11). Where appropriate, lice treatment will be coordinated across the Farm Management Area to maximise the benefit of treatment options and reduce potential transfer of lice between farm sites and from farmed fish to wild fish.
- A detailed and robust Environmental Management Plan (Appendix 16) has been developed and agreed in consultation with Fisheries Management Scotland and the local Fisheries Boards and Trusts. A detailed discussion and negotiation was led by Fisheries Management Scotland and Argyll District Salmon Fisheries Board (with Argyll District Salmon Fisheries Board also representing Lochaber District Salmon Fisheries Board). Subsequently the Environmental Management Plan has been signed by Fisheries Management Scotland and Argyll District Salmon Fisheries Board. This will establish ongoing monitoring of lice levels and lice loading from farmed fish and monitoring of population status and lice levels of wild salmonids, enable data sharing amongst stakeholders, and allow ongoing evaluation of mitigation measures in response to both farm and wild salmonid monitoring, through an adaptive management process. As new information becomes available it will facilitate an improved understanding of interactions between farming and wild salmonids.

- Adherence to the Sea Lice Management Strategy (Appendix 13) which seeks to prevent, monitor and control sea lice so that intervention measures are not required on the farm. The strategy is underpinned by well-resourced farms, experienced farmers, good husbandry, area management (stocking strategy, synchronous fallow and single year class), physical exclusions methods (lice shields), biological control (focused deployment of cleaner-fish), mechanical intervention methods (physical delousing), medicinal intervention, functional feeds and a fully resourced and qualified Fish Health Team. The control of sea lice on SSF farms is a fully integrated holistic approach with prevention backed up by continuous control measures as the core strategy, and immediate measures actioned only when required. An efficacy statement has been prepared outlining the availability of medicinal sea lice therapeutants as authorised by the SEPA CAR licence variation (Appendix 12). SSF have recently (from the start of the current production cycle in March 2020) adopted a lower intervention threshold of 0.5 adult female lice all year round, which will facilitate earlier intervention on a cage-by-cage basis as well as farm basis compared with that of previous farm cycles. In addition, in 2020 SSF have committed to increased investment in intervention capacity. These measures are anticipated to maintain a continued decreasing trend in sea lice levels across SSF sites.
- Stocking of larger smolts from the Recirculating Aquaculture System hatchery which are almost twice the size as before, more robust and facilitate a shorter production cycle.
- The risk of transmission of parasites and disease from farmed salmon to wild salmonids and the protection of farmed stock from diseases carried by wild fish is managed through a suite of monitoring and mitigation measures detailed in Fish Husbandry Manual (Appendix 21). The Fish Husbandry Manual provides a framework of guidance, operating principles and protocols, and systems of accountability designed to achieve the highest health and welfare standards for rearing farmed Atlantic salmon. It sets out biosecurity measures, best practice management and husbandry procedures for fish health and welfare, disease surveillance measures, disease control measures and fish health communication and training. Key measures include the vaccination of all smolts stocked at SSF sites against common bacterial and viral infections and specific biosecurity measures for farmed salmon and cleaner fish species.
- SSF recognises the potential environmental and financial impacts of farm escapes and endeavours to maintain a target of zero escapes across all SSF sites. To accomplish this target SSF employs industry-leading fish farm design standards on cages, netting and moorings that meet or exceed the Scottish Technical Standard taking into account the worst conditions expected at the farm location. In addition, a Containment Plan and an Escape Prevention and Contingency Strategy have been compiled, which are consistent with the industry Code of Good Practice and set out measures and operational procedures to ensure equipment is used and maintained appropriately and ultimately minimise the risk of fish escapes. The latter also identifies procedures which must be followed in the unlikely event of an escape or suspected escape (Appendix 17 and 18).

7.4.6 Summary

The Dunstaffnage farm and proposed area for expansion is out-with any designated area for wild salmonids and is unlikely to affect any designated area. However, Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) are listed as a Scottish Priority Marine Feature and listed on the Scottish Biodiversity List under the category 'conservation action needed' and there is the potential for interactions between the farming operations and wild salmonids. In addition, salmon and trout populations are important in terms of conservation interest and fishery value. Available information suggests that local populations of both adult and juvenile salmonids are sub-optimal in terms of conservation targets.

The interactions between salmon farms and wild salmonids commonly highlighted as having the potential to result in significant effects are potential increase in sea lice infestation, the potential for disease transfer and the potential effects of genetic interactions between wild and escaped farmed fish. These interactions were therefore assessed in relation to the Dunstaffnage expansion proposal as well as any cumulative effects arising from existing farms within the Farm Management Area and the wider SSF Loch Linnhe development programme.

Farm sea lice monitoring data for Dunstaffnage for the current and previous two farm cycles show that levels of adult female sea lice never exceeded the applicable Marine Scotland reporting levels and were generally maintained below the industry Code of Good Practice threshold for intervention. A sea lice attestation, covering the current and previous two production cycles, has been prepared and is attached as Appendix 14. Data returns also indicate effective management of sea lice levels at SSF sites in the Linnhe Farm Management Area (FMA M-36) with levels generally being maintained below the industry Code of Good Practice threshold for intervention (refer to Figure 7-14). SSF are continuously adapting sea lice management strategies within the Company to ensure the most effective methods are implemented at each site. SSF requires strict adherence to the Sea Lice Management Strategy (Appendix 13) which seeks to prevent, monitor and control sea lice so that intervention measures are not required on the farm. The strategy is underpinned by well-resourced farms, experienced farmers, good husbandry, area management (stocking strategy, synchronous fallow and single year class), physical exclusions methods (lice shields), biological control (focused deployment of cleaner-fish), mechanical intervention methods (physical delousing), medicinal intervention, functional feeds and a fully resourced and qualified Fish Health Team. The control of sea lice on SSF farms is a fully integrated holistic approach with prevention backed up by continuous control measures as the core strategy, and immediate measures actioned only when required. An efficacy statement has been prepared outlining the availability of medicinal sea lice therapeutants as authorised by the SEPA CAR licence variation (Appendix 12). SSF have recently (from the start of the current production cycle in March 2020) adopted a lower intervention threshold of 0.5 adult female lice all year round, which will facilitate earlier intervention on a cage-by-cage basis as well as farm basis compared with that of previous farm cycles. In addition, in 2020 SSF have committed to increased investment in intervention capacity. These measures are anticipated to maintain a continued decreasing trend in sea lice levels across SSF sites.

Effects of salmon farms in general on wild salmonid populations from potential increased sea lice infestation are not yet fully understood due to gaps in available information and uncertainties. As such, a precautionary approach has been adopted in the assessment of the potential effects on wild salmonid populations. Tolerance to lice burdens generally increases with fish size. As a result, wild salmonids are expected to be most vulnerable to harm from sea lice infestations when they migrate as smolts to sea. Smolt migration is seasonal with the smolt migration period being in the spring (April to May/June). The impact assessment therefore focuses on the effects of the potential increase in sea lice infestation on migrating smolts (salmon in particular due to the uncertainties regarding the distribution range and behaviour of sea trout in the marine environment). The assessment was informed by sea lice dispersal modelling which simulated the hydrodynamic properties of the assessment area (SSF farms within the Linnhe Farm Management Area) and accounted for sea lice biology to estimate sea lice numbers and dispersal patterns in the environment. The model outputs presented in this impact assessment represent a worst-case scenario as the model assumes a continuous level of sea lice (0.5 adult female lice per fish) which is an overestimation as adequate management would ensure that levels are generally maintained below 0.5 adult female lice per fish. The model also conservatively assumes that all adult female lice are ovigerous when in reality only between 40 and 60% are at any one time. The assessment found that the majority of migrating salmon smolts are expected to travel through the entire extent of the predicted lice dispersal area in less than a day and may be exposed to areas with the highest predicted sea lice densities for a matter of hours during their journey to open sea as they pass in proximity to SSF farms, should sea lice management at farms not be adequate. The likelihood and probability of migrating salmon smolts remaining in areas with the highest predicted sea lice densities for prolonged periods is low. This is due to the anticipated rapid swimming velocity of the salmon smolts; the limited extent of the predicted highest density areas (associated with each individual farm should sea lice management not be adequate) which they may encounter along their migratory path to open sea; and that adequate sea lice management would ensure that levels are generally maintained below 0.5 adult female lice per fish resulting in lower sea lice densities compared with those predicted in the worst-case modelling assessment.

The magnitude of the potential effect of increased sea lice infestation on wild salmonid populations is assessed as **high** as a **precautionary** approach has been adopted due to gaps in current available knowledge resulting in uncertainty in extrapolating and assessing the potential effects on wild salmonid populations. To address the uncertainties, SSF have committed to additional mitigation in the form of an Environmental Management Plan (Appendix 16). Adaptive

management is a structured process of robust decision making in the face of uncertainty, with an aim to reducing uncertainty over time through monitoring. Management objectives are regularly revisited and accordingly revised in response to new information allowing for continuous improvement in future management. The Environmental Management Plan, developed in consultation and agreed with Fisheries Management Scotland and the local Fisheries Boards and Trusts, will facilitate ongoing monitoring of lice loading from farmed fish as well as monitoring of population status and lice levels of wild salmonids. Mechanisms prescribed in the plan enable data sharing amongst stakeholders and allow for the ongoing review of farm management measures in response to farm and wild salmonid monitoring as well as when new knowledge on farmed and wild salmonid interactions becomes available.

Existing SSF sites within Disease Management Area 15b (Loch Linnhe, Firth of Lorne, Sound of Mull and Loch Sunart), have not had any notifiable diseases (listed under the Aquatic Animal Health (Scotland) Regulations 2009) since 2010. Standard mitigation measures are deemed adequate in ensuring fish health is managed in a manner preventing a risk to wild salmonids (refer to Section 7.4.5). SSF sites are inspected at least once a year by the Fish Health Inspectorate as part of their disease surveillance programme to ensure adequate fish health management. Aside from a single fish which escaped from Dunstaffnage due to a physical handling error in 2013, there has not been an escape event at an SSF farm in the Loch Linnhe Farm Management Area (FMA M-36) within the past 9 years. Considering this, standard mitigation measures are deemed adequate in preventing escapes (refer to Section 7.4.5). Therefore, the magnitude of the contribution from the Dunstaffnage expansion proposal or cumulative contribution as a result of the wider SSF Loch Linnhe programme of developments to the effects of transmission of disease and escapes on the wild salmonid population is considered to be **low.**

7.4.6.1 Significance of residual effects

The receptor (wild salmonids) in the study area is considered to have a **medium** weighting as the proposal is out-with areas designated for wild salmonids and areas of effect of any designated areas but the potential for interactions with these Priority Marine Feature exists.

The effects of transmission of disease from farmed salmon to wild salmonids and genetic introgression of wild salmonid populations, resulting from farm escapes at Dunstaffnage and other SSF sites and proposals within the Farm Management Area are determined as having a **low magnitude** overall. The standard mitigation measures are considered adequate to minimise the effects to an acceptable degree. It is anticipated that residual effects will therefore be of **minor significance**.

The magnitude of the potential effect of increased sea lice infestation on wild salmonid populations is assessed to be **high** as a **precautionary approach** has been adopted due to gaps in current available knowledge resulting in uncertainty in extrapolating and assessing the potential effects on wild salmonid populations. The residual effect is therefore considered to be of **moderate** significance. To manage this uncertainty an adaptive management approach, in addition to the standard mitigation measures for sea lice, is proposed. It is anticipated that with the implementation of adaptive management approach the significance of the residual effect can be reduced to **minor significance.** Refer to Table 7-7 for a summary of the potential impacts and effects.

Table 7-7 Summary of potential impacts and effects on wild salmonids

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
Direct Impacts – Dunstaffnage Proposal Only				
Increased biomass (increased number of hosts)	Potential increase in sea lice infestation	Potential effects on wild salmonid populations	Operate in accordance with the Farm Management Statement. Adhere to the Sea Lice Management Strategy and coordinate sea lice treatments where appropriate across the Farm Management Area to maximise the benefit of treatment options and reduce potential transfer of lice between farms. Adhere to the Environmental Management Plan and implement adaptive management measures, as necessary.	SSF are committed to effectively controlling sea lice levels. There are however gaps and uncertainties in current knowledge regarding potential impacts to wild salmonid populations **(residual effect of moderate significance)** and therefore this area requires further investigation through farm and wild fish monitoring. It is anticipated that with the implementation of the proposed Environmental Management Plan, including adaptive management in response to wild fish and farm monitoring findings, the significance of the **residual effect can be reduced to minor significance.**
	Potential for transmission of disease from farmed to wild salmonids		Adhere to the Fish Husbandry Manual.	SSF are committed to maintaining high fish health standards and endeavour to achieve a target of zero escapes across all sites **(residual effect of minor significance)**.
Potential escapes	Potential for genetic interactions with wild salmonids as well as competition for resources		Ensure cages, netting and moorings are designed to meet or exceed the Scottish Technical Standard taking into account the worst weather conditions expected at the farm location and potential for predator interactions.	
			Adhere to the Containment Plan and the Escapes Prevention and Recapture Strategy.	
Cumulative Impacts – existing farms and wider SSF Loch Linnhe development programme				

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
Measures to mitigate direct effects as described above also serve to mitigate cumulative effects. Cumulative contributions from existing farms and wider SSF Loch Linnhe development programme to the potential effects on wild salmonid populations are considered to be low as they are being actively and effectively managed. SSF sea lice data generally shows effective sea lice management at the Dunstaffnage site and sites within Loch Linnhe in terms of industry Code of Good Practice. The gaps and uncertainties in current knowledge regarding the potential effects of increased sea lice infestation on wild salmonid populations however require further investigation which will be facilitated through farm and wild fish monitoring as outlined in the Environmental Management Plan. Mechanisms are also in place to allow for adaptive management to be implemented in direct response to farm and wild fish monitoring and as and when new knowledge on farmed and wild salmonid interactions becomes available.				

7.5 COMMERCIAL FISHERIES

7.5.1 Introduction

7.5.1.1 Scottish fisheries

The following introductory information was obtained from the Scottish Government 2019 fisheries statistics report.[73] Commercial fishing is an important economic and cultural activity, particularly in vulnerable and remote coastal communities. In 2019, Scottish registered vessels landed 393 thousand tonnes of fish and shellfish at a value of £582 million pounds, with 4,886 people registered as employed on Scottish vessels. This figure is up 1% since 2018. Compared to 2018, there were 91 less regularly employed fishers (2% decrease), 86 more irregularly employed fishers (10% increase) and 31 more crofters who gain some part of their living from fishing.

The total value of landings varies by species, with shellfish generally generating more income per unit of weight than pelagic or demersal species. Demersal species were worth £191 million, a fall of 7% compared to 2018. Pelagic species decreased 5% in value to £195 million. Shellfish value increased 10% to £196 million.

In 2019, mackerel (*Scomber scombrus*) remained the species of highest landing quantity and value representing 27% of the value of all Scottish vessels' landings. *Nephrops* (*Nephrops norvegicus*) is the second most valuable species, with 15% of the total value.

Scotland's fishing fleet is dominated by vessels of 10m length or less which are commonly used for inshore fisheries which have an important role in maintaining the economy of coastal regions and rural communities. There were 2,098 active Scottish fishing vessels in 2019, an increase of 9 vessels from 2018. In 2019, the number of over 10m vessels was 539 (25% of the fleet), down 11 vessels (2%) from 2018. There were 1,559 vessels in the 10m and under fleet (74% of the fleet), an increase of 20 vessels (1%) compared to 2018.

7.5.1.2 Fisheries relevant to the assessment area

The area being assessed encompasses wider Loch Linnhe to encompass the potential impacts and effects of the Dunstaffnage proposal on commercial fisheries as well as the cumulative effects of the proposed programme of developments at a number of the existing sites within the Linnhe region, namely Lismore West, Lismore North and Shuna.

Port districts are collections of individual ports that come together to form one unit for fisheries administration. In Scotland, there are 18 port districts. Each port district is responsible for managing the vessels, fisheries and data reporting in their area. Landings data is reported at the International Council for the Exploration of the Sea (ICES) statistical rectangle level. Inshore fishery areas within the assessment area fall within portions of the 42E4 and 41E4 ICES statistical rectangles. The port district relevant to the assessment is therefore Oban. Of the total landings (9,845 tonnes) recorded for the Oban district in 2019 the majority (9,310 tonnes) was shellfish. Of the shellfish landed the main species were *Nephrops* (3,429 tonnes), followed by scallops (2,198 tonnes), edible crab (1,762 tonnes), lobster (1,076 tonnes) with the remainder of the tonnage landed comprising other shellfish. As at, 31 December 2019, there were 125 active Scottish registered vessels in the Oban district with the majority (86) being less than 10m in length. The Oban port district shellfish landings (2373 tonnes) account for 4% of the national landings (62,217 tonnes) and the *Nephrops* landings (489 tonnes) account for 2% of the national landings (24,080 tonnes).

In 2018, it was noted that fishing vessels of 10m or less, mainly use creels and tend to target shellfish, with 1,374 (88%) of the vessels that were 10m and under using creels. In the 2019 fisheries statistics report, all tables containing

73 Scottish Government. (2020) [online] at: https://www.gov.scot/publications/scottish-sea-fisheries-statistics-2019/pages/4/ accessed on 28/10/2020.

information on main fishing method have been removed from the publication due to concerns regarding the reliability of the main fishing method for active vessels due to the discontinuation of a data source as fishing method as declared on a vessel's licence is no longer regularly kept up to date between licence applications.

During pre-application consultation for the proposed Loch Linnhe programme of developments with the West Coast Regional Inshore Fisheries Group a consultee raised concerns regarding the proposed SSF programme of developments due to the potential impacts on commercial *Nephrops* fishing activities especially around Lismore. It was highlighted that 'the area around Lismore is currently heavily populated with creels and this area represents the only prawn trawl left to pursue in the area for mobile fishermen'.

Based on the latest landings data for Oban, the information provided by the member of the West Coast Regional Inshore Fisheries Group and the benthic habitat prevalent in the assessment area, *Nephrops* is anticipated to be the key target species in terms of commercial fisheries in the assessment area and was therefore selected as the point of focus of the assessment. *Nephrops* are also known as Norway lobster, langoustine, Dublin Bay prawns or scampi. *Nephrops* are the most valuable shellfish stock and the only shellfish species subject to quota[74]. The Scottish fleet fish for *Nephrops* by creeling and by trawling and both these methods are used in Loch Linnhe.

7.5.2 Baseline

7.5.2.1 Distribution and suitable habitat

Nephrops are a mud burrowing marine decapod crustacean. *Nephrops* distribution is limited by the extent of suitable muddy sediment in which they can construct burrows.[75]

In 2017, Marine Scotland developed the *Nephrops* Functional Units and suitable habitat layer on National Marine Plan interactive (NMPi)[76] for the purposes of management and stock assessment. *Nephrops* are assessed across Europe as individual stocks in 34 functional units (FUs). This data combines the ICES functional units (based on ICES statistical rectangles), with the actual extent of muddy sediment in Scottish and adjacent waters. This is based on British Geological Survey information and Vessel Monitoring Systems data (to map inferred fishing distribution of the *Nephrops* fleet). The assessment area is located within FU12, the South Minch FU and does not include suitable *Nephrops* habitat (refer to Figure 7-16) in terms of importance for fisheries stock management.

74 Quota Fish are species that subject to international quotas. Quotas are the tonnage of fish of different species that may be legally landed from defined sea areas by individual countries. The UK Quotas are divided up and allocated to Fish Producer Organisations according to the number of Fixed Quota Allocation units held by the Producer Organisation and their member vessels. National quotas are negotiated as a share of the Total Allowable Catch.

75 Marine Scotland. (2018) Nephrops (Norway Lobster) [online] at: https://www.gov.scot/Topics/marine/marine-environment/species/fish/shellfish/nephrops.

76 http://marine.gov.scot/maps/334.

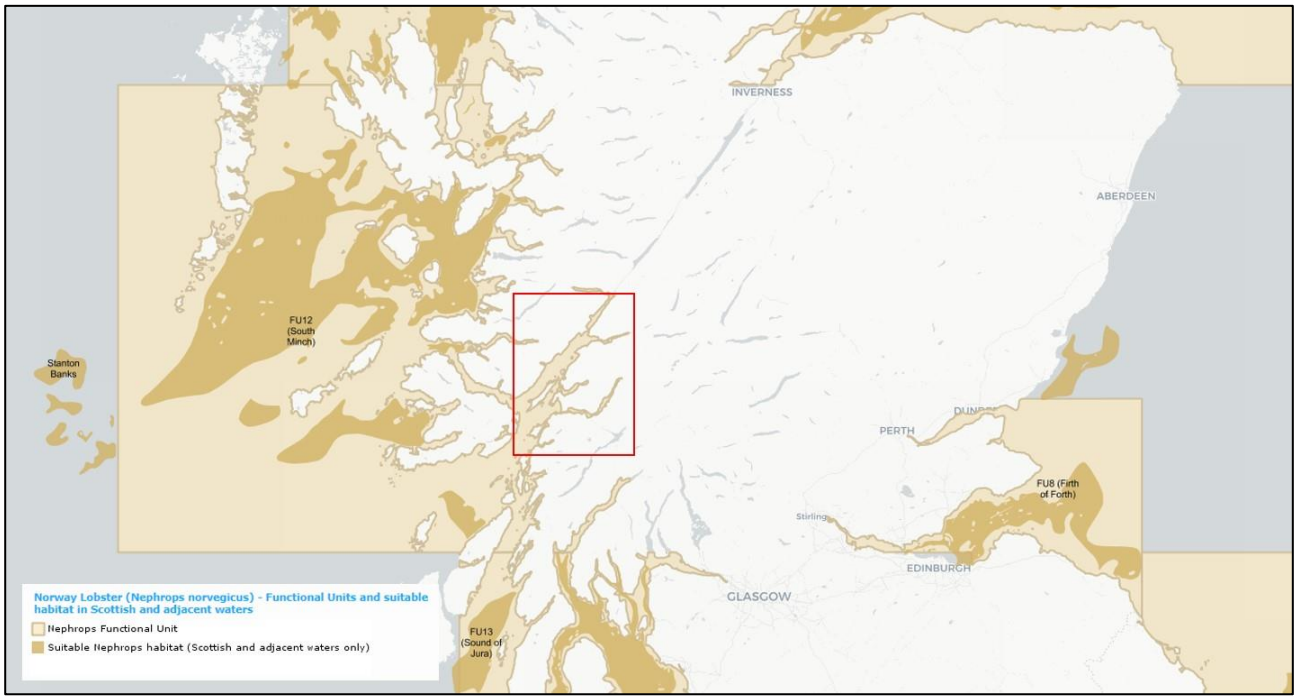

Figure 7-16 Marine Scotland Nephrops - Functional Units and suitable habitat in relation to the EIA assessment area shown in red[77]

According to the Marine Scotland fisheries sensitivity layers on National Marine Plan interactive (NMPi)[78] the entire assessment area is considered *Nephrops* spawning and nursery grounds. According to Scottish Natural Heritage spatial data [79] available on National Marine Plan interactive (NMPi) a conservative indication of the possible availability of *Nephrops* habitat by assuming suitable habitat exists where Burrowed Mud habitat is present (refer to Section 7.4.3.3 for a description of the assumptions and uncertainties associated with the use of this data). This data shows a wide extent of a high number of records of the habitat across Loch Linnhe (refer to Figure 7-17). This concurs with the Scottish Natural Heritage commissioned report describing Scottish Priority Marine Features, which states that Burrowed Mud is extensively distributed along the Scottish west coast.[80]

77 https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=334.

78 http://marine.gov.scot/data/fisheries-sensitivity-maps-british-waters-coull-et-al-1998.

79 https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=GEMS-PMF

80 Scottish Natural Heritage (2016) Descriptions of Scottish Priority Marine Features (PMFs) [online] at: https://www.nature.scot/sites/default/files/Publication%202016%20-%20SNH%20Commissioned%20Report%20406%20-%20Descriptions%20of%20Scottish%20Priority%20Marine%20Features%20%28PMFs%29.pdf accessed on 01/11/2020.

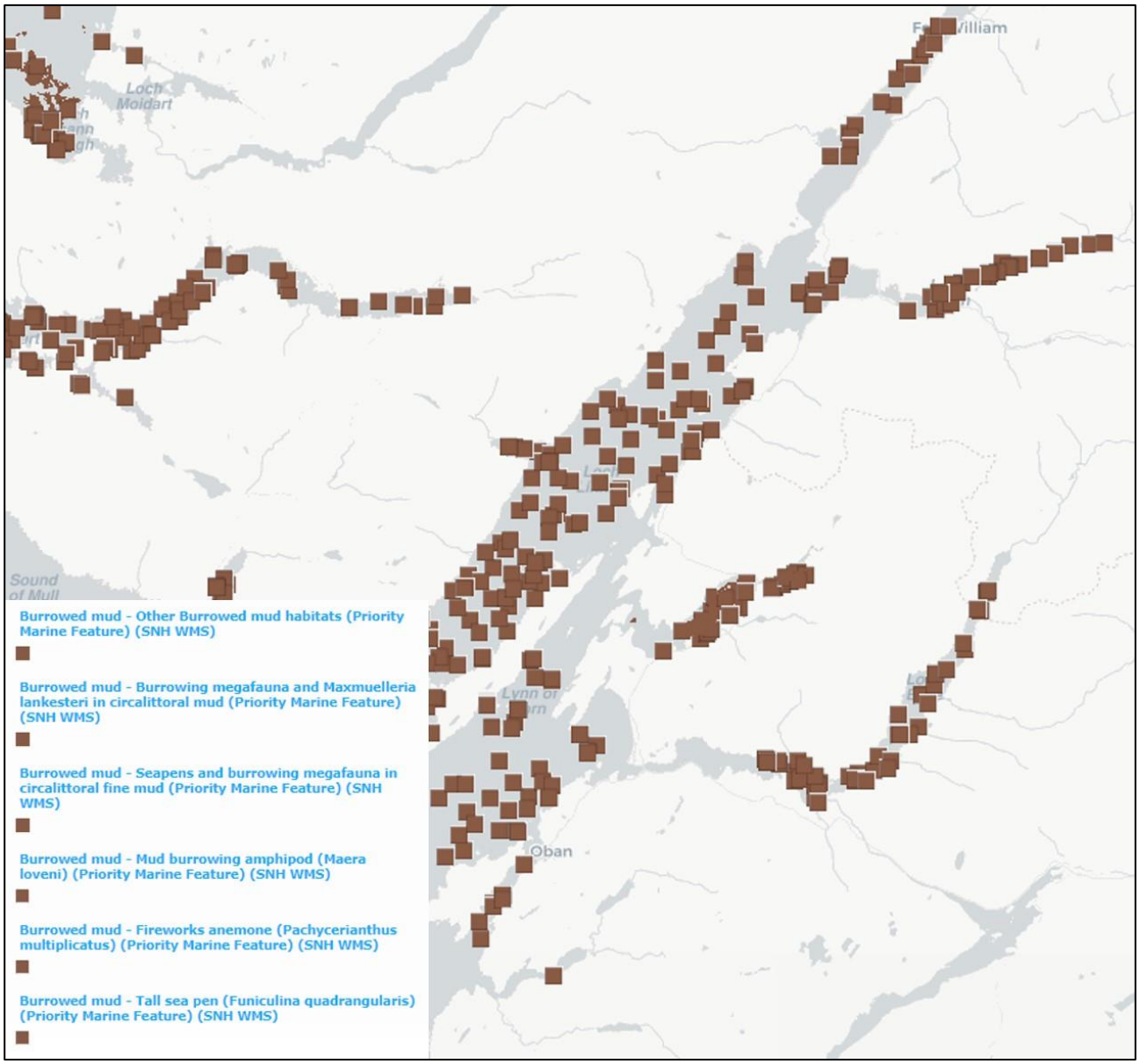

Figure 7-17 Delineated burrowed mud habitat within the assessment area[79]

During the EIA screening process for the proposed Loch Linnhe programme of developments, Scottish Natural Heritage also confirmed that this Priority Marine Feature habitat is of local significance but is widely distributed, and that the proposals were therefore unlikely to have a significant effect on the national status.

Benthic surveys conducted at the SSF farms forming part of the programme of development within Loch Linnhe to inform the development proposals found that *Nephrops* habitat was available. The survey conducted at Dunstaffnage[81] for the proposed expansion identified that there was little variation in seabed characteristics throughout the survey site, with water depths ranging from approximately 35–45m. Sediments across the area were dominated by soft muds with numerous *Nephrops norvegicus* burrows throughout the soft muds of the survey area. The findings of the survey align with a previous survey conducted in 2013 by Scottish Natural Heritage of the wider Firth of Lorn area including between

81 Aquatera (2019) Argyll and Summer Isles Sites Benthic ROV Survey Dunstaffnage undertaken for SSF.

the islands of Lismore and Kerrera[82]. Biological analysis revealed that Burrowed Mud was widely distributed across the northern region of the Firth of Lorn, with observations of *Nephrops* in soft muds.

The survey conducted at Lismore West[83] found that there was slight variation in seabed characteristics throughout the Lismore West survey site. Water depths ranged from approximately 20 – 40m depth. Sediments composed of fine sands and muds were predominantly observed throughout the site and numerous *Nephrops* burrows were observed throughout the soft muds of the survey area.

The survey conducted at Lismore North found that within the shallower water (<20m) the substrate mainly comprised mixed coarse sediments and rocky substrate, while the deeper water (30-50m) was dominated by fine burrowed muds. Numerous *Nephrops* burrows were observed throughout the soft-muddy sediments below approximately 30m depth.[84]

The survey conducted at Shuna[85], showed slight variations in seabed characteristics were observed throughout the survey area. Water depths ranged from approximately 9m in the southern part of the survey area off the coast to 47m in the northwest. Sediments in shallow areas less than 20m were heterogeneous and consisted of variable proportions of fine sands, gravel, and shell fragments with scattered pebbles, cobbles and occasional boulders. At depths greater than 20m, the composition of sediments transitioned to fine sands and muds with common patches of coarse material including pebbles and cobbles, as well as aggregations of shells. Soft muds dominated at depths greater than 30m throughout the north and west of the survey area. Numerous *Nephrops* burrows were observed throughout the soft muds of the survey area.

7.5.2.2 Fishing intensity

Information on the activity for larger vessels (vessels greater than 15m in length) is available from satellite-based Vessel Monitoring Systems (Vessel Monitoring Systems). The Marine Scotland Vessel Monitoring Systems amalgamated intensity layers provide an indication of the most intense areas for various types of fishing in Scottish waters including *Nephrops* fishing for both mobile and static gear. Several years' (2009 – 2013) of data have been amalgamated and effectively show spatial patterns in high-resolution for both intense and infrequently fished areas, with darker areas representing higher activity.[86] The data indicates that the assessment area falls within low intensity fishing areas for larger vessels (>12m) for both static and mobile gear (refer to Figure 7-18 and Figure 7-19 respectively).

82 Moore, C.G. (2013). Biological analyses of underwater video from research cruises in Lochs Kishorn and Sunart, off the Mull of Kintyre and islands of Rum, Tiree and Islay, and in the Firth of Lorn and Sound of Mull approaches. Scottish Natural Heritage Commissioned Report No. 574.

83 Aquatera (2018) Argyll and Summer Isles Sites Benthic ROV Survey Lismore West undertaken for SSF.

84 Aquatera (2018) Dubh Sgeir (Option A – Site Expansion) Benthic ROV Survey undertaken for SSF.

85 Aquatera (2019) Benthic ROV Survey Shuna undertaken for SSF.

86 http://marine.gov.scot/node/12882.

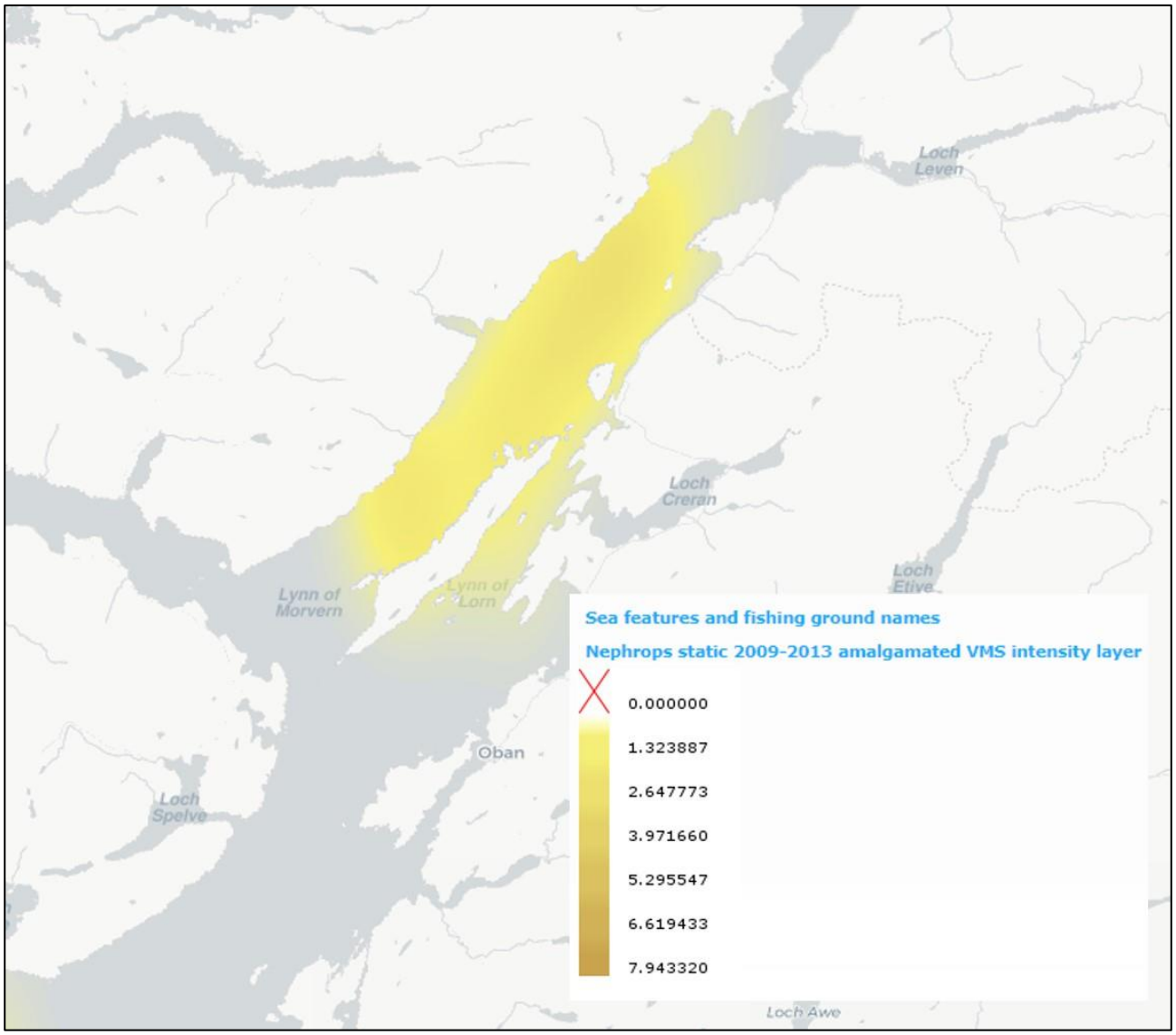

Figure 7-18 Nephrops creel fishing vessel (> 15m in length) activity within the assessment area

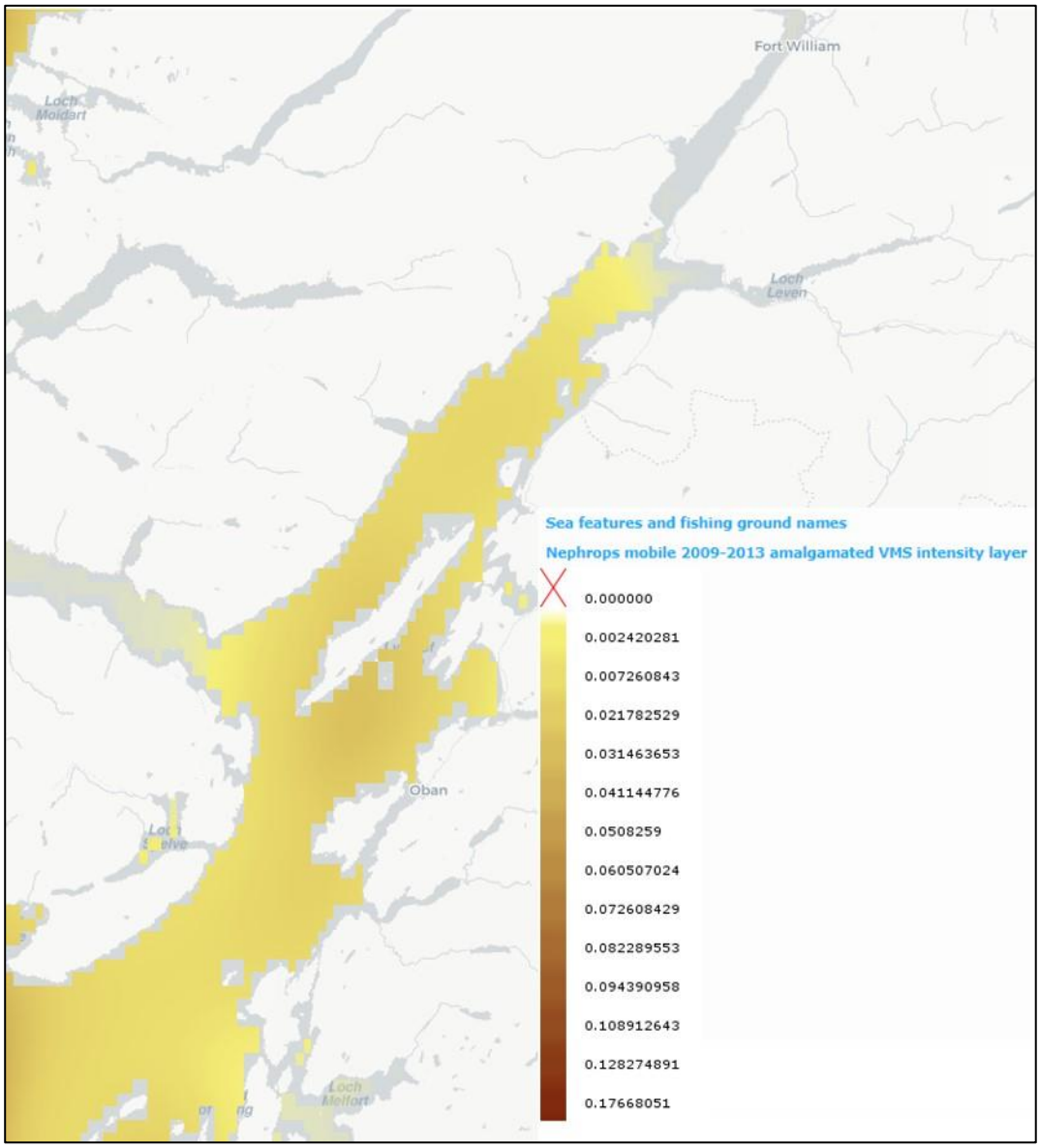

Figure 7-19 Nephrops trawl fishing vessel (> 15m in length) activity within the assessment area

ICES produced spatial data layers of fishing intensity in response to an OSPAR request to inform a benthic impact assessment.[87] The layer was produced using relevant Vessel Monitoring Systems and logbook data for the period 2009 - 2017. The amalgamated data for this period shows that the average trawl fishing intensity for *Nephrop*s within the assessment area varies between hours to up to a week based on vessel activity within the area (refer to Figure 7-20).

87 ICES (2018) https://www.ices.dk/SITES/PUB/PUBLICATION%20REPORTS/ADVICE/2018/SPECIAL_REQUESTS/OSPAR.2018.14.PDF

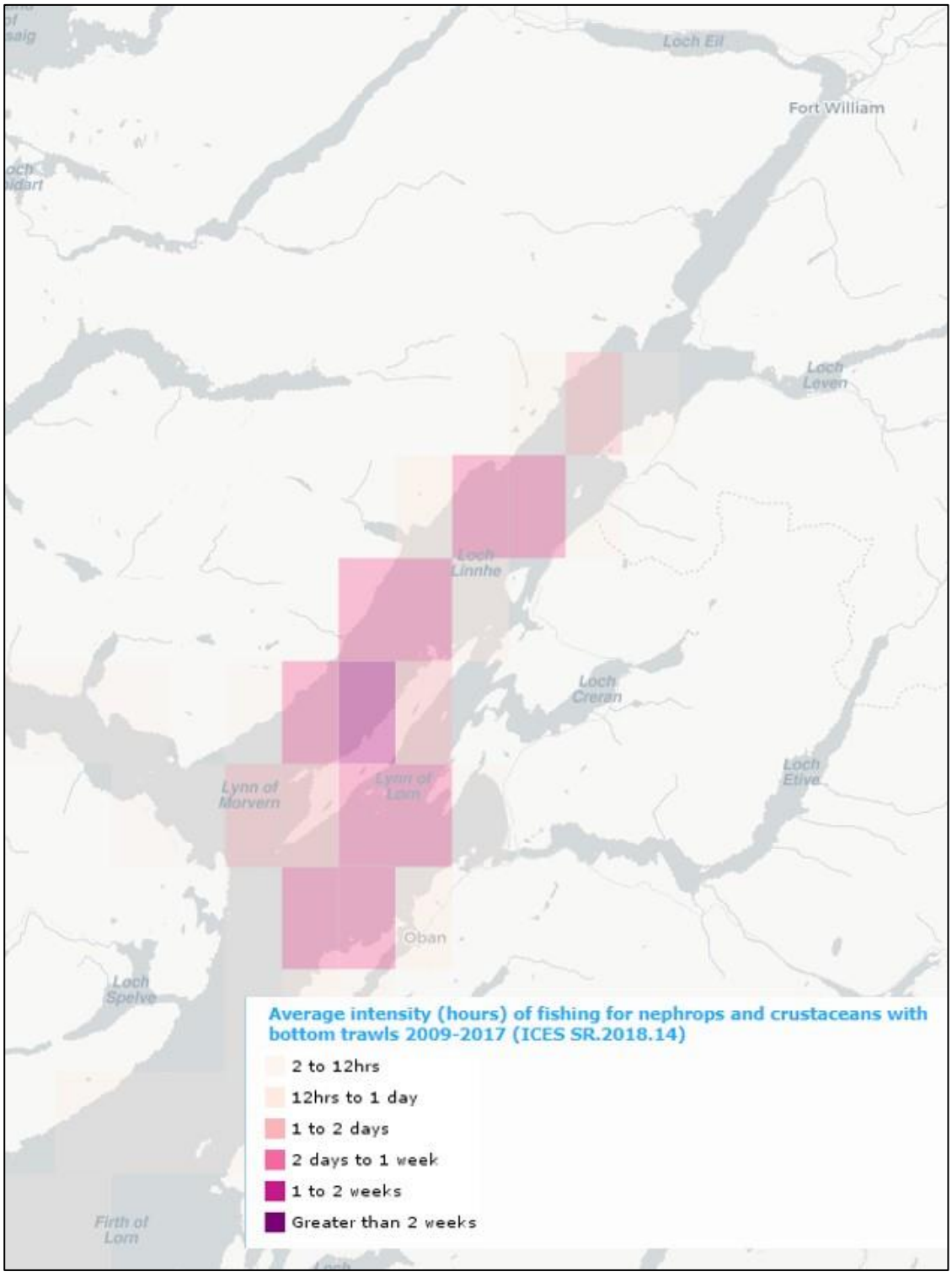

Figure 7-20 Nephrops trawl fishing intensity (vessels > 15m in length) within the assessment area

However, the majority of the Scottish fleet overall as well as vessels registered in the Oban are smaller fishing vessels that are not currently fitted with Vessel Monitoring Systems . Information about where these vessels fish is based on landings data which, because they are reported at the ICES statistical rectangle level (which are 30 nautical miles (nm) by 30 nm in extent), are of relatively poor spatial resolution and of limited utility. Recognising the need for better information on the under 15m fleet, Marine Scotland carried out a fishery mapping project known as ScotMap for the

period between 2007 - 2011. The ScotMap data[88] was utilised to provide an indication of the high value *Nephrops* fisheries areas in Scotland and to provide an indication of the comparable value of any *Nephrops* fisheries areas within the assessment area. However, there are limitations associated with this data which are outlined in Section 7.4.3.3.

Maps of the *Nephrops* creel fishing vessel activity and value (Figure 7-21 a and b) show an almost exclusively west coast distribution. Activity and value are concentrated to the east of the Outer Hebrides extending into both the North and South Minch, around Skye, in the sea lochs along the north west coast and the Inner Sound of Raasay. The mapping also indicates important *Nephrops* creel fishing areas further south, around Mull and Jura and smaller high value areas to the north of Islay and in the sea lochs of the Clyde.

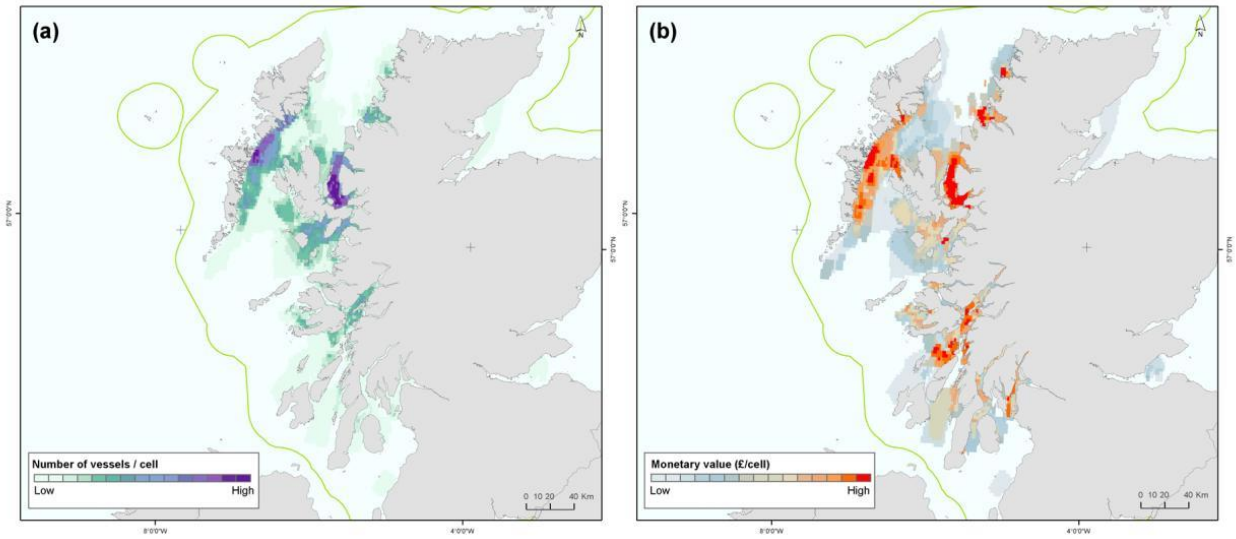

Figure 7-21 Nephrops creel fishing vessel activity (a) and value (b)[88]

The vessel number and value maps of trawl fishing for *Nephrops* (Figure 7-22 a and b) show fisheries off both the east and west coasts of Scotland, with a generally more offshore distribution than those of creels. There are significant concentrations of activity in the Moray Firth, the Firth of Forth and extensive areas in the North and South Minch, with areas of particularly high activity and/or value around Skye, Rum and Eigg and North of Raasay.

88 Kafas, A., McLay, A., Chimienti, M., and Gubbins, M. (2014) ScotMap Inshore Fisheries Mapping in Scotland: Recording Fishermen's use of the Sea, Scottish Marine and Freshwater Science. doi: 10.7489/1616-1 [online] at: http://marine.gov.scot/information/scotmap-inshore-fisheries-mapping-project-scotland accessed on 03/11/2020.

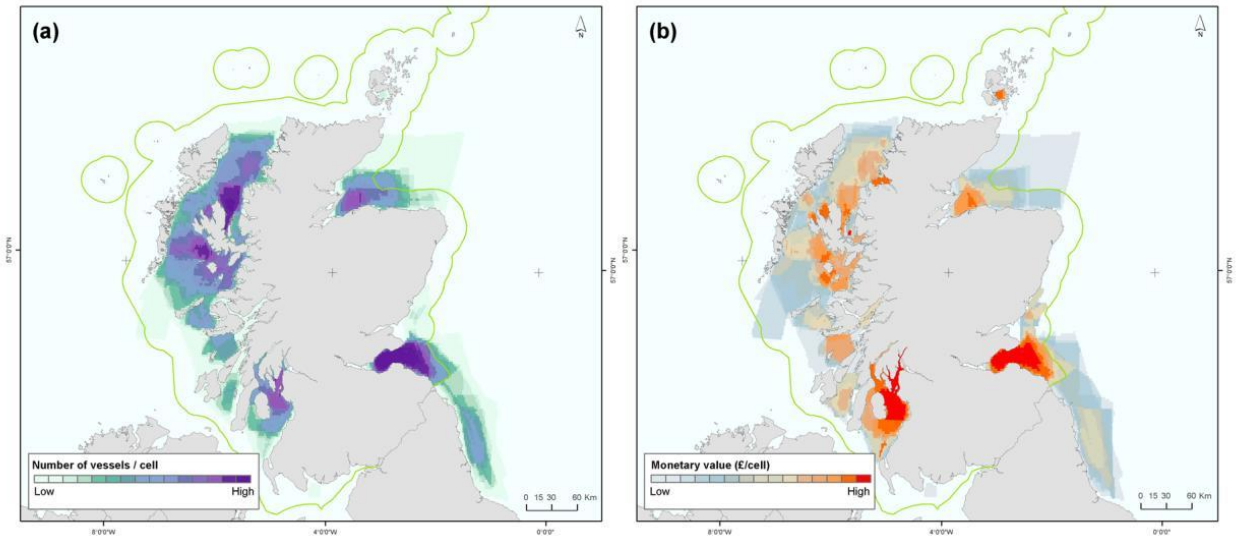

Figure 7-22 Nephrops trawl fishing vessel activity (a) and value (b)[88]

The ScotMap study indicates that the assessment area falls out-with high value trawl fishing areas, which is expected due to the inshore location. The study also found that the entire assessment area is characterised as low-moderate value (£806 annual landings value) and it is estimated that 3 trawling vessels fished within the grid squares that overlap with the proposal areas and the wider assessment area during the study period. This data however represents a snapshot of a period (2007 - 2011) prior to spatial management restrictions being imposed as a result of the Loch Sunart to Sound of Jura Marine Protected Area being designated in 2016 for the protection of the common skate[89] (refer to Figure 7-23). Restrictions imposed on trawling in the area may therefore have resulted in changes to the fishing intensity since 2016.

[89] Loch Sunart to the Sound of Jura NCMPA - designation documents [online] at: https://www.nature.scot/professional-advice/protected-areas-and-species/protected-areas/marine-protected-areas/nature-conservation-mpas/loch-sunart-sound-jura-ncmpa accessed on 09/11/2020.

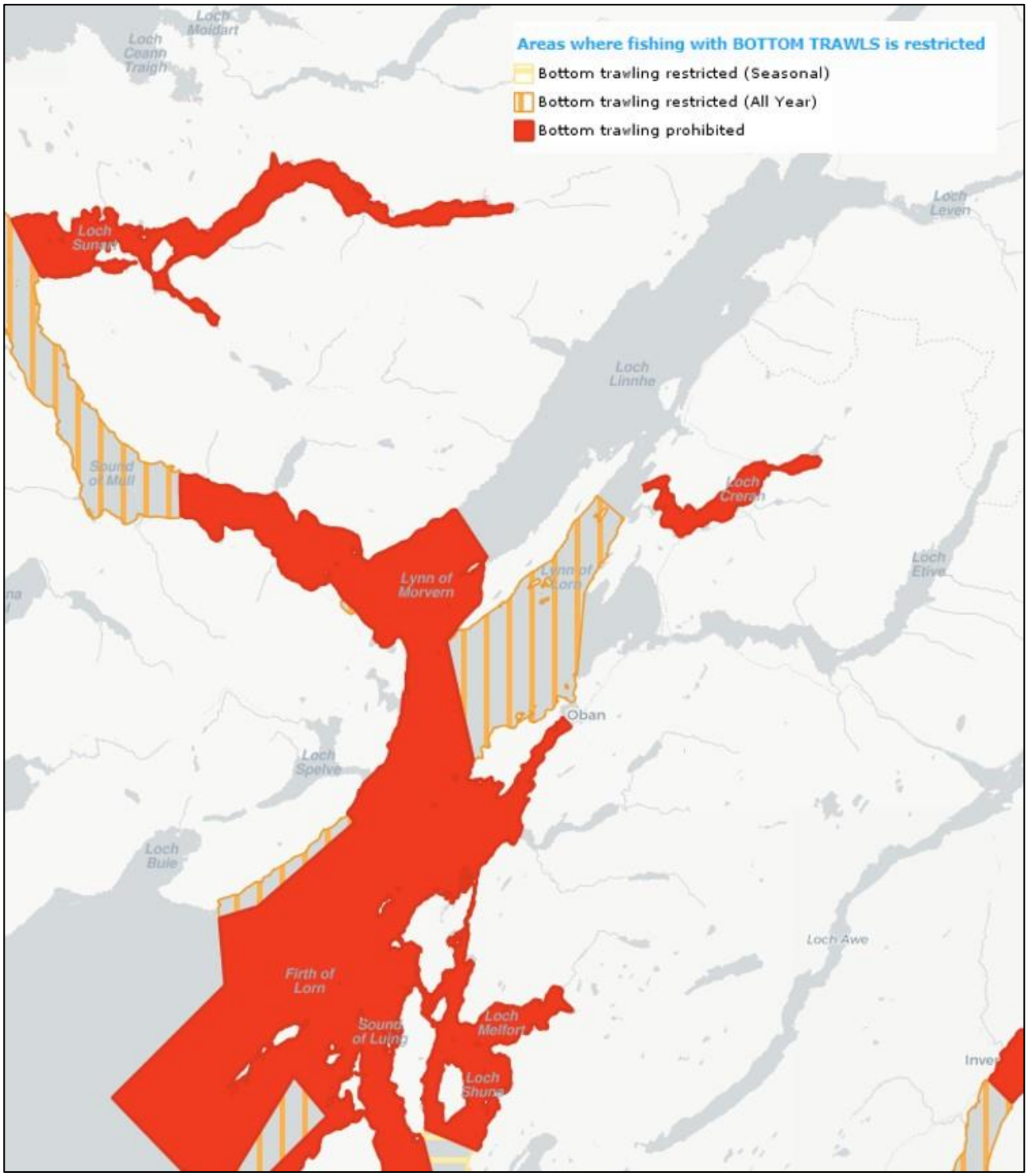

Figure 7-23 Trawling restrictions in the assessment area imposed as a result of the designation of the Loch Sunart to Sound of Jura Marine Protected Area

The designation of the Marine Protected Area has not imposed restrictions on creeling and there are localised areas of moderate to high value creel fishing within the assessment area (refer to Figure 7-24). The Dunstaffnage proposal falls within an area of moderate value (£4673 – £6094 annual landings value), Lismore West falls within an area of moderately high value (£7924 - £10970), Lismore North falls within an area of low value (£2439 – £2641) and Shuna falls within an area of lower value (£1220 - £1828).

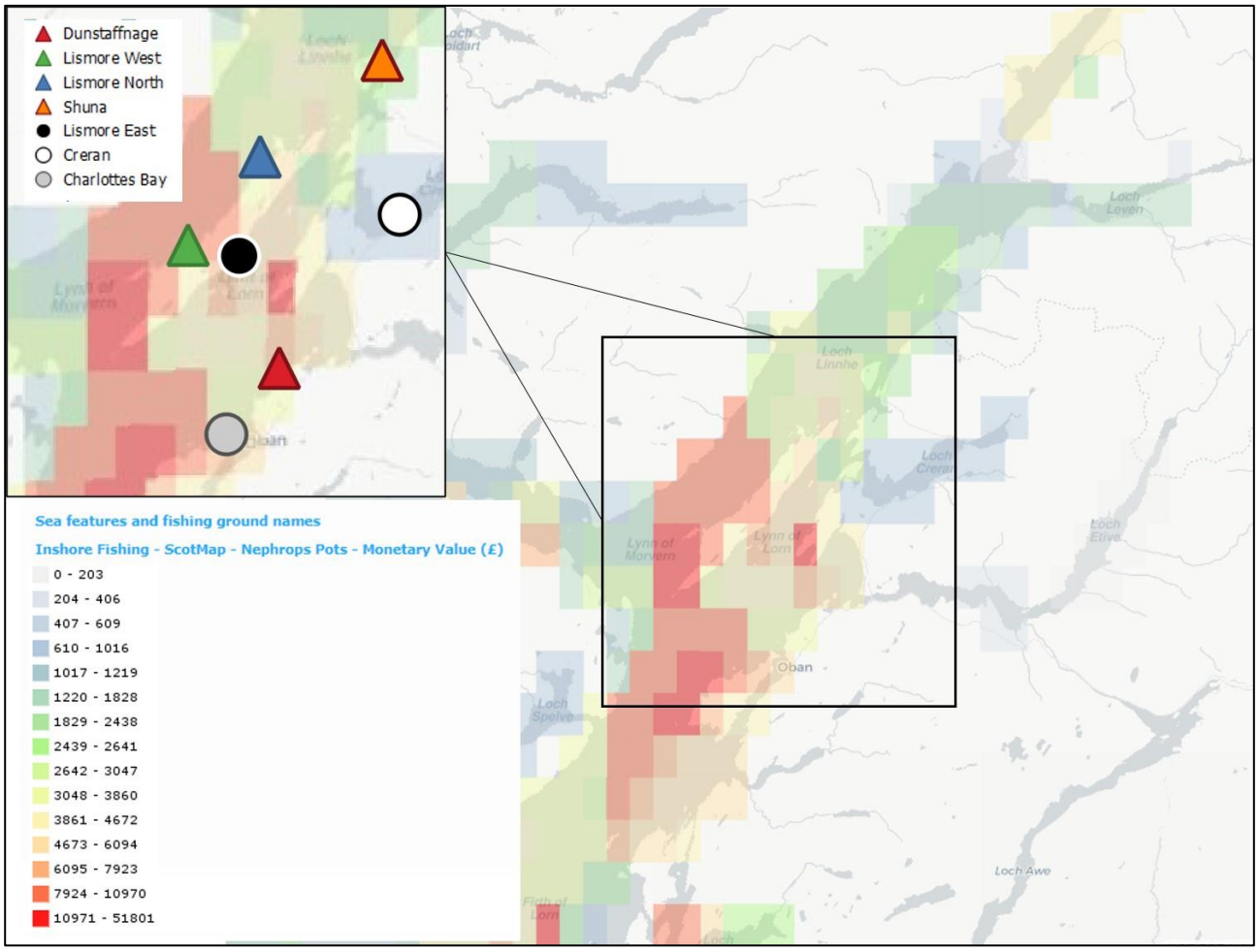

Figure 7-24 Estimated annual landings value of Nephrops creel fishery within the assessment area and in relation to the existing farms including those which form part of the programme of developments (indicated with triangles)[88]

The ScotMap study estimated that during the study period (2007 - 2011) between 6 and 10 creeling vessels fished within the grid squares that overlap with the proposal areas and the wider assessment area (refer to Figure 7-25). This equates to (5 - 8%) of the fleet of vessels (125) registered in the Oban port district.

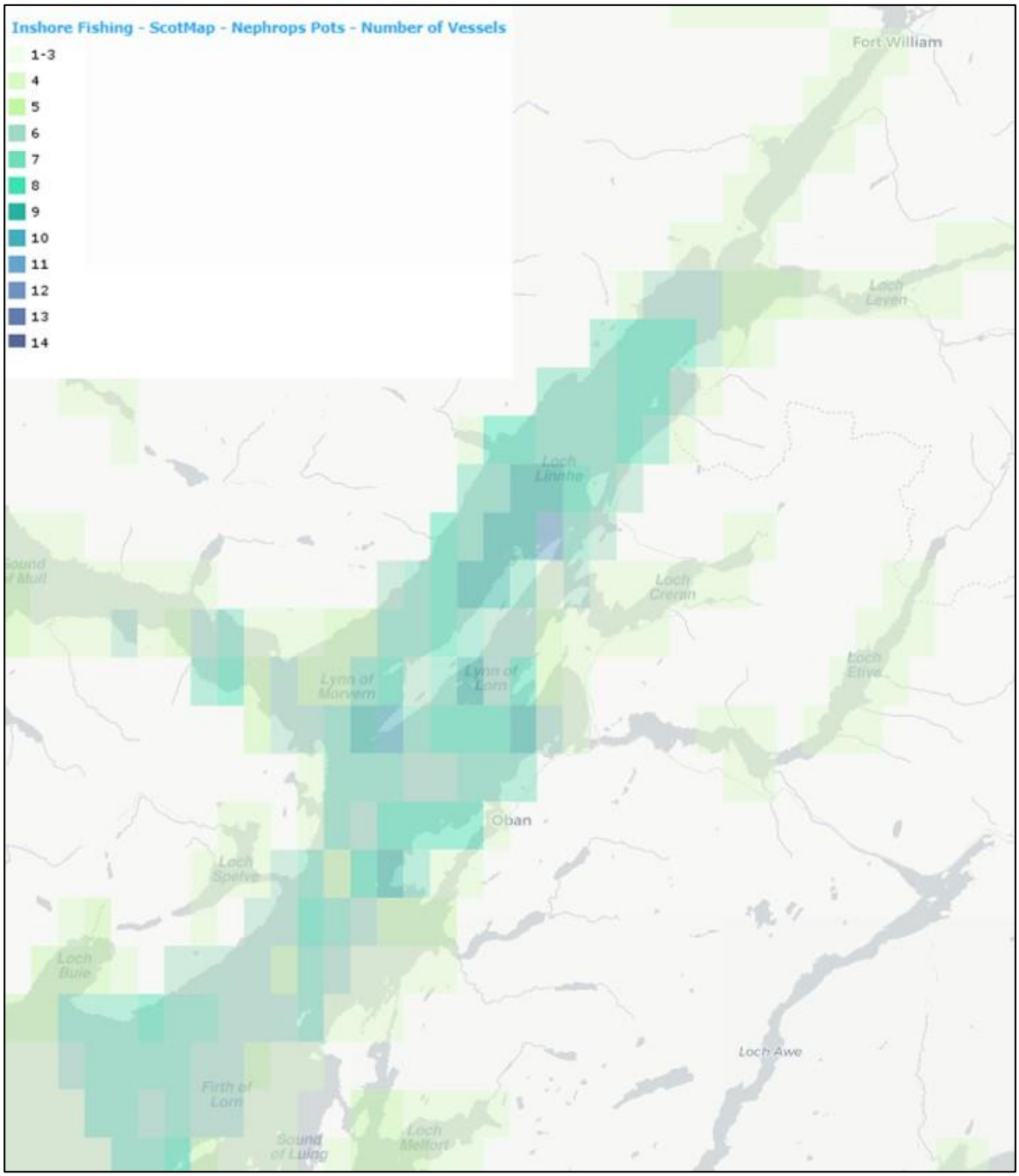

Figure 7-25 Nephrops creel fishing vessel (<15 m in length) activity within the assessment area for the study period (2007 – 2011)[88]

A study to assess the environmental sustainability of fish stocks and the socio-economic efficiency of creel fishing activity was conducted in 2017 with the aim to inform effective fisheries management in Scotland's inshore waters.[90] The study focussed on the fishing effort within the static gear sector, in particular, those vessels fishing with creels in four regions

90 Gallego, A. (2017) Marine Scotland Science: Creel Fishing Effort Study [online] at: https://www.gov.scot/Resource/0052/00523958.pdf accessed on 03/11/2020.

in Scotland. *Nephrops* fishery on the west coast of Scotland was one of the regions analysed. The findings from the west coast region indicated that the number of *Nephrops* creels that vessels deployed (in water capacity) at any one time to target *Nephrops* ranged from 50 to 2,500 creels per vessel and average number of deployed creels across all surveyed vessels was 925. When broken down, vessels operated by 2 crews, deployed an average of 1,167 creels and those operated by 3+ crews deploying an average of 1,693 creels per vessel. Around 10% of surveyed vessels deployed over 2,000 creels, 25% deployed between 1,000 to 1,999 creels and the remaining 65% deployed under 1,000 creels. Gear haul rates per 4km^2 ranged from 0.1 creels hauled per day in very lightly fished areas to 640 creels hauled per day per 4km^2 grid cell in highly fished areas.

The region studied includes the assessment area and as such the findings could be used to provide an indication of the comparable *Nephrops* creel fishing effort within the assessment area. The fishing effort in the assessment area (refer to Figure 7-26) ranged between 7 and 149 creels hauled per day. The Dunstaffnage proposal falls within a grid cell with an average of 35 creels hauled per day, Lismore West falls within a cell with an average of 34 creels hauled per day, Lismore North falls within a grid cell with an average of 25 creels hauled per day and Shuna falls within a grid cell with an average of 21 creels hauled per day indicating that the proposal areas as well as the wider assessment area is lightly fished in comparison to other areas in the same region.

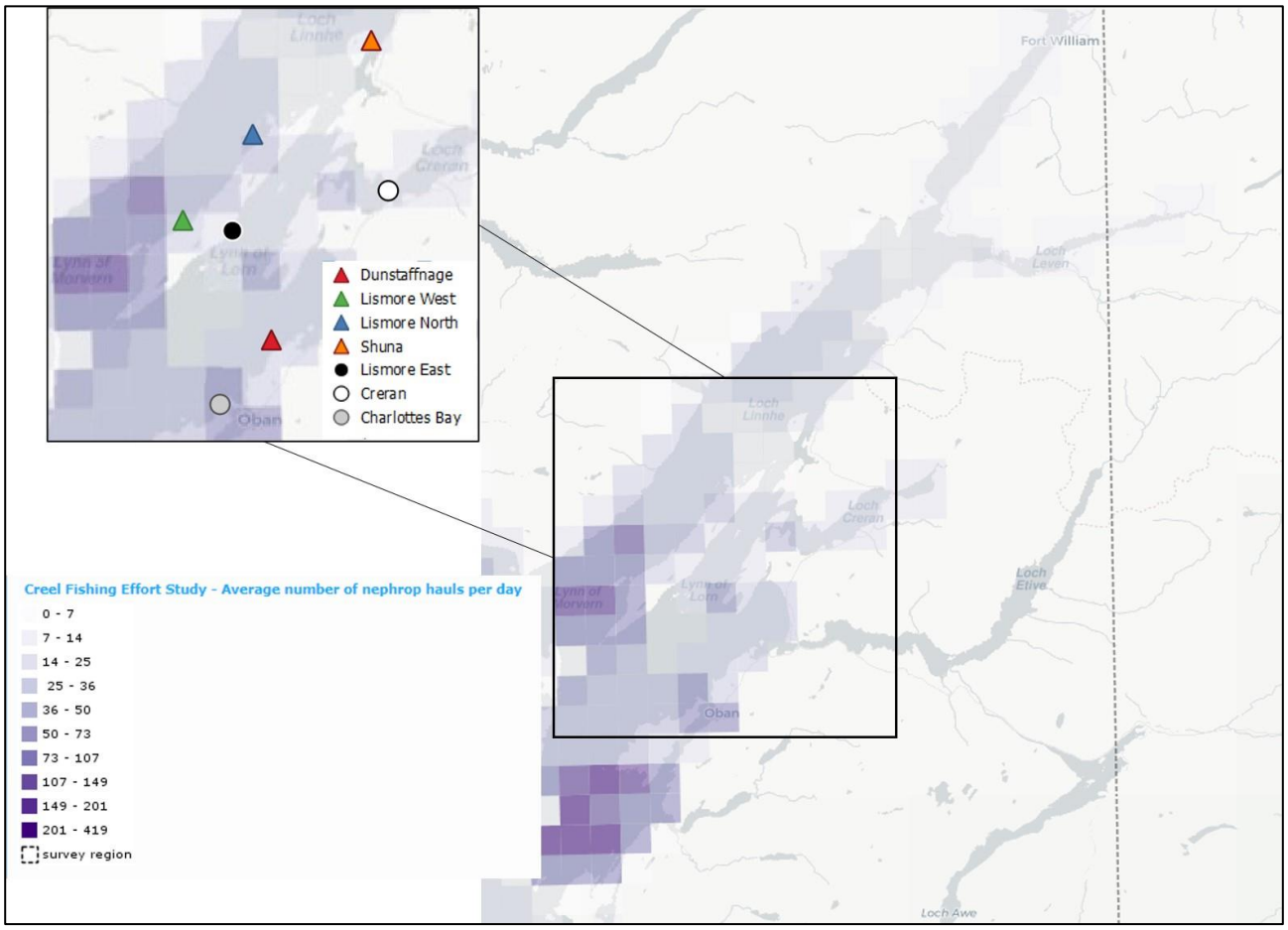

Figure 7-26 Nephrops creel fishing effort within the assessment area and in relation to the existing farms including those which form part of the programme of developments (indicated with triangles)[90]

7.5.3 Assessment

Potential impacts on commercial fisheries from salmon farms include:

- Loss of access to fishing grounds due to presence of the farm and associated economic effects.
- Changes to the abundance of *Nephrops* as a result of degradation and modification of benthic community assemblages.

Both the above-mentioned direct impacts have the potential to result in the following indirect effects:

- Adverse impacts on the income and livelihoods of individual fishermen.
- Displacement of fisherman to other fishing grounds resulting in increased pressure on resources or conflict with other sea users.

7.5.3.1 Loss of access to fishing grounds

The assessment area is out-with high value trawl fishing areas (refer to Figure 7-22) and a low number (3) of fishing vessels using mobile gear were estimated to utilise the assessment area for *Nephrops* trawling. However, the restrictions on trawling imposed in 2016 as a result of the designation of the Loch Sunart to Sound of Jura Marine Protected Area (refer to Figure 7-23) may have resulted in a change in the intensity of trawling in the remaining unrestricted areas by fishermen in the area. The proposal falls out-with the restricted trawling areas and therefore may be utilised by fishermen in the area for trawling.

Localised areas of moderate to high commercial value creel fishing ground occur within the assessment area (refer to Figure 7-24), mainly located around Lismore, the assessment area including these higher value areas are lightly fished compared with other areas with suitable *Nephrops* habitat in the region (refer to Figure 7-26).

The number of creeling fishing vessels estimated to be directly affected by the programme of developments in Loch Linnhe is expected to be between 6 and 10 (refer to Figure 7-25), which equates to (5 - 8%) of the fleet registered in the Oban port district overall and 3 trawling vessels are estimated to be affected (2% of the registered Oban fleet).

To facilitate the safety of sea users, fishermen are excluded from the entire moorings area of a farm to avoid interaction with farm infrastructure and vessels associated with site operations.

Table 7-8 Extent of proposed expanded moorings areas of SSF farms which form part of the Loch Linnhe development programme and estimated annual value

Site	Extent of the moorings area associated with the proposal[91]	Percentage of 4km^2 grid cell	Annual landings value of *Nephrops* creel fishing grounds within the 4km^2 grid cell[92]	Annual landings value of *Nephrops* trawl fishing grounds within the 4km^2 grid cell[93]
Dunstaffnage	153,701m^2 (0.15km^2)	3.75%	X £6094 = £229	X £806 = £30
Lismore West	127,718m^2 (0.13km^2)	3.25%	X £10970 = £357	X £806 = £26
Shuna	307,500m^2 (0.31km^2)	7.75%	X £2641 = £205	X £806 = £62
Lismore North	192,975m^2 (0.19km^2)	4.75%	X £1828 = £86	X £806 = £38
Total	**0.78km^2**		**£877**	**£156**

Table 7-8 shows the estimated loss of value and subsequent income for fishermen operating within the assessment area as a result of the proposals going ahead if landings are assumed to be distributed equally across the 4km^2 grid cell areas and the whole area to be directly lost by the moorings extent assumed to be important *Nephrops* fishing grounds. The total combined area to be lost due to the proposed programme of developments takes up approximately 0.78km^2 at a total anticipated annual value of £877 and £156 for creeling and trawling respectively. As a cautious estimate, assuming this value may have doubled since the data were gathered, and to account for the low survey response rate (55% participation) and potential under-reporting the total estimated annual landings values, assumed to be lost, were doubled (£1754 and £312).

It is anticipated that the activities of a low number of fishing vessels comparable to the port district fleet would only be partially impacted if the proposed sites were to be developed suggesting that the developments are unlikely to have a high adverse impact on the *Nephrops* fishery in the district as a whole. Due to the predicted comparably low fishing effort in the grid cells where development is proposed as well as within the wider assessment area in proportion to the fishing grounds of similar or higher value available within the region, any change to the *Nephrops* fishery and potential economic effects as a result of the proposals is likely to be localised and of a **low** magnitude. However, it is possible that

91 For the new consolidated Lismore North site and new Shuna site the total moorings areas are being assessed, but only the additional moorings areas associated with the expansion proposals at Dunstaffnage and Lismore West (areas currently available to fishermen are being assessed ..

92 ScotMap provides a range estimation of average annual monetary value of landings for the inshore fleet during a snapshot period (2007-2011) across a grid cell area of 4 km2. The ScotMap monetary values for the grid cell areas where the proposals are located have been utilised for the assessment. It is likely that value of the fishing grounds will not be homogenous across the grid cell area, therefore the higher estimate of monetary value in proximity to the proposal is assumed as a further precaution to ensure a worst-case impact scenario is assessed in the absence of accurate spatial and economic data.

93 ScotMap provides a range estimation of average annual monetary value of landings for the inshore fleet during a snapshot period (2007-2011) across a grid cell area of 4 km2 and for trawling the monetary value was consistent across the assessment area. The ScotMap monetary value for the grid cell areas where the proposals are located have been utilised for the assessment.

any proportional loss of landings may result in a greater impact on income for individual fishermen affected by the proposals.

7.5.3.2 Changes to the distribution and abundance of Nephrops

The Burrowed Mud habitat present throughout the assessment area (refer to Figure 7-17) has the potential to host *Nephrops*, with the presence of *Nephrops* being confirmed in multiple locations. However, the distribution of Burrowed Mud habitat may not indicate or correlate with the spatial distribution of suitable or important *Nephrops* habitat in terms of fishery interests. The assessment area has not been highlighted as suitable *Nephrops* habitat in terms of importance for fisheries stock management (refer to Figure 7-16), is out-with high value trawl fishing areas (refer to Figure 7-22) and has not been identified as intensely fished through creeling (refer to Figure 7-26). Although *Nephrops* habitat is present within the assessment area, the assessment area is small in comparison to the wider habitat availability in the region which is considered more suitable in terms of fishery interests.

The increased deposition of organic material from the fish farming activities may lead to the degradation of benthic communities directly beneath the cages and a change in community structure within the Allowable Zone of Effect, as high levels of organic material can cause the sediment to become enriched and potentially oxygen-depleted. In such conditions, diversity of the invertebrate infauna is predicted to fall, and the number of opportunistic species (short-lived, opportunistic detritus feeding polychaetes) will rise both in species numbers and abundance of individuals. As Nephrops are mobile, they are expected to relocate as a result of the change. Medicinal residues from lice treatments may pose a risk to benthic organisms including *Nephrops*. Azamethiphos is not expected to pose a risk to benthic organisms as it remains in the aqueous phase until broken down into non-toxic derivatives, however the pyrethroid bath treatments (cypermethrin and deltamethrin) are not water soluble and are quickly removed from the aqueous phase by readily binding to organic particles and other solids and are incorporated into sediments. Although benthic organisms closely associated with the sediment are therefore potentially at risk, the pyrethroids bind strongly to the particulates and to organic particles especially, thereby becoming less bio-available in organically enhanced environments such as directly beneath the cages. The active chemical ingredient emamectin benzoate of in-feed lice treatment is toxic to crustacea. However, mobile crustacea, including *Nephrops*, are likely to move away from the near-field Allowable Zone of Effect due to particle size change, therefore the smaller burrowing amphipods are considered most likely to be impacted. The potential benthic impacts have been assessed in detail in Section 7.2 above. The modification of benthic communities and assemblages in the affected areas as a result of nutrient enrichment and medicinal residues is likely to involve a reduction in the abundance of *Nephrops* in these areas. The effects arising from the proposals on the benthic community will generally be limited to the site and a local scale within the Allowable Zone of Effect which overlaps with the existing footprints and the consequence is anticipated to be minimal, taking into account the wider habitat availability (refer to Table 7-9).

The benthic impacts of the proposals are required to be assessed by SEPA, through the process of determining the CAR licences. The effects have been predicted not to exceed the appropriate benthic Environmental Quality Standards and SEPA have issued a CAR Licence variation in respect of chemical treatments and discharges from Dunstaffnage, Lismore West and are still to assess the proposed biomass increase for Lismore North and an application for the Shuna proposal. Standard mitigation measures (refer to Section 7.5.5) are considered adequate to minimise the effects on benthic habitat to an acceptable degree.

Table 7-9 Benthic footprints associated with the proposals which form of the Loch Linnhe development programme

Site	Increased benthic area to be affected as a result of the proposal[94]	Percentage of moderate to high value *Nephrops* habitat within the assessment area lost due to the proposed expansion[95]
Dunstaffnage	46,804m^2 (0.05km^2)	0.03%
Lismore West	46,831m^2 (0.05km^2)	0.03%
Shuna	109445m^2 (0.11 km^2)	0.07%
Lismore North	86,502m^2 (0.09km^2)	0.06%
Total	**0.30 km^2**	**0.20%**

A direct loss of suitable *Nephrops* habitat in the local area may indirectly impact *Nephrops* creeling by reducing the available resource or requiring increased effort by fisheries to maintain landings. However, this is not anticipated due to the minimal area to be impacted by the proposals (0.2%) in proportion to the wider availability of *Nephrops* habitat in assessment area and the region as well as the low fishing effort in the grid cells where development is proposed as well as within the wider assessment area. The magnitude of the potential impact is therefore anticipated to be **low**.

7.5.3.3 Indirect effects

Small vessels fish mainly in inshore waters where the competition for space is often greatest. Displacement of fishing activity from traditional fishing grounds as a result of loss of access to fishing grounds or loss of suitable habitat could result in increased pressure on other existing grounds, gear conflict or conflict with other sea users. The creel fishing effort study by Gallego (2017) identified concerns of interviewed fishermen including gear conflict and gear saturation as key issues for the creeling sector. Increasingly, fishermen are no longer able to move gear to rest fishing grounds as in the past, and there is conflict for access to grounds with other creel fishermen and the mobile fishing sector.[96]

Due to the anticipated low magnitude of the effects of the direct impacts of loss of access to fishing grounds and changes to the distribution and abundance of *Nephrops*, no significant indirect effects are anticipated with regard to the displacement of fishing effort on the local inshore fleet as a result of the Dunstaffnage proposal in isolation or the cumulative effect of the wider Loch Linnhe programme of developments. However, the potential exists for the income and livelihoods of individual fishermen to be adversely affected should the areas to be developed comprise a substantial portion of individuals' fishing grounds.

94 The values in the table provide estimates of the benthic footprints at the current maximum consented biomass for all farms apart from Dunstaffnage where the proposed biomass is considered and for Lismore North, Lismore West and Shuna the potential increases in biomass proposed by SSF but not yet approved.

95 It has been assumed that the entire assessment area (550km2) has the potential to support *Nephrops* although only localised areas mainly around Lismore (150km2) have been identified as being of moderate to high value. To ensure a conservative assessment is undertaken the 150km2 moderate to high value area is used for comparison.

96 Gallego, A. (2017) Marine Scotland Science: Creel Fishing Effort Study [online] at: https://www.gov.scot/Resource/0052/00523958.pdf accessed on 03/11/2020.

7.5.4 Assumptions and uncertainties

A range of government-collated datasets inform the baseline characterisation and impact assessment for commercial fisheries. However, each has inherent gaps or uncertainties, such as lack of coverage due to qualitative or voluntary information sources and spatial uncertainties due to the sensitive nature of fisheries information:

- The Scottish Natural Heritage dataset (Figure 7-17) focusses on the most likely areas where important deep burrowed mud biotopes are located i.e. focussing on wider species diversity (e.g. tall sea pen *Funiculina quadrangularis*, fireworks anemone *Pachycerianthus multiplicatus* and burrowing megafauna such as angular crabs *Goneplax rhomboides*, Fries's gobies *Lesueurigobius friesii* and rugose squat lobsters *Munida rugosa*) rather than *Nephrops* abundance, and although this species is likely to be associated with these areas, the burrowed mud distribution not indicate or correlate with suitable or important *Nephrops* habitat in terms of fishery interests.
- The ScotMap study[88] involved a participatory mapping and questionnaire approach. However, not all the relevant stakeholders participated in the survey (55% participation). The ScotMap dataset is derived from interviews with local fisheries to inform on the spatial fishing activity and income related to inshore fisheries (vessels under 15m overall length, not subject to requirement to carry a Vessel Monitoring Systems), providing a snapshot over the five-year period 2007-2011. The dataset, although it remains the best available information to provide an indication of high value fishing areas, may be outdated. The numbers of vessels analyses provide information on the spatial extent of fishing as reported during interviews and are a representation of fishing intensity i.e., where most boats fish. They are not necessarily a good indicator of fishing effort, particular in the case of the combined (all interview) data set, or for fisheries where activity varies seasonally.
- The creel fishing effort survey undertaken by Gallego (2017); the data used for this study do not provide valuations of fishing grounds and rely on a voluntary based interview methodology (with participation for this region at 65%), as such, the results may not accurately represent the current distribution of local fishing activity. This study provides an indication of potential fishing effort only and if creeling is not quantified in an area in this map, that does not mean creeling is not taking place. Equally, quantified effort could be higher given some creeling vessels were not surveyed. Fishing effort outside of the surveyed areas was not measured.
- The Marine Scotland Vessel Monitoring Systems amalgamated intensity layers[86] source data is anonymised Vessel Monitoring Systems data for all UK vessels landing in UK ports combined with landings information. Fishing activity was identified by applying a speed threshold and a heat map, identifying the areas of fishing activity, was then created for the various annual fishing activities. The years 2009 to 2013 were amalgamated to produce intensity layers for various fishing activities. The dataset may be outdated. Vessel Monitoring Systems amalgamated layer values should not be taken as an absolute representation of amount of fishing vessels in a given area. Rather, the Vessel Monitoring Systems values are a product of the statistical model used. The Vessel Monitoring Systems layers represent fishing intensity (for vessels greater than or equal to 15m length) at a national scale, with darker areas representing higher activity. At a local scale, the smoothing nature of the model may be visible, and consideration should be taken when working at larger scales.
- The ICES trawl fishing intensity layer for OSPAR[87] was produced using relevant Vessel Monitoring Systems and logbook data for the period 2009 – 2017. It therefore provides a snapshot over this period. In addition, the dataset provides an indication fishing intensity by larger vessels with Vessel Monitoring Systems .
- Although a member association of the West Coast Regional Inshore Fisheries Group raised concerns that the proposed expansions would affect important *Nephrops* creel and trawl fishing areas, no detailed information on the specific locations fished and the number of fishermen was provided to inform the assessment on potential impacts on individual fishermen.

7.5.5 Mitigation

- SSF endeavoured to minimise the scale of the development proposals when siting the consolidated Lismore North farm and new Shuna site and determining the configuration of the expansions at Dunstaffnage and Lismore West. However, areas suitable for fish farming in terms of tidal flow and depth tend to overlap with suitable for *Nephrops* habitat due to the site conditions in these areas.
- The following standard mitigation measures to minimise impacts to benthic habitat will be implemented, which will in turn minimise impacts on the abundance of *Nephrops*:
    - Minimisation of feed waste will be achieved by use of visual monitoring of feeding by camera, thereby allowing feeding to be terminated when the fish are satiated; and feed pellet size appropriate to the size of fish will be selected. High digestibility feed will also be used to minimise faecal production.
    - Benthic impacts at the cage edge and the surrounding area will be regularly monitored in accordance with the conditions of the CAR Licence. Suitable transects and sampling stations for compliance monitoring will be agreed with SEPA, informed by model outputs. Routine monitoring will involve the collection of seabed samples which are analysed for indicators of organic enrichment, benthic community disturbance and in-feed chemical residues. As a result of the survey regime, a site can be assessed for its compliance with the relevant environmental standards, and consented biomass and/or medicines can be adjusted accordingly through a licence variation process.
    - Chemical residues on seabed sediments will be minimised through adherence to the Sea Lice Management Strategy (Appendix 13) which seeks to prevent, monitor and control sea lice so that intervention measures are not required on the farm. Should lice levels rise to levels which require intervention then the strategy prioritises non-medicinal measures (focused deployment of cleaner fish and physical delousing measures) to limit the use of medicinal treatments where possible. Where medicinal treatment is required the SEPA CAR Licence limits will be adhered to (Appendix 2).
    - Any medicinal treatments administered will be solely in accordance with the limits specified in the SEPA CAR licence, as deemed appropriate for the location.

7.5.6 Summary

The assessment focussed on the cumulative effects of the proposal as well as the wider SSF Loch Linnhe programme of developments. *Nephrops* is anticipated to be the key target species in terms of commercial fisheries in the assessment area and was therefore selected as the point of focus of the assessment.

The Burrowed Mud benthic habitat present throughout the assessment area has the potential to host *Nephrops*, with the presence of *Nephrops* being confirmed in multiple locations. However, the distribution may not correlate with the spatial distribution of suitable or important *Nephrops* habitat in terms of fishery interests. Although *Nephrops* habitat is present within the assessment area, the development areas are small in comparison to the wider habitat availability in the assessment area as well as the wider region.

In 2019, *Nephrops* landings from the Oban port district (489 tonnes) account for 2% of the national landings (24,080 tonnes). Localised areas of moderate to high commercial value creel fishing ground occur within the assessment area, mainly located around Lismore, however the assessment area including these higher value areas are predicted to be lightly fished compared with other areas with suitable *Nephrops* habitat in the region. Considering the fishing grounds available within the wider area, any change to commercial *Nephrops* fishing activity and income as a result of the proposals is likely to be localised. The fleet utilising the assessment area comprises mainly smaller vessels that fish for *Nephrops* by creeling, and to a lesser degree by trawling. The number of fishing vessels that may be directly affected by the programme of developments in Loch Linnhe is estimated to be between 6 and 13.

The total combined area to be lost due to the proposed programme of developments takes up approximately 0.78km^2 at a total anticipated annual value of £877 and £156 for creeling and trawling respectively. As a cautious estimate, assuming this value may have doubled since the data were gathered, and to account for the low survey response rate (55% participation) and potential under-reporting the total estimated annual landings values, assumed to be lost, were doubled (£1754 and £312).

It is anticipated that the activities of a low number of fishing vessels comparable to the port district fleet would only be partially impacted if the proposed sites were to be developed suggesting that the developments are unlikely to have a high adverse impact on the *Nephrops* fishery in the district as a whole. Due to the predicted comparably low fishing effort in the grid cells where development is proposed as well as within the wider assessment area in proportion to the fishing grounds of similar or higher value available within the region, any change to the *Nephrops* fishery and potential economic effects as a result of the proposals is likely to be localised and of a **low** magnitude. However, the potential exists for the income and livelihoods of individual fishermen to be adversely affected should the areas to be developed comprise a substantial portion of individuals' fishing grounds.

7.5.6.1 Significance of residual effects

The receptor (commercial fisheries) within the assessment area is considered to have a **medium** weighting as it is an area of high local importance as a source of revenue and employment due to localised moderate to high value creel fishing areas being present within the assessment area. However, available spatial data shows comparatively low fishing effort in the grid cells where development is proposed as well as within the wider assessment area compared to fishing effort in other areas with suitable *Nephrops* habitat in the region.

As areas suitable for fish farming in terms of tidal flow and depth tend to overlap with those suitable for *Nephrops* habitat due to the site conditions in these areas and the fact that fishermen will be excluded from the entire moorings extent to prevent hazards through interactions between of vessels and equipment associated with farming and fishing activities, there is no available mitigation against the loss of access to fishing ground. However, as the effects were determined as having a low magnitude, they are therefore anticipated to be of **minor** significance to commercial fisheries in the region but could be of higher significance on an individual level.

The effects arising from the proposal on the benthic community (from deposition of waste and discharge of medicinal residues) will generally be limited to the site and a local scale and the consequence minimal, taking into account the wider *Nephrops* habitat availability. The effects are therefore determined as having a low magnitude overall. The standard mitigation measures are considered adequate to minimise the effects on benthic habitat to an acceptable degree (refer to Table 9-1). It is anticipated that residual effects will therefore be of **minor** significance.

Due to the anticipated low magnitude of the effects of the direct impacts of loss of access to fishing grounds and changes to the distribution and abundance of *Nephrops*, **no significant indirect effects** are anticipated.

Refer to Table 7-10 for a summary of the potential impacts and effects.

Table 7-10 Summary of potential impacts and effects on commercial fisheries

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
Direct Impacts – Proposals in isolation				
Increase in the extent of the moorings area to accommodate proposed expansion	Loss of access to fishing grounds	Potential adverse economic impacts	None available as areas suitable for fish farming in terms of tidal flow and depth tend to overlap with those suitable for *Nephrops* habitat due to the site conditions and fishermen will be excluded from the entire moorings extent to prevent hazards through interactions between of vessels and equipment associated with farming and fishing activities	The effect is expected to be of **minor significance** to commercial fisheries in the region due to the wider availability of *Nephrops* habitat of similar or higher value in the region and comparably low fishing effort in the grid cells where development is proposed and surrounds in proportion to the fishing grounds available within the region.
Waste feed and fish faeces	Potential for nutrient enhancement and smothering	Degradation and modification of benthic community assemblages resulting in loss of *Nephrops* habitat may indirectly adversely impact Nephrops fishermen by reducing the available resource	Restrict biomass in accordance with the SEPA CAR Licence limits and minimise waste feed to ensure the depositional footprint does not extend past the regulated acceptable area	The Allowable Zone of Effect / Mixing Zone has been defined to prevent the occurrence of unacceptable effects. Therefore, significant effects are rendered unlikely post mitigation **(residual effect of minor significance)**.
Medicinal lice treatments	Potential for deposits of chemical residues on seabed sediments		Minimise the management of sea lice through medicinal measures and when used comply with the SEPA CAR Licence chemotherapeutant limits to ensure residues remain below the Environmental Quality Standards	The Environmental Quality Standards have been set to ensure that doses or concentrations in the environment for specific chemicals remain below the threshold at which unacceptable effects are expected to occur. Therefore, significant effects are rendered unlikely post mitigation **(residual effect of minor significance).**
Indirect Impacts – Proposals in isolation and wider SSF Loch Linnhe development programme				
Loss of access to fishing grounds and reduction in availability of *Nephrops* habitat may result in potential adverse impacts on the income and livelihoods of individual fishermen as well as cause displacement of fisherman to other fishing grounds resulting in increased pressure on resources or conflict with other sea users. Due to the anticipated low				

Development Activity / Aspect	Characterisation of unmitigated impact on the feature / receptor	Characterisation of potential significant effect without mitigation	Mitigation	Residual effect (post mitigation) and level of significance
magnitude of the effects of the direct impacts of loss of access to fishing grounds and changes to the distribution and abundance of *Nephrops*, no significant indirect effects are anticipated as a result of the Dunstaffnage proposal in isolation or the cumulative effect of the wider Loch Linnhe programme of developments. However, it is possible that any proportional loss of landings may result in a greater impact on income for individual fishermen affected by the proposals.				
Cumulative Impacts – Wider SSF Loch Linnhe development programme				
The assessment area encompasses wider Loch Linnhe to encompass the potential impacts and effects of the Dunstaffnage proposal on commercial fisheries as well as the cumulative effects of the proposed programme of developments at a number of the existing sites within the Linnhe region, namely Lismore West, Lismore North and Shuna. The cumulative effects in terms of loss of access to fishing grounds and reduction in availability of *Nephrops* habitat is not anticipated to be significant due to the comparatively low fishing effort in the wider assessment area and the proportion of the *Nephrops* habitat present within the assessment area comparable to the wider availability of *Nephrops* habitat of similar or higher value in the region. However, it is possible that any proportional loss of landings may result in a greater cumulative impact on income for individual fishermen should they be affected by multiple proposals.				

7.6 CONCLUSION

The high-level impact assessment (refer to Section 7.1) encompassed the potential interactions between the proposal and environmental receptors. Only benthic habitat, water column, wild salmonids and commercial fisheries were identified as receptors upon which the proposal may exert impacts with the potential to result in likely significant effects. As such, these were progressed for further detailed assessment. The detailed impact assessments (Sections 7.2 to 7.5) found that the proposal will not result in any residual effects of moderate or major significance (significant effects) as appropriate mitigation measures have been identified and committed to by SSF (refer to the schedule of mitigation in Table 9-1). As such, no likely significant effects are anticipated as a result of the proposal going ahead with strict adherence to the proposed mitigation.

8 VULNERABILITY TO RISKS OF MAJOR ACCIDENTS OR DISASTERS

8.1 MAJOR STORM EVENTS

SSF employs industry-leading fish farm design standards on cages, netting and moorings that meet or exceed the Scottish Technical Standard[97], which applies appropriate safety factors to ensure equipment and their design will withstand the worst conditions expected at the farm location. SSF sites have been able to withstand the worst of the weather without any significant incidents or stock losses taking place. The cages and nets for the proposal will be designed to meet best practice standards (Appendix 19 – Equipment attestation). SSF also have an Emergency Plan for Storms (Appendix 22) in place which provides an overview of equipment in use, and how to safeguard the site from an environmental disaster related incident resulting from a storm event.

8.2 ESCAPE EVENTS

Escape events at finfish farms generally result from operational accidents, predator interaction, equipment failure or adverse weather events. Escape events are rare, for example, aside from a single fish which escaped from Dunstaffnage due to a physical handling error in 2013, there has not been an escape event at an SSF farm in the Linnhe Farm Management Area (FMA M-36) within the past 9 years[98], and significant events (where high numbers of fish escape) are an even rarer occurrence. To prevent escapes, SSF ensures that the integrity of the cages and nets is regularly inspected, and that timeous preventative or corrective action is implemented in response to any issues noted, refer to the SSF Containment Plan (Appendix 17) and the Escapes Prevention and Recapture Strategy (Appendix 18). In the unlikely event that an escape event occurs, SSF have measures in place to minimise the adverse effects thereof as detailed in the Escapes Prevention and Recapture Strategy (Appendix 18).

8.3 MASS MORTALITY EVENTS

Mortalities are a normal aspect of fish farming. However, mass mortality events are not. In the event of a mass mortality event (an event which is beyond the mortality disposal capacity of the site), additional waste management capacity can be arranged within an acceptable timeframe to prevent significant effects. SSF will endeavour to utilise the most environmentally sound method of disposal feasible should a mass mortality event occur. Refer to the Waste Management Plan (Appendix 21).

97 Scottish Government. (2015). A Technical Standard for Scottish Finfish Aquaculture: https://www.gov.scot/publications/technical-standard-scottish-finfishaquaculture/

98 Aquaculture Scotland [online]: http://aquaculture.scotland.gov.uk/data/fish_escapes.aspx accessed on 25/09/2020

9 MANAGEMENT AND MONITORING

Table 9-1 summarises the proposed measures to monitor and mitigate adverse effects of the proposal as detailed throughout this EIA report.

Table 9-1 Schedule of mitigation

Development Activity / Aspect	Potential Impact	Mitigation
Increased biomass	Increased sea lice infestation potential on wild salmonids	• Operate in accordance with the Farm Management Statement. • Adhere to the Sea Lice Management Strategy and where appropriate, coordinate sea lice treatments across the Farm Management Area to maximise the benefit of treatment options and reduce the potential for transfer of lice between farms. • Adhere to the Environmental Management Plan and implement adaptive management measures, as necessary.
	Potential for transmission of disease from farmed to wild salmonids	• Ensure staff are adequately trained in aspects of fish health so that they are prepared for any event. • Adhere to the Fish Husbandry Manual.
	Potential for escapes and resultant potential for genetic interactions and competition for resources between escaped farmed fish and wild salmonids	• Ensure cages, netting and moorings are designed to meet or exceed the Scottish Technical Standard taking into account the worst weather conditions expected at the farm location and potential for predator interactions. • Adhere to the Containment Plan and the Escapes Prevention and Recapture Strategy.
Waste feed and fish faeces	Nutrient enhancement in benthos and water column and smothering of benthic communities	• Limit maximum biomass to the consented biomass in the SEPA CAR Licence. • Train staff in feed usage and methods to reduce waste feed. Manage feeding in a manner to prevent overfeeding and minimise the discharge of waste feed by monitoring feed levels and the fish during feeding to ensure optimum feeding rates and termination of feeding when the fish are satiated. • Select feed pellet size appropriate to the size of the fish. • Conduct routine compliance monitoring, as stipulated in the SEPA CAR Licence, to ensure the Environmental Quality Standards are adhered to.
Medicinal lice treatments	Medicinal residues in water column and seabed sediments	• Adhere to the Sea Lice Management Strategy and limit the use of medicinal treatments where possible. • Where medicinal treatment is administered, adhere to quantities stipulated in the SEPA CAR Licence. • Conduct routine compliance monitoring, as stipulated in the SEPA CAR Licence, to ensure the Environmental Quality Standards are adhered to.

Development Activity / Aspect	Potential Impact	Mitigation
Pole-mounted top nets	Potential for bird entanglement (including species of conservation interest such as gannets)	• Maintain daily records of wildlife entanglement / entrapment using a standardised proforma and submit regular (typically six-monthly) returns to the Planning Authority copied to NatureScot. • Immediately notify the Planning Authority and NatureScot in event of any significant entrapment or entanglement (e.g., involving three or more birds of any named species on any one day and/or a total of ten or more birds in the space of any seven-day period and/or or repeat incidents involving one or more birds on four or more consecutive days). • Implement adaptive management approaches based on monitoring findings (as agreed with the Planning Authority in consultation with NatureScot).
Feed barge	Potential visual impact on sensitive receptors (Ganavan)	• Ensure the barge is sited off the centre of the cage group on the southeast (shoreward) side. • Ensure the barge is painted in a dark matt colour scheme, or other colour scheme agreed by the planning authority.
	Potential for noise impacts (although not anticipated)	• Ensure that every effort is made to keep operations as unobtrusive as possible by the use of noise insulation on noisy equipment and by restricting adjusting hours of operation as far as is practicable to limit the potential for nuisance.
Predator interactions	Potential fish welfare issues and potential for escape due to damage to cages	• Adhere to the Predator Exclusion Plan. • In the unlikely event that the use of acoustic deterrent devices is required in the future, permission must be sought from Marine Scotland through a separate licensing process prior to installation.
Presence of the farm infrastructure and vessel operations	Potential for navigational hazards and wildlife interactions with vessels	• Install and maintain the required navigational markings and lighting in accordance with the Marine Licence and any recommendations from the Northern Lighthouse Board. • Skipper and crew of SSF vessels are responsible for adhering to safe navigational conduct and SSF management protocols and procedures, including adherence to the Scottish Wildlife Watching Code.

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11 ATTACHMENTS

Attachment A	Plans
Attachment B	Coordinates
Attachment C	Infrastructure drawings
Attachment D	Screening Opinion

12 APPENDICES

Appendix 1	Non-technical summary
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Appendix 5	Benthic monitoring report
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Appendix 7	Equilibrium Concentration Enhancement assessment
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