The Scottish Salmon Company

Environmental Impact Assessment Report

North Arran

Marine Fish Farm

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GLOSSARY

ABBREVIATION	DESCRIPTION
AoD	Above Ordnance Datum
APQ	Area of Panoramic Quality
Arcus	Arcus Consultancy Services Ltd
ADD	Acoustic Deterrent Device
ADSFB	Argyll District Salmon Fishery Board
AFSA	Aquaculture and Fisheries (Scotland) Act 2013
AutoDEPOMOD	A software package used for modelling biomass and chemotheraputants for finfish farms in Scotland, developed by SEPA and SAMs
BAP	Best Aquaculture Practice
BRC	British Retail Consortium
BUTEC	British Underwater Test and Evaluation Centre
CAR	Controlled Activities Regulations
CCT	Coastal Character Type
CFA	Clyde Fishermen's Association
COAST	Community of Arran Seabed Trust
CoGP	Code of Good Practice
cSAC	Candidate Special Area of Conservation
DFF	Dawnfresh Farming
DMA	Disease Management Area
ECE	Equilibrium Concentration Enhancement
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
eMPA	Emergency Marine Protected Area
EMS	Environmental Management System
EPS	European Protected Species
EQS	Environmental Quality Standard
FCR	Feed Conversion Rate
FMA	Farm Management Agreement
FMS	Farm Management Statement
FNC8	Flying Net Cleaner 8
g	Gram
GAP	Good Agricultural Practices
GSSI	Global Sustainable Seafood Initiative
GVA	Gross Value Added
HACCP	Hazard Analysis & Critical Control Points
HES	Historic Environment Scotland
HRA	Habitats Regulations Appraisal
HSE	Health Safety and Environment
IPC	Integrated Pest Control
IROPI	Imperative reasons of overriding public interest
km	Kilometre
LCA	Landscape Character Assessment
LCT	Landscape Character Type
LOI	Loss on ignition
LVI	Landscape and Visual Impacts
LVIA	Landscape and Visual Impact Assessment
m	Metre
MoD	Ministry of Defence

ABBREVIATION	DESCRIPTION
MPA	Marine Protected Area
MS-LOT	Marine Scotland Licensing Operations Team
MSS	Marine Scotland Science
NAC	North Ayrshire Council
NCMPA	Nature Conservation Marine Protected Area
NewDEPOMOD	Particle dispersal modelling software, an update of AutoDEPOMOD, developed by SAMS
NLB	Northern Lighthouse Board
NTS	Non-Technical Summary
NSA	National Scenic Area
OSPAR	Oslo & Paris Commission
PAH	Polycyclic Aromatic Hydrocarbons
PCP	Predator Control Plan
PGI	Protected Geographical Indication
PMF	Priority Marine Feature
POP	Persistent Organic Pollutants
QMS	Quality Management Systems
RONC	Remotely Operated Net Cleaner
RIB	Rigid-hulled Inflatable Boat
ROV	Remote Operated Vehicle
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SAMS	Scottish Association of Marine Science
SEPA	Scottish Environment Protection Agency
SEERAD	Scottish Executive Environment and Rural Affairs Department
SHO	Seal Haul Out
SLA	Special Landscape Area
SLICE	Sea lice treatment
SLVIA	Seascape and Landscape Visual Impact Assessment
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSC	The Scottish Salmon Company
SSPO	Scottish Salmon Producers Organisation
SSSI	Site of Special Scientific Interest
The EIA Regulations	Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017
The Proposed Development	North Arran Marine Fish Farm
UKBAP	United Kingdom Biodiversity Action Plan
UKTAG	United Kingdom Technical Advisory Group
W	watt
WCRIFG	West Coast Regional Inshore Fisheries Group
WDC	Whale and Dolphin Conservation
WLA	Wild Land Area
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

This Environmental Impact Assessment Report ('the EIAR') has been prepared by Arcus Consultancy Services Ltd (Arcus) on behalf of the Applicant, The Scottish Salmon Company ('SSC'). This EIAR has been prepared in accordance with The Town and Country Planning (EIA) (Scotland) Regulations 2017[1] ('the EIA Regulations') to assess a marine fish farm known as North Arran ('the Proposed Development') comprising of 20 x 120 m circumference fish pens and associated infrastructure to the north-east of Arran. The location is shown in Figure A1 (Appendix A).

This EIAR accompanies the planning application for the Proposed Development ('the Application'). The scoping process was undertaken in early 2019 with the Scoping Opinion received on the 1st May 2019. The issues raised through the scoping process have been addressed in full in this EIAR to specifically identify where significant effects may occur and propose mitigation measures as appropriate.

A separate Planning Statement accompanies the Application and sets out the relevant planning policy considerations for the Proposed Development. It considers both national and local planning policy and guidance of relevance and looks in detail at the relevant planning policies of the Local Development Plan (LDP) and associated Supplementary Guidance (SG).

The Proposed Development falls under the jurisdiction of North Ayrshire Council (NAC) as the local planning authority, therefore the statutory NAC Development Plan, adopted 20th May 2014[2] ("NACLDP") is applicable at submission of the Application. The NAC are currently in the process of examination of the Proposed Local Development Plan[3] ('the Proposed Plan') which is set to be adopted in 2019. Given that the Proposed Plan is set to be adopted during the determination period of the Application, this will be considered one of the primary documents used for the determination of the Application.

All policies and SG considered to be of relevance to the Proposed Development are identified and assessed in the Planning Statement. Consideration has been given to these during the design of the Proposed Development and in undertaking the EIA.

1.1 Proposed Development Overview

Innovation is at the heart of this development and SSC will be integrating innovative equipment design, developed in collaboration with a number of suppliers, with recognised industry best practice at the proposed site. These innovations and enhanced management measures include:

- Integrated pens and equipment design (the SeaQure Farm concept developed by Gael Force);
- Seal Pro nets (provided by W&J Knox);
- Freshwater treatments;
- Cleanerfish in stocked pens;
- Hydrolicer treatments; and
- Thermolicer treatments.

Incorporated as part of the SeaQure Farm concept design are; passive net fouling prevention, mort recovery, a live fish swim-through system for regular fish health

[1] Scottish Government (2017). The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Available at https://www.legislation.gov.uk/uksi/2017/571/

[2] North Ayrshire Council (2014) Local Development Plan [online] Available at: https://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/LocalDevelopmentPlan/post-examination/adopted-LDP-policy.pdf

[3] North Ayrshire Council (2019) Proposed Local Development Plan [online] Available at: https://www.north-ayrshire.gov.uk/planning-and-building-standards/ldp/ldp2.aspx

treatment, and an air distribution system in each pen, all of which should optimise fish health and lower the relative environmental impact.

The Proposed Development layout is shown in Figure A2 (Appendix A) and would consist of the following key components which are discussed in detail in Chapter 3: Description of the Proposed Development:

- Pens – The Proposed Development will comprise two groups of 10 pens of 120 m circumference (19.1 m radius). The surface area is approximately 2.3 hectares (ha);
- Feed Barge – The feed barge would be fully automated, have a feed holding capacity of 600 tonnes and would potentially include an integrated 140 tonne freshwater treatment facility;
- Moorings – The pens would be secured within a rope and chain matrix arranged in a grid layout;
- Pen Nets – This site will utilise Seal Pro nets, which are designed to reduce the potential for seal interactions. The proposed net depth is 10 m;
- Pen Lighting – All pens would be fitted with low energy, long life underwater lights suspended at a depth of 6 m.
- Navigational Lighting – All lighting requirements would be agreed with the Northern Lighthouse Board (NLB);
- Bird Nets – These would be positioned over the top of each pen and supported by 16 x 5 m support poles per pen; and
- SeaSpine - A central spine would run between the pens and the feed barge, to allow transfer of the fish to the barge and back to the pens for treatment or processing. These pipes in the spine also allow automatic, fast mort recovery.

A proposed production cycle based on 5000 tonnes maximum standing biomass is expected. The Proposed Development would operate for 22 out of every 24 months, ensuring that a two-month fallow period takes place prior to the introduction of the next input of smolts. Harvesting and processing will take place at SSC's Ardyne and Cairndow sites respectively.

The husbandry practices of salmon farmers are strictly regulated by SEPA, through the Water Environment (Controlled Activities) (Scotland) Regulations (2011) as amended, and Marine Scotland, through the Aquaculture and Fisheries (Scotland) Act 2013.

1.2 The Applicant - SSC

SSC is one of the leading Scotland based producers of fresh Scottish Salmon, employing a team of over 650 staff across 60 sites on the West Coast and Hebrides. Seven (7) full time members of staff are employed on Arran and over 230 in Argyll & Bute, SSC sourced over £112 million worth of supplies from over 650 Scottish suppliers, representing more than 75% of all procurement in 2018 and made a capital investment of £20.5 million. SSC is committed to building long-term partnerships and to sourcing locally where possible. SSC is dedicated to the health and safety of their staff and their development, running an award-winning Modern Apprentice programme; in 2018 SSC enrolled 14 modern apprentices, bringing the total to 38 across the business.

SSC is fully engaged in all stages of the supply chain, from smolt production through freshwater and marine farming to harvesting and processing, as well as sales and marketing, ensuring total supply chain integrity, full traceability and Scottish guaranteed provenance. SSC exports over 60% of production to 26 countries around the world, with a key focus on North America and the Far East. SSC was the recent recipient of a Scotland Food & Drink Excellence Award for Native Hebridean Salmon and won three Highland & Islands Food & Drink Awards in 2017 for Export, Innovation and Best New Product for Native Hebridean Salmon.

SSC is focused on sustainable business development following international demand for Scottish Salmon, the UK's largest food export. SSC is committed to Scottish Provenance and takes great pride in producing quality Scottish Salmon, whilst being committed to the environmental, cultural and economic growth and sustainability of rural Scotland. SSC is the first salmon producer in the UK to be awarded 2-star Best Aquaculture Practice (BAP) for **all** marine and processing sites.

1.2.1 Accreditations/ Standards

SSC holds and maintains accreditations/certifications for a number of Standards including Global G.A.P, Best Aquaculture Practice (BAP), Code of Good Practice for Scottish Finfish Aquaculture, Protected Geographical Indication (PGI), Label Rouge, and British Retail Consortium (BRC). SSC is also accredited for ISO14001:2015, Environmental Management Systems.

1.2.1.1 *GlobalG.A.P*

GlobalG.A.P. is the worldwide standard for Good Agricultural Practices. It covers a broad range of criteria including Food Safety and Traceability, Environment (including biodiversity), Workers' Health, Safety & Welfare, Animal welfare, Integrated Pest Control (ICP), Quality Management Systems (QMS) and Hazard Analysis & Critical Control Points (HACCP).

1.2.1.2 *Best Aquaculture Practice (BAP)*

Best Aquaculture Practices (BAP) is the most comprehensive, proven and trusted third-party aquaculture certification programme worldwide. This standard encompasses environmental responsibility, social responsibility, food safety, animal health and welfare. It is benchmarked by globally recognised GSSI (Global Sustainable Seafood Initiative), which is established to ensure confidence in the supply and promotion of certified seafood, as well as to promote improvement in seafood certification schemes.

1.2.1.3 *Code of Good Practice for Scottish Finfish Aquaculture*

The Code of Good Practice is guidance for the Scottish Aquaculture industry and has been produced as a collaborative process involving industry, regulators, government and other stakeholders. SSC is signed up to full adherence to all requirements of the Code of Good Practice for Scottish Finfish Aquaculture. The Proposed Development will be operated in accordance with the principles of Integrated Sea Lice Management and a Farm Management Statement (FMS) will be prepared.

1.2.1.4 *Protected Geographical Indication (PGI)*

Protected Geographical Indication (PGI) is an EU based scheme aimed at promoting and protecting the names of quality regional agricultural products and foodstuffs. The PGI logo is a quality mark that enables consumers to easily identify quality products, allowing them to verify their authenticity in terms of regional origin or traditional production methods.

1.2.1.5 *Label Rouge*

Label Rouge 33/90 is a highly esteemed quality assurance mark officially endorsed by the French Ministry of Agriculture. It aims to promote superior quality food or farmed product, particularly with regard to taste. To obtain this recognition, product must meet very stringent standards by adhering to a range of criteria through the production chain, including farming techniques, feed, processing and distribution.

1.2.1.6 *British Retail Consortium (BRC)*

The BRC Global Standard for Food Safety is a leading national standard for the retail industry covering food safety and supply chain management. It provides the framework for producers to manage and control product safety, integrity, legality and quality.

1.2.1.7 *ISO14001*

ISO14001 is an internationally recognised standard for Environmental Management. It sets out the criteria for an Environmental Management System (EMS) and the framework that businesses can follow to setup an effective EMS. ISO14001 provides assurance that the environmental impact of a business is being continually measured, monitored and improved. SSC has successfully transitioned to the 14001:2015 standard.

1.2.1.8 *Technical Standard for Scottish Finfish Aquaculture*

SSC is also working towards full compliance with the Technical Standard for Scottish Finfish Aquaculture, which was developed by the Ministerial Group for Sustainable Aquaculture's Scottish Technical Standard Steering Group. The Scottish Technical Standard will be implemented by a regulation under the Aquaculture & Fisheries (Scotland) Act 2013, and compliance with the standard is required by 2020.

2 THE EIA PROCESS

2.1 Overview

EIA is an iterative process aimed at identifying and assessing the likely significant effects arising as a result of a proposed development. These effects can occur throughout all phases of development from site installation, through operation and during decommissioning. Where adverse effects are identified that cannot be avoided through embedded mitigation in the design of a proposed development, suitable mitigation measures to reduce or offset effects are proposed.

The main steps of the EIA process as relating to the Proposed Development are broadly summarised as follows:

- **Scoping and Consultation**: A Scoping Request and accompanying Report were submitted to NAC in March 2019. The Scoping Opinion received on 1st May 2019 has informed and focused the scope of the EIA on likely significant effects that could be anticipated to occur as a result of the Proposed Development. A detailed summary of Scoping responses and other consultation undertaken is provided in Chapter 5: Consultation and GAP Analysis. Further opportunities were available throughout the EIA stage for consultees to comment on those areas where it is felt there is the potential for significant effects under the terms of the EIA Regulations;
- **Baseline studies**: Desk-based assessment, baseline surveys and site visits have been undertaken, as appropriate, in order to determine the baseline conditions of the environment and area that may be affected by the Proposed Development. The methods and findings are outlined within each technical assessment as reported in Chapters 7 to 16;
- **Predicting and assessing effects**: Potential interactions between the Proposed Development and the baseline conditions have been considered. The nature of the effects, e.g. direct or indirect; positive or negative; long, medium or short term; temporary or permanent, have been predicted and assessed. A generalised methodology for the assessment of significant effects is outlined in Section 2.3, with specific methodologies described in each technical assessment as reported in Chapters 7 to 16;
- **Mitigation and assessment of residual effects**: Potential effects have been avoided or reduced wherever possible through embedded mitigation. Where this is not possible, operational mitigation or other measures to reduce and/or offset significant effects are proposed. Further detail is provided in Section 2.4. The residual effects are then assessed to determine any effects predicted to remain following implementation of the recommended mitigation measures;
- **Cumulative effects**: A generalised methodology for the assessment of cumulative effects arising from the Proposed Development in conjunction with other proposed or consented developments is presented in Section 2.5. Cumulative effects have been considered as appropriate for each technical assessment; and
- **Production of the EIAR:** The results of the EIA are set out in the EIAR. The required content and the structure of the EIAR is outlined in Section 2.6.

2.2 The Precautionary Principle

The Precautionary Principle is one of the key elements for policy decisions concerning environmental protection and management. It is applied in the circumstances where there are reasonable grounds for concern that an activity could cause harm, but where there is uncertainty about the probability of the risk and the degree of harm.

Although there is no universally accepted definition, the Scottish Government is committed, through Scottish Planning Policy (SPP), to using the precautionary principle, which is included as Principle 15 in the 1992 Rio Declaration on Environment and Development[4].

The Precautionary Principle may be invoked when:

- There is good reason to believe that harmful effects may occur to human, animal or plant health or to the environment; and
- The level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision-making.

The Precautionary Principle is also embedded within the EIA process and included in the content requirements within the EIAR.

However, "precaution" can be a misused and misunderstood concept. Taking a precautionary approach is about balancing benefits and risks, and managing environmental risks through proportionate mitigation measures. Sustainable development and the precautionary principle are already enshrined in Scottish Planning Policy[5] (SPP) and are underpinned by a cascade of legislation applicable to fish farms. SPP cautions that the precautionary principle should not be a reason to impede development without justification (paragraph 204 of SPP).

In order to apply the Precautionary Principle within the context of an EIA, the worst case scenario is assessed based on known technical and scientific parameters. These parameters include technical specifications of equipment, utilisation of established and approved survey and assessment methodologies, together with established best practice techniques. Where there is uncertainty, for example the presence or absence of a protected species, this is stated and the precautionary approach is taken i.e. the species is present, unless proven otherwise.

The outcome of this scenario is then considered using risk assessment procedures to inform decisions on how to reduce the risk or threat through mitigation and management measures to acceptable levels.

2.3 Overarching EIA Methodology

The determination of whether an effect is significant in accordance with the EIA Regulations combines professional judgement together with consideration of the following:

- The sensitivity of the resource or receptor under consideration;
- The magnitude of the potential effect which occurs as a result of the Proposed Development;
- The type of effect, i.e. adverse, beneficial, neutral or uncertain;
- The probability of the effect occurring, i.e. certain, likely or unlikely; and
- Whether the effect is temporary, permanent and/or reversible.

A generalised methodology for assessing significant effects is detailed below, however each individual technical area will have a specific assessment methodology which may vary from that detailed in the following subsections.

2.3.1 Sensitivity of Receptors

The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Proposed Development or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory

[4] United Nations "Conference on Environment and Development" (UNCED (1992) – The "Earth Summit". Available at: https://www.un.org/documents/ga/conf151/aconf15126-1annex1.htm

[5] Scottish Planning Policy [Online] Available at: https://www.gov.scot/Resource/0045/00453827.pdf

designations and/or professional judgement. Table 2.1 details a general framework for determining the sensitivity of receptors.

Table 2.1: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.
Negligible	The receptor is resistant to change and is of little environmental value.

2.3.2 Magnitude of Effect

The magnitude of potential effects will be identified through consideration of the Proposed Development, the degree of change to baseline conditions predicted as a result of the Proposed Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

General criteria for assessing the magnitude of an effect are presented in Table 2.2 below.

Table 2.2: Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

If effects of zero magnitude (i.e. none / no change) are identified, this will be made clear in the assessment.

2.3.3 Significance of Effect

The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. Table 2.3 summarises guideline criteria for assessing the overall effect and whether this is significant.

Table 2.3: Framework for Assessment of the Significance of Effects

Magnitude of Effect	**Sensitivity of Receptor**				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

For the purposes of the EIA, effects predicted to be of major or moderate significance are considered to be 'significant', and are shaded in light grey in the above table.

Zero magnitude of change upon a receptor will result in no effect, regardless of sensitivity.

2.4 Mitigation and Residual Effects

Where the EIA identifies likely significant adverse environmental effects, mitigation measures are proposed in order to avoid, reduce, offset or compensate those effects in line with the mitigation hierarchy identified in Planning Advice Note (PAN) 1/2013[6]. There are two types of mitigation namely that which may be embedded in the design and additional mitigation which may be applied once residual effects have been identified.

Embedded mitigation measures for the Proposed Development are focussed on recognised best practice management and operational measures employed routinely by SSC at their sites and also specifically the utilisation of the innovative SeaQure Farm concept at this Site. This is outlined in Chapter 3: Description of the Proposed Development.

The assessment will conclude with an examination of residual effects after embedded mitigation has been applied, i.e. the overall predicted (potential) effects of the Proposed Development. Additional mitigation may be applied thereafter to reduce a significant effect.

2.5 Cumulative Effect Assessment

In accordance with the EIA Regulations, this EIAR will also give consideration to 'cumulative effects'. These are effects that result from incremental changes caused by past, present or reasonably foreseeable future actions together with the Proposed Development. For cumulative assessment, two types of effects will be considered:

- The combined effects of individual effects, for example benthic and water column effects or a single receptor; and
- The combined effects of several developments that may on an individual basis be insignificant but, cumulatively, have a significant effect, such as landscape and visual effects of many fish farm developments.

Figure A3 (Appendix A) shows operational and pre-application sites within a 50 km radius. This includes Dawnfresh Farming (DFF) sites currently at the pre-application stage, having been scoped but not submitted at the time of this application. Sites have been taken into consideration as appropriate for each technical assessment depending on identified study areas. Further detail on this process is provided in Chapter 4.

The Proposed Development is outwith any current Disease Management Area (DMA). The nearest potential new site is located south-east of the Isle of Bute and would result in the recommended separation distances from these sites potentially overlapping. Currently this

[6] Scottish Government, 2017, Environmental Impact Assessment Revision 1.0 [Online] Available at: http://www.gov.scot/Resource/0043/00432581.pdf

site is not consented, however the cumulative assessment will take into consideration any potential impact on other DMAs in the area. Regarding comments raised by Marine Scotland Science (MSS) in relation to the potential overlap of DMAs, SSC has undertaken a dynamic risk assessment using a tiered approach to assessing the risk provided as Appendix H. This 'building block' approach allows for a robust staged cumulative assessment the conclusions of which are described in Chapter 16.

2.6 The EIAR

The results of the EIA are presented in this EIAR, which, as prescribed in Schedule 4[7] of the EIA Regulations is required to include:

- A description of development, including location, characteristics, operational process, and estimate of residues and emissions. This is provided in Chapter 3: Description of Proposed Development;
- A description of reasonable alternatives (location, design, technology etc.) which are relevant, with an indication of reasons for the chosen option and comparison of environmental effects. This is provided in Chapter 4: Alternative Sites, Design and Technology;
- A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution without implementation of the project on the basis of available and relevant information;
- A description of the factors likely to be significantly affected by the development e.g. population, human health, biodiversity, water (for example hydromorphological changes, quantity and quality), cultural heritage, and landscape;
- The description of the likely significant effects including both 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.
- 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.
- 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.
- 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.

Unless stated otherwise the information noted above is found within each technical assessment as reported in Chapters 7 to 16 as relevant.

In addition, a non-technical summary (NTS) must be provided.

Section 5.3 of this EIAR states which elements have been scoped in and scoped out of the EIA following the pre-application discussions and receipt of the Scoping Opinion. Effects which are not considered to be significant do not need to be described.

[7] Scottish Government (2017). The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (Schedule 4). Available at https://www.legislation.gov.uk/uksi/2017/571/schedule/4/made?view=plain

2.7 Contributors

A number of organisations have contributed expertise and information to the EIA and to this report as outlined in Table 2.4.

Table 2.4: Contributors to the EIA/R

Topic Area	Contributor
Development Description	The Scottish Salmon Company - Planning Lead - BSc, MSc (11 years) Arcus Consultancy Services Ltd - Project Manager - BSc (Hons) MSc (Disc.) PhD (15 years) Planning Lead – Chartered Town Planner BA (Hons), MAA, MRTPI (13 years).
Consultation and Gap Analysis	The Scottish Salmon Company - Planning Lead - BSc, MSc (11 years) Arcus Consultancy Services Ltd - Project Manager - BSc (Hons) MSc (Disc.) PhD (15 years)
Benthic Habitats	The Scottish Salmon Company - Planning Lead – BSc, MSc (11 years) Arcus Consultancy Services Ltd - Principal Ecologist - BSc (Hons) MRes CEnv MCIEEM (7 years)
Water Column Impacts	The Scottish Salmon Company - Planning Lead - BSc, MSc (11 years) Arcus Consultancy Services Ltd - Project Manager - BSc (Hons) MSc (Disc.) PhD (15 years)
Interactions with Predators	The Scottish Salmon Company - Planning Lead - BSc, MSc (11 years) Arcus Consultancy Services Ltd - Principal Ecologist - BSc (Hons) MRes CEnv MCIEEM (7 years)
Interactions with Wild Salmonids	The Scottish Salmon Company - Planning Lead - BSc, MSc (11 years) Arcus Consultancy Services Ltd - Principal Ecologist - BSc (Hons) MRes CEnv MCIEEM (7 years)
Impacts on Species and Habitats of Conservation Importance	Arcus Consultancy Services Ltd - Principal Ecologist - BSc (Hons) MRes CEnv MCIEEM (7 years)
Habitats Regulations Appraisal	Arcus Consultancy Services Ltd - Principal Ecologist - BSc (Hons) MRes CEnv MCIEEM (7 years)
Navigation Anchorage, Commercial Fisheries, other non-recreational maritime uses	Arcus Consultancy Services Ltd - Project Manager - BSc (Hons) MSc (Disc.) PhD (15 years) Anatec Ltd
Landscape and Visual Impact Assessment	Arcus Consultancy Services Ltd - Chartered Landscape Architect - BA, MA (Hons), CMLI (18 years)
Socio-economics & Tourism/Recreation	Imani Enterprise Ltd

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 The Site

The Proposed Development is located off the north-east coast of the Isle of Arran in an expanse of open water in the Firth of Clyde (Figure A1, Appendix A). The Firth of Clyde has a coastline of over 1200 km and includes eight sea lochs, five estuaries and numerous islands including Arran, Bute and the Cumbraes.

3.2 Employment

As part of the development plans in the area SSC is looking to recruit an additional ten full-time equivalent members of staff which will support 41 supply chain (indirect) jobs and 10 wider economy (induced) jobs across Scotland with a total Gross Value Added (GVA) for the Scottish economy of over £8.6 million per year. Further analysis on the socio-economic baseline and affects from the Proposed Development are presented in Chapter 15: Social and Economic Assessment.

3.3 Infrastructure

The Proposed Development layout is shown in Figure A2 (Appendix A) and would consist of the key components discussed in detail below. Equipment and site installation will be in accordance with Marine Scotland's Technical Standard for Scottish Finfish Aquaculture[8].

3.3.1 SeaQure Farm Concept

This proposal has innovation at its heart, ensuring robust fish health and welfare and environmental sustainability. SSC, in collaboration with Gael Force Group and its other suppliers, seeks to underpin this Proposed Development with innovation through implementation of the SeaQure Farm concept design provided by Gael Force. The guiding principle has been to deliver sustainable growth through improved stock welfare. The key objectives identified for innovation included:

- Improving fish health and welfare;
- Operating securely in higher energy sites;
- Enhancing the safety of SSC staff, visitors and equipment; and
- Ensuring environmental impacts are assessed, mitigated and monitored.

The SeaQure Farm concept facilitates the integration of fish welfare improvement space. This space enables fish to be treated for lice and gill disease, in a controlled environment, using multiple inline and proven non-medicinal solutions. The SeaQure Farm concept also features an integrated central spine (the SeaSpine) that connects all pens to the barge. This involves swimming the fish to and from the health treatment facility on the barge in a contained system. This allows a more passive process and reduced impact on fish whilst handling, as the fish are at all times at sea level reducing the need for pumping and heating systems associated with other processes.

The SeaSpine also assists in the swift, automatic, removal and containment of mortalities from the pen, via the central spine, to the barge. The mort recovery would happen immediately and this will reduce the risk of predator attacks, particularly from seals, to a minimum. The barge would have space to allow the morts to be processed in such a way that value can be gained, e.g. through oil extraction to run the power requirements, but in any event reducing the environmental and commercial impact of processing regular natural fish mortalities.

The SeaQure Farm concept allows for freshwater treatments. This will utilise a rain water collection system on the nearby feed barge to supplement freshwater treatments, which

[8] Marine Scotland (June 2015) A Technical Standard for Scottish Finfish Aquaculture (Scottish Government)

will take place in an installed freshwater facility of 140 tonnes within the barge itself. This method of freshwater treatment will be facilitated through a swim-through system and will reduce the need for medicinal bath treatments. The containment of freshwater within a controlled environment ensures that treatments are not only effective, but also that any water used in the treatment is captured and neutralised (lice filtered out and destroyed) before releasing to the environment. The process of treatment of fish is well practised today in other infrastructures and well proven.

With the above designs being integrated and automated, and the inclusion of monitoring systems for the farm and environment, the SeaQure Farm would deliver safe, integrated and value adding innovation. With this system utilised, the Proposed Development would be leading innovation in Scotland and would offer significant opportunity to become an exemplar of lowering environmental impact per tonne of production.

The SeaQure Farm concept is a fully integrated farm which includes a number of benefits whilst building on innovation. The desire is to deliver all this innovation and assure that the SeaQure Farm delivers on a number of fronts.

Table 3.1: Summary of SeaQure Farm Innovations

Innovation	Description	Environmental Benefit
Passive Net Cleaner	Aeration system to ensure automatic cleaning of nets to allow for a good flow through of water and to reduce algal growth on the netting.	Mitigation of mortalities caused by algae/plankton Reduction in manual handling Reduction in Work boats/Staff deployment, improved O_2, reduced Carbon footprint
Mort recovery (to pen side)	Fast automatic mort removal from sea using the LIFTUP technology via the SeaSpine, and sent directly to servicing barge via self-contained tubes	Reduction in Work boat/Staff deployment, Reduced Carbon footprint
Mort processing	Create a value adding solution to treat morts to create product with value – Food (pet), Oil extraction, etc	Reduction in Work boat/Staff deployment, protein/value gain from current costly controlled waste, Reduced Carbon footprint
Fish/Mort transfer	Centralised spine to transfer live/dead fish (separately) between pen side and relevant treatment/process facility (on Barge)	Reduction in Work boat/Staff deployment, Reduced Carbon footprint, significant stress reduction on fish
Barge based Fish welfare	Connected to central spine a fish welfare facility mounted in the barge to passively treat fish (Gill, Lice etc) and mort processing	Reduction in Work boat/Staff deployment, reduction on medicinal treatments, Reduced Carbon footprint, significant stress reduction on fish

These are the headline engineering innovations of the SeaQure Farm and each of these concepts has been tried and tested individually. One of the aims of this project is to combine as many of these aspects as possible in order to drive and deliver improvements.

In addition to these engineering designs, SSC will also incorporate a number of enhanced management measures which are discussed in Section 3.4.

3.3.2 Pens

The Proposed Development will comprise two groups of 10 pens of 120 m circumference (19.1 m radius), with a surface area of 22,922 m^2 or approximately 2.3 hectares (ha). The pens will be orientated parallel to the coastline. An example of the type of pen is shown

in Appendix B. All pens and feed pipes would be dark grey or black in colour to minimise visual intrusion and impact on the landscape.

The SeaQure Pen is designed to operate in higher energy sites such as the site of the Proposed Development. The design integrates all the functional equipment through the pen, keeping cables and in-pen furniture fully enclosed and safe. This reduces the risk of power and data cable failure, removes trip hazards and maintenance issues, and provides a wide and clear working platform. Uniquely, the pen also provides the addition of a clip on safety line, which ensures people are kept safe when working on the pen-side.

The pens also contain an air distribution system which allows for an increased level of movement within the water flow, reducing the potential effects of harmful plankton species.

3.3.3 Moorings

The pens will be secured within a rope and chain grid matrix. Moorings will be specifically designed to meet the meteorological, hydrological and topographical conditions predicted at the Proposed Development. The moorings system will be checked as part of the daily containment checks and a full inspection of component parts is also undertaken by trained staff at the end of every production cycle. Mooring checks methodologies and the program for checks are outlined in a Standard Operating Procedure and the Escapes Prevention and Contingency Plan for the Proposed Development. The total surface area of the Proposed Development including moorings is 0.97 km^2. The moorings layout is shown in Appendix B.

3.3.4 Pen Nets

The net depth of the Proposed Development will be 10 m. Nets will be manufactured by Knox (or other suitable supplier) and will be specifically designed to suit site conditions and husbandry requirements. This site will utilise Seal Pro nets, which are made from a high density polyethylene and strengthened by the addition of polymer core. Hot wax injections are also made during the braiding process to provide enhanced stiffness. The nets are designed to reduce the potential for seal interactions.

SSC typically employs a net tensioning system across its sites and sinker tubes will be used at the Proposed Development. These are rigid circular structures, manufactured of high density plastic and filled with chain or steel wire, which are attached to the pen structure and held level with the base of the nets. The pen nets attach to the sinker tubes at regularly spaced fixing points, this ensures nets are highly tensioned and pen volume and structure is maintained. This allows for improved water flow through the nets, improved net integrity and an improved efficiency of net cleaning operations. An example of a sinker tube is shown in Appendix B.

Net tensioning holds the pen net uniformly taut, so that a "wall" is presented to any underwater predator, with no slack areas for entanglement or purchase on the net through which a seal can grab or bite fish. The use of a net tensioning system removes the need for predator nets and therefore eliminates the risk of entanglement for predators (both seals and diving birds).

Nets are subject to a regular strength testing and maintenance program (this generally takes place in the fallow period) and are generally replaced after 6 years, dependant on strength test results. Nets are fully traceable and a database of net location and service history is hosted by the manufacturer.

Biofouling, where organisms such as algae attach to underwater structures, can occur on pen nets and associated structures. SSC divers regularly inspect each net which, on average, is cleaned every ten days using mechanical net cleaners, Remotely Operated Net Cleaners (RONCs) and Flying Net Cleaners (FNC8s) which use mechanical arms and concentrated jets of water to dislodge weed and other organisms.

SSC intends to trial an aeration system to ensure automatic cleaning of nets to allow for a good flow through of water and to reduce algal growth on the netting. This will evenly distribute compressed air across all pens to promote greater water upwelling and movement. This mitigates plankton blooms by moving low density algae/plankton water from below to help dilute the algae/plankton density in the water inhabited by the fish. Different air flows can be dialled into the flowmeters to control the delivery of air within each pen's diffuser platforms. This air control allows the site operator to mitigate different harmful plankton species, for each pen, based on the plankton's unique motility. The main features and benefits of this system include:

- Mitigates mortalities caused by algae/plankton;
- Dilutes the algae/plankton density to reduced levels in the water inhabited by fish;
- Creates water movement and upwelling across the entire net pen site;
- Customers have reported > 50% improvement in removal of harmful plankton from the usage of the units; and
- Flowmeter manifold design allows for air output to be dialled in for maximum performance.

3.3.5 Bird Nets

The site will use tensioned 2'' mesh nets in conjunction with bird net supports in accordance with RSPB recommendations, to reduce predation and the risk of bird entanglement. These would be positioned over the top of each pen and supported by 16 x 5 m high support poles. Poles would be light grey. The nets would be highly tensioned in order to deter predation from diving birds and small mesh to minimise risk of entanglement. Top nets will be inspected and re-tensioned on a daily basis and maintenance will be conducted as required, minimising the potential risk of accidental entanglement to birds.

An example of the type of bird net to be used is provided in Appendix B.

3.3.6 Feed Barge

The feed barge would be fully automated and would have a feed holding capacity of 600 tonnes. The proposed barge would be approximately 9.5 m/7.8 m height above sea level (unloaded/loaded), 35.5 m long and 12.5 m wide and would include an integrated 140 tonne freshwater treatment facility. The barge can be adapted to offer additional space for accommodation, welfare, or storage demands. An elevated control room offers extensive 360 degree views, and houses the feeding and farm control technology.

A figure showing the proposed barge is shown in Appendix B.

The barge is built in accordance with DNV-GL standards, which are the accredited registrar for maritime engineering, and designed to operate in the most exposed sites. The design is intended to capture that of a modern ship with tapered bow and stern for excellent sea keeping, whilst remaining functional for the operational needs for on site. The special design of the barge can accommodate fish treatment and mort processing aboard as described in Sections 3.4.2 and 3.4.3.

3.3.7 SeaSpine

A central spine runs between the pens and the feed barge, transferring the fish to the barge and back to the pens. There are also additional (separate) pipes in the spine, to allow mort recovery.

The central spine and pipes are made of high density polyethylene (HDPE), which is a proven reliable and robust product. This, with the addition of sensor technology in the system, will minimise any risk of fish being pumped out of the sealed system. The system will be fully valved, to ensure that only the open lines are operating.

3.3.8 Lighting

Navigational lighting requirements for the pens would be agreed with the NLB. As part of the production cycle it might be necessary during periods of reduced daylight hours to use underwater lighting in the pens. Typically, underwater lights at farm sites are used during the first winter of the marine production cycle but may also be used at other times.

It is proposed that low energy, long life 240W LED lights (1000 W halogen lights equivalent) would be used in each pen. This lighting is installed at a depth of 6 m within all pens stocked with fish and is directed downwards into the pens and not 'off-site'. The potential effect from these lights will be a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. No unnecessary surface lighting will be used on the Proposed Development, and any pen and barge lighting will be specified in the Marine Mooring and Navigation Licence.

An example of the type of lighting to be installed as part of the Proposed Development is shown in Appendix B.

3.4 Husbandry

In addition to the innovative engineering designs outlined in Section 3.3, the Proposed Development will also incorporate a number of enhanced management measures including good husbandry, dedicated nutritionists and veterinary services and use of biological and physical treatments (e.g. cleaner fish, freshwater treatment, and hydrolicers) where appropriate. A site specific **Environmental Management Plan (EMP)** is implemented at all SSC sites, a key aspect of which is to ensure compliance with a quality assured integrated sea lice management plan (ISLM). This incorporates the Escapes Prevention and Contingency Plan (EPCP) and also the Predator Control Plan (PCP). The draft EMP for the Proposed Development is included as Appendix C to the EIAR.

3.4.1 Production cycle

An example production cycle for the maximum biomass at the Proposed Development is detailed in the production prediction spreadsheet (Appendix D), which provides information on the proposed time of stocking, input numbers, expected growth, estimated mortality and harvest numbers. A proposed production cycle based on 5000 tonnes maximum standing biomass is expected.

An application has been made by SSC to SEPA for two CAR Licences covering the Proposed Development. This is one for each group of 10 pens. The maximum weight of fish held at any time at the Proposed Development shall not exceed a total of 5000 tonnes.

It is planned that the Proposed Development will operate for 22 months out of every 24 months, ensuring that a two-month fallow period takes place prior to the introduction of the next input of smolts. Due to the timings of production cycles, it may not be possible to coincide this fallow period with the period when salmon and sea trout smolts migrate to the marine environment (typically between April and May). However historical sea lice records for Lamlash (the closest SSC site on Arran and one that is operated on the same production cycle expected to be used at the Proposed Development) over the smolt run period for the last few years show the site typically performs very well over these months with very low sea lice densities.

Over the fallow period essential maintenance and any repairs will be carried out at the Proposed Development to prepare for the introduction of the next cycle of fish. Following the end of each cycle, all the nets will be removed from the pens and sent to the manufacturer for testing, cleaning, disinfection, inspection, repair and antifouling. Following inspection and repairs as necessary, nets that achieve specific quality standards will be cleaned and disinfected before being returned to site. The mooring legs and pen

mooring grid components will be inspected and any necessary maintenance, repair or replacement work will be carried out by competent personnel.

3.4.1.1 *Stocking*

At the start of the production cycle, a well boat would be used to stock the Proposed Development with smolts over a period of 1 to 2 months.

3.4.1.2 *Food and Feeding*

SSC has a dedicated team of nutritionists working with leading feed suppliers to source the best quality feed. Vitamins and minerals are added to feed to support the fish's immune system and disease resistance is promoted with new generation of functional feeds focussing on skin healing and mucous production.

The proposed feeding mechanism is fully automated with an inbuilt pellet detection system and associated feedback loop to ensure minimal waste. This would be supported by state-of-the-art underwater cameras to monitor feeding, general fish health and welfare and also enhance the safety of equipment.

Food and feed equipment for the normal operation of the Proposed Development will be stored on board the barge in silos and would predominantly be delivered directly to the barge by boat from the manufacturers' plant. The number of feed deliveries estimated during the production cycle will be approximately 78 deliveries (based on c. 165 tonne feed deliveries and a consumption rate of approximately 12800 tonnes per production cycle).

3.4.1.3 *Grading*

Standard grading operation procedures and associated risk assessments are currently undertaken at all SSC sites and these would also be used at the Proposed Development. Grading occurs at key points in the production cycle, to separate out different sizes of fish. This is to ensure a smooth and even growth profile across the entire stocked production, and reduce the risk of aggression developing within the stocked population.

Through the SeaSpine, fish will be transferred to the barge, where they pass over a de-watering table, then a grading table where size selectors enable different sizes of fish to be separated out. The different size groups are then returned to separate pens, being counted on exit.

Fish are graded approximately 2-3 times during the production cycle. Fish health is checked prior to grading operations by SSC Biology staff. Whilst fish are graded they will be continuously monitored to ensure they are not experiencing unacceptable levels of stress or welfare issues. The manager will determine if mitigation measures need to be taken to maintain good welfare during grading, such as increasing the volume of space available to the fish.

3.4.1.4 *Harvesting*

Harvesting will usually take place over six months in the second year of production. During these harvesting months the harvest boat activity will be around 10 trips a month, and no activity at all other times. Boat activities during harvesting will have a low impact on the maritime traffic in the vicinity of the Proposed Development and are scoped out of further assessment.

To maintain a high level of welfare, the maximum length of time that fish can be crowded in the net for is limited. Once on board the well boat, fish will be transported live to the SSC harvest station located at Ardyne. Conditions within the wells are monitored by camera and oxygen levels and temperature are controlled. During transport, fish are chilled in order to reduce stress levels on arrival at the harvest station. At the harvest station, fish

are pumped ashore and killed by unrecoverable stunning. Carcasses will then be transported onto the Cairndow (Argyll) processing plant for primary processing and filleting.

3.4.2 Fish Health & Welfare

SSC has a dedicated team of biologists who are responsible for regular health checks, and monitoring and managing biosecurity issues throughout the company's operations. The company employs a dedicated veterinarian and certain veterinary services are also contracted out to Fish Vet Group who have clinical responsibilities for fish stocks. SSC focus is on the prevention of disease through effective monitoring and biosecurity controls. Comprehensive Veterinary Health Plans are put in place for each site and final decisions regarding the requirement to treat and appropriate type of treatment are made by the company veterinarian.

The SeaSpine is designed to allow the farmer to recover fish back to the barge, where the barge has been designed to offer a large fish welfare improvement space. This allows fish to be treated for lice and gill disease, in a controlled environment using multiple in line and proven non-medicinal solutions. This spine returning the fish to the barge and back to the pens allows a more passive and reduced impact on fish whilst handling, as the fish are at all times at sea level reducing the need for the pumping and heating systems associated with other processes.

SSC follows a stringent, quality assured integrated sea lice management plan (ISLM). This plan aims to actively reduce the use of medicinal products, whilst increasing the use of biological control (i.e. cleanerfish) and systems which physically remove sea lice (e.g. Hydrolicer flushing system). Preventative health management is integral to SSC's improved lice strategy, because lice control cannot be viewed in isolation to other health challenges that may impact the ability to delouse. Amoebic gill disease (AGD) and Pancreas Disease (PD) have typically been limiting factors for lice intervention, as these diseases can significantly decrease a fish's ability to tolerate being handled.

Health monitoring occurs routinely (monthly during winter months, fortnightly during summer months) with an aim to intervene at the pre-clinical stage and mitigate clinical disease. For example, strategic gill treatments are conducted during cooler water temperatures for AGD, and PD vaccine is used where appropriate. Where clinical disease is observed, a lower stress intervention option may need to be utilised, such as increased cleanerfish stocking density, short medicinal baths or freshwater treatments, whereas healthy, robust fish could be treated with any of the lice removal options available, including non-medicinal treatments.

Lice monitoring is conducted from as soon as the fish are able to be caught with feed. SSC operates to an enhanced sea lice monitoring regime. Every stocked pen on site is health checked on a weekly basis for both lice and gill health, and 10 fish are randomly selected. SSC's sea lice thresholds for treatment are significantly lower than those stated in the CoGP, which allows time for resources to be organised and treatment to be administered without loss of lice control. During the cycle, bioassays may be conducted to determine the trend in lice sensitivity, and help to make treatment decisions.

A Sea Lice Action Plan (SLAP) is drawn up at the start of every new generation, coinciding with the Veterinary Health Plan and End of Cycle review. Once fish are stocked both a cleanerfish stocking plan and a SLICE treatment forecast is produced. All available and appropriate tools for sea lice control are taken into consideration. These are outlined below with further detail provided in the EMP, included as Appendix C.

3.4.2.1 *Cleaner Fish*

The salmon louse is the most common parasite on farmed salmon, and is one of the challenges facing the aquaculture industry. Cleaner fish represent an effective biological

method for the removal of lice. This means that delousing can potentially be carried out without the use of medications, reducing the use of chemicals and reducing the likelihood of resistance developing to delousing medications.

SSC intends to deploy cleaner fish as a biological control for sea lice at the Proposed Development. Across SSC sites 90% of the cleaner fish are from farmed origin, whilst 10% are wild caught ballan wrasse from sustainable sources. The SSC biology department will choose to deploy farmed lumpsuckers, wild caught wrasse or farmed wrasse based on criteria such as availability, effectiveness and sustainability. A suitable stocking density will be chosen, as deemed appropriate by the SSC biology department. Cleaner fish will be stocked with suitable hides (artificial habitat) and provided with feed. Trained staff will monitor health and conduct routine checks to ensure these fish are suitably cared for. Additional cleaner fish may be stocked as required to assist with lice control.

Farmed lumpsuckers and wrasse will be appropriately health screened before inclusion in pens with salmon, whilst wild wrasse are to be procured from professional fishermen, contracted to SSC, who are regularly audited to ensure they adhere to all the relevant regulatory standards.

In order to safeguard areas in which wild wrasse are sourced, SSC has signed up to the Scottish Salmon Producers Organisation's "Voluntary control measures for the live capture of Scottish wild wrasse for salmon farmer's" standard.

Further details on the use of cleaner fish as a lice control mechanism are provided within the EMP included as Appendix C.

3.4.2.2 *Medicinal Treatment*

SSC has a number of different medicinal treatment options available, all licenced by SEPA. The Proposed Development will be regulated against two separate CAR consents (i.e. one CAR consent per group). The expected permitted and approved medicinal sea lice treatment options at the Site, include:

- The in-feed medicine SLICE (Emamectin Benzoate);
- The topical treatments;
  - Excis (Cypermethrin);
  - Alphamax (Deltamethrin) and
  - Salmosan (Azamethiphos).

Final permitted values will be in line with SEPA licencing.

Strategic in-feed treatments will be administered as per the site specific Sea Lice Management Plan. SLICE is planned to be fed from input until approximately the end of year one in the sea strategically across both pen groups.

Bath treatments are undertaken primarily in full enclosure tarpaulins (either wedge or cone), although occasionally treatments may be administered by using well-boats (under licence). Bath treatments may be alternated to minimise the risk of resistance developing, however results from bioassay and analysis of pre/post treatment lice counts will determine how chemotheraputants will be used.

The Proposed Development is planned to consist of 20 x 120 m pens, which means that, independent of resource, the whole site could be treated with AMX or Excis in four days (2 pens per 3 hours). In extreme cases, additional boat resource can be allocated to the site to help with treatments and increase the number of pens treated per day. Where resource is required to be shared between areas, 24 hour shifts can be organised to treat the site faster.

All bath treatments adhere to SSC procedures and medicines are prescribed by the company veterinarian, taking health and lice trends into consideration.

Further details on the use medicinal treatments are provided within the EMP included as Appendix C. A Sea Lice Efficacy Statement is provided as Appendix E.

3.4.2.3 *Non-Chemical Treatment*

SSC utilise a number of non-chemical treatments in order to reduce the reliance on medicinal treatment and these will be used where appropriate and necessary.

- **Freshwater Treatments**: SSC have invested heavily in freshwater treatments, primarily for AGD/gill health but these can also be used for sea lice. The onshore site at Ardyne has consent for onshore storage of 5,000 m^3 of freshwater and work is underway with concrete works complete and tanks and pumps on order and is anticipated to be operational by the end of 2019. This site will cover Loch Striven and Arran, and potentially the lower end of Loch Fyne. At the Proposed Development, freshwater will be pumped onto the barge and fish will be transferred into the integrated freshwater treatment facility on the barge, where they are held for an allotted time period.
- **Hydrolicers:** Hydrolicers use low pressure water to remove sea lice from the salmon. This system reduces the lice burden without medicines (which has environmental benefits). Sea lice are filtered out and destroyed. There is one dedicated hydrolicer for southern operations which will include the Proposed Development. Generally, treatments conducted by the Hydrolicer have achieved at least 85% clearance of all stages of lice. Lice bags are used to capture all removed lice from the system, so lice are not returned to the water.
- **Thermolicer:** SSC has conducted several treatments in 2018 using a Thermolicer vessel on loan from another fish farming business, with excellent results. Clearance with the Thermolicer was a minimum of 85% all stages and this option is available for the Proposed Development should it be required.

The combination of both cleaner fish and non-chemical treatments has been shown to reduce post treatment resettlement, thus reducing the need for chemical treatments. Further details are provided within the EMP included as Appendix C.

3.4.3 Mortalities

Mortalities collect at the bottom of the pen net, in the centre, and will be collected automatically through the SeaSpine and sent to the barge for processing. Using sensors on the camera systems already used in pens, the LIFTUP technology will automatically start to carry morts directly to the barge via a network of self-contained pipes. After de-watering, the mortalities will be kept inside a controlled environment where further mort processing can take place in a safe and sealed environment. The waste from the barge would then be transferred by boat to a specialist contractor for appropriate disposal.

In addition to this, there will be a regular diver inspection of the pens, during which mortalities that have not collected in the basket will be noted and the site manager informed. Mortalities will then be removed and the removal system checked.

If there is a mortality event on site, defined as a mortality rate higher than 100 tonnes of fish in a week (which is beyond the mortality disposal limits of most sites), SSC will use a specialist contractor to remove and dispose of the mortalities. SSC will ensure the third party contractor complies with the appropriate regulations regarding waste management and will endeavour to find the most environmentally friendly method of disposal feasibly available via the SSC Environmental Management System.

Details of mortalities (e.g. suspected cause and number) are recorded by site staff and are reviewed regularly by biology staff throughout the production cycle. This, together with regular health monitoring, assists with early detection of particular health challenges. A Fish Mortality Plan is provided as Appendix F.

3.4.4 Predator Control

A PCP for the Proposed Development is provided in the EMP (Appendix C) and provides detail on the risk of predation and the measures taken to minimize the risk of associated escapes. This will be reviewed at least once per production cycle. Measures that will be employed at the Proposed Development include specific equipment choice and design, effective husbandry and an ongoing assessment of local wildlife trends. It is thought that seals are likely to be the most significant potential predator to the site. For this reason, the site will be equipped with multiple methods of seal deterrent, and the measures will be monitored regularly by site staff to assess their effectiveness.

3.4.4.1 Equipment

The following equipment forms a key part of the strategy for predator control:

- **Seal Pro Nets**: As outlined in Section 3.3.4, this site will utilise Seal Pro nets designed to reduce the potential for seal interactions;
- **Net Tensioning**: The use of net tensioning is recognised as good practice in terms of predator control and sinker tubes will be used at the Proposed Development as outlined in Section 3.3.4;
- **Top Nets:** Tensioned top nets will be used at the site to protect from predation by birds (Section 3.3.5); and
- **Seal Blinds**: Seal blinds may also be used on site, which are sections of material hanging down from underwater net panels, acting as a curtain to prevent seals from reaching the fish from below the pen. This system is also recognised as good practice.

3.4.4.2 Effective Husbandry

Maintenance of effective husbandry practices will help to reduce the number of birds attracted to the Proposed Development thereby reducing the risk of interaction and entanglement. There will be careful control of fish feed to make sure that it is not left available, and feed spreaders will be faced downwards and set to spread the feed evenly so there will be no available feed source to attract birds. Scarecrows will be used on site, should there be an increase in predatory bird interaction.

The presence of mortalities is a known attractant to seals and an effective mortality removal procedure such as that proposed can reduce the risk of predator attacks.

Careful site and waste management procedures will be in place that prevent net and rope debris entering the marine environment during site servicing, thereby removing any entanglement risks.

The site will be kept in a neat and tidy state and any rubbish found on the adjacent shoreline will be collected by local site staff on a regular basis, to minimise impacts to the local environment.

3.4.4.3 Wildlife Log and Assessment

The site staff will keep a log of wildlife observed around the fish farm to record the incidence of wildlife sightings and any interactions with the fish farm. This will help to determine the need and effectiveness of site anti-predator devices and will help to inform the site and area managers during the annual predator control reviews, by building an understanding of seasonal and longer term, local wildlife trends.

3.4.4.4 Acoustic Deterrent Devices

It is anticipated that effective husbandry practices and the use of specialist netting as described above will provide a robust defence against seal interactions. However, if necessary at the site, Acoustic Deterrent Devices (ADDs) such as OTAQ's SealFENCE (or

similar) will be installed as a further line of defence. This works at a frequency of 8-12kHz and will be operated in such a manner to minimise the potential risk of habituation and of potential interaction with non-target species. ADD use will be triggered i.e. only when deemed necessary and for as long as deemed effective. The devices will be implemented when site staff note high risk seal activity within the vicinity of the site. A log will be kept of the incidence of attack, and timings and duration of the ADD activation, to be assessed by SSC Managers annually to determine usage. An ADD Deployment Plan is provided as Appendix G.

The installation of Seal Pro nets at the Site, in addition to supplementary ADD usage if required, should prevent the need for further intervention. There has been no requirement for lethal methods of control at Lamlash for over five years because of the effectiveness of alternative methods. Further detail is provided within the PCP which is an Annex to the EMP (Appendix C).

3.5 Access and Communications

The Proposed Development will be routinely serviced from the existing SSC Lamlash shore base, where staff and work boats will depart to site. There is also the opportunity for vessels to depart from Brodick, however no additional facilities will be required. Staff access to a shore base will be by vehicle and then by boat to the Proposed Development. It is anticipated that the staff vehicle usage will be ~ 5 return journeys each day (based two people sharing) between normal working hours (0800 – 1700). It is normal practice for staff to share transport where possible. Boat journeys are anticipated to include a return journey for one workboat and one smaller rigid-hull Inflatable boat (RIB) per day.

Access to the Proposed Development will be with covered fast boat (seating for 10) or landing craft, these boats will also be used to transport visitors/divers. A second open boat will be available on site for additional work around the pens.

SSC has experience of operating in exposed sites and dealing with the particular challenges of weather and sea conditions. SSC's Gometra site off the west coast of Mull has been in operation since 2012 and remote monitoring technology is used to ensure the safe operation for staff conducting routine husbandry operations, equipment checks and sea lice counts and also other visitors like divers and regulators. It is also used to ensure that the health and containment of fish on site is not compromised by conditions experienced at the location. As an example, the Gometra site was inaccessible due to inclement weather on five days (not consecutive) in the last production cycle. These five days were over Winter/Spring (between the 1st November and 1st April). Despite this, staff were able to carry out routine feeding and monitoring duties on these days, using remote technology. This system would be installed at the Proposed Development.

Cameras below the surface would be used to remotely monitor fish behaviour, feeding and health. Cameras above the surface are used to monitor sea conditions and feed operations as well as inspecting the condition of the overall environment. This information will be available via remote connectivity and fed back to the shore base. This enables remote feeding by viewing the cameras. SSC are also investigating systems to remotely manage the hatches and other functionality on the barge to allow timely unmanned feed delivery (if required) to the barge alongside a full monitoring system for that process.

For robust communications SSC would use a relay station to establish line of sight with a relay station bouncing the signal to the shore base. From the shore base SSC would upgrade the telephony and data communications line in line with the site requirements. Alternatively 4G and satellite communications would be a fall-back position.

3.6 Reporting Requirements

SEPA requires data returns to be submitted for each site which include details of biomass stocked, number and weight of mortalities, feed volume administered and quantities of treatment medicines used. These records are broken down month by month and provided quarterly; they must also be available for inspection by SEPA at any reasonable hour. Records must be maintained for a period of five years as per conditions of the SEPA licence. SEPA require prior notification of any planned treatment (bath or in-feed) at site. Further to this, once a year SEPA also receives records of the use of non-restricted chemicals e.g. anti-foulants and cleaning chemicals.

Marine Scotland Licensing Operations Team (MS-LOT) requires prior notification of any planned treatment via well boat. The permitted medicines for well boat treatments are based on what has been permitted on the SEPA CAR consent. Marine Scotland also requires submission of records of well boat treatments which include details of the vessel used, location and quantities of permitted medicines used, these are submitted quarterly.

MS-LOT also licenses the placement of marine equipment under the Marine (Scotland) Act 2010 (Part 4), which includes all fish farm moorings.

It is also a requirement of salmon farmers to report to Marine Scotland Fish Health Inspectorate any unintentional releases of fish from marine or freshwater fish farms.

Internal and external audits of fish husbandry practices are undertaken as part of the internal quality management systems, external 3rd party accreditation and for customer requirements.

Records are audited and reviewed regularly in line with internal procedures with an aim to assess the overall performance of the company. Each individual site is audited annually by an independent 3rd party accreditation body.

4 ALTERNATIVE SITES & DESIGN INNOVATION

This Section provides an overview of the process in choosing this site and in finalising the design and technology choice. Information is provided on alternatives that were considered as appropriate and how environmental and economic costs and benefits have been balanced.

4.1 Site Location

The location of the Proposed Development has been influenced by, and represents a balancing of, a number of factors:

- SSC's objectives for sustainable growth;
- Regulation and Guidance for the Aquaculture Industry; and
- Environmental Considerations.

4.1.1 SSC Sustainable Growth

SSC is looking at sites to support its sustainable growth across the west coast of Scotland and the Outer Hebrides. Particularly, SSC is looking to balance its production both geographically and by generation in order to best utilise existing infrastructure and to offer a consistent supply of fish to customers. The Proposed Development, off the north-east coast of Arran, contributes to the balancing in SSC's portfolio for the following reasons:

- The site is in southern Scotland where there is a large market for supply and also capacity at existing processing facilities at Cairndow;
- The site is able to be operated independently, insomuch as the stock generation can be balanced across the year to maintain supply to customers and processing facilities; and
- The site is close to SSC's existing harvesting site at Ardyne, reducing well boat passage time (and fuel usage).

At many of the other locations where SSC operates, any new sites or expansion of existing facilities is tied to a specific generation.

4.1.2 Regulation and Guidance for the Aquaculture Industry

The Rural Economy and Connectivity Committee (RECC) Salmon Farming in Scotland Report 2018[9], recommends that work to examine the scope for siting salmon farms in suitable offshore and other locations should focus on higher energy water flows as a priority. The benefits associated with operating in the higher energy environments include:

- Improving overall fish health;
- Reducing the environmental impact of waste; and
- Providing scope for the industry to develop higher capacity sites.

SSC has collected current meter data in this area, which is indicative of a moderately flushed site. The dominant current direction in the observed data was towards the south-east with relatively modest contribution towards the north-west. A notable feature of the North Arran site is the steep sloping seabed; water depths increasing from less than 10 m to more than 100 m depth across just a few hundred metres.

This approach of siting salmon farms in higher energy water flows is supported by SEPA in the Finfish Aquaculture Sector Plan[10] which contains a combination of proposals which SEPA as stated it anticipated would lead to fewer fish farms in shallower, slow-flowing waters and more fish farms in deeper and faster-flowing waters.

[9] Scottish Parliament (2018) Salmon Farming in Scotland [Online] Available at: https://sp-bpr-en-prod-cdnep.azureedge.net/published/REC/2018/11/27/Salmon-farming-in-Scotland/REC-S5-18-09.pdf (Accessed 25/01/2019)
[10] SEPA (2018) Finfish Aquaculture Sector Plan

The RECC also recommends that the siting of farms in the vicinity of known migratory routes for wild salmon must be avoided. The Proposed Development is not located in any known migratory routes (further detail in Chapter 10: Interaction with Wild Salmonids).

4.1.3 Environmental Considerations

The minimisation of environmental impacts on receptors including land, water, air, populations and infrastructure is a key objective for the Proposed Development.

Within the context of the discussion above, SSC has considered a number of alternative locations for installing or expanding marine fish farming facilities. Several of these locations have been discounted from further consideration due to a range of environmental constraints which are considered not to be applicable to the Proposed Development as identified in Table 4.1.

Table 4.1: Alternative Sites Considered

Site name	Location	Planning Progress	Reasons for not progressing
Cock of Arran	2 – 3 km NW of proposed site (towards Lochranza)	Scoping response received	Landscape and visual (the site location was much closer to Laggan Cottage)
Skipness	9 – 10 km NW of proposed site (mainland, by Claonaig ferry)	Scoping response received	Visual, potential linking of DMAs (Loch Fyne and potential new site at Cock of Arran)
Straad	13 km NNE of proposed site (N of Inchmarnock, W of Bute)	Screening Scoping request prepared, but not submitted	Primarily visual concerns (Ettrick Bay popular with tourists)
Skelmorlie	24 km NE of proposed site (N of Largs)	Initial surveying undertaken	Water current speed not suitable for required production growth for area
Lamlash Extension	19 km SE of proposed site (Lamlash Bay)	Initial surveying/ exploration	Site extension could not produce required production growth for area

Generally, it was identified that sites located further north would potentially result in overlapping DMA's with sites in Loch Fyne, while any location south of the existing site at Lamlash would be within the Marine Protection Area (MPA). There are limited areas within the MPA where a site of this size could be located and not overlap with known recorded locations of protected features. The waters to the south of Arran would also be much more exposed than the chosen location.

4.2 Layout

The layout has been informed by a number of factors through the site selection and iterative design process. This has including seabed conditions, currents and operational constraints. SSC operate a similar site in Skye with 20 x 120 circumference circles with the barge split between the two groups. This has been demonstrated to be an effective and efficient way of managing sites.

The scale of the Proposed Development is governed by the equipment necessary to facilitate the functions of an Atlantic salmon fish farm at the Site. Any equipment on the Proposed Development will be at a height less than a single storey, ensuring that they are

not overly disruptive to the landscape of the area, with the majority of the infrastructure lying below the surface.

The split into two groups of 10 pens each is primarily to optimise water flow conditions in and around the site, thereby reducing potential benthic and water column impact and improving fish health. On a more pragmatic level it was also necessary to have separate footprints for CAR licencing as currently licences will not be granted for more than 2500 tonnes.

The pen groups have been orientated parallel to the coastline in order to offer protection and to minimise landscape and visual impacts. The barge has been positioned in a specific location for operational reasons in order to allow it to effectively feed all pens within the Site. This siting distance is due to the barge requiring a significant amount of power to blow feed along the maximum length of the pipe. As such, it needs to be located within the middle of the two groups of pens in order to operate effectively and to be within optimum distance of all pens. Its location at the centre will also:

- Protect the vessel from the often harsh weather elements;
- Reduce any potential interactions with nearby marine traffic; and
- Reduce any potential Landscape and Visual impacts

4.3 Design Innovation

As discussed above in Chapter 3: Description of the Proposed Development, SSC will be integrating innovative equipment design, developed in collaboration with a number of suppliers, with recognised industry best practice at the Proposed Development. At the heart of this is the SeaQure Farm concept design provided by Gael Force (see Section 3.3.1), the guiding principle of which has been to deliver sustainable growth through improved stock welfare.

Incorporated as part of the SeaQure Farm concept design are passive net fouling prevention, mort recovery, a live fish swim-through system for regular fish health treatment, and an air distribution system in each pen, all of which should optimise fish health and lower the relative environmental impact. The air distribution system allows for an increased level of movement within the water flow in each pen, reducing the potential effects of harmful plankton species

This design and other innovative measures outlined throughout Chapter 3 will offer the following key advantages:

- Reduce the use of medicinal treatments by implementing alternative sea lice control techniques;
- Enhance the safety of people, wildlife and equipment by introducing specialist equipment that can operate securely in higher energy sites;
- Minimise seal interactions and the use of ADD's through the utilisation of specialist Seal Pro nets; and
- Improve access to the pens through the addition of an integrated central spine that connects directly to the barge and allows the safe containment and transportation of fish.

The Proposed Development would be leading innovation in Scotland and would offer significant opportunity to become an exemplar of lowering the relative environmental impact of production.

5 CONSULTATION AND GAP ANALYSIS

5.1 Consultation

Stakeholder consultation has been undertaken throughout the development and planning process. SSC has sought to obtain stakeholder support at key stages and to ensure stakeholders have an opportunity to comment.

Although consultation throughout the development phase has been continuous it can be split up into the following three key phases:

- Phase 1: Screening and Scoping consultation;
- Phase 2: Ongoing consultation; and
- Phase 3: Planning and EIA results and conclusions.

Consultation approaches have varied depending on the matters for discussion and stakeholder requirements. As such, several techniques have been adopted, including (but not limited to):

- Meetings and conference calls;
- Community Consultation events;
- Local Updates in the form of a newsletter; and
- Correspondence.

Phase 1 included consultation and agreement on the specification of surveys and studies (for example benthic surveys etc.) as well as consultation on certain technical aspects.

Through discussion with stakeholders, SSC's proposed approach was introduced. Where relevant, the scope and methodology for surveys/studies and the approach to the EIAR was agreed. The meetings also provided an opportunity to establish key concerns and issues that have been dealt with as part of the EIA.

Table 5.1 details the stakeholders that the SSC Site Development Team engaged with.

Table 5.1: Stakeholder Scoping Summary

Stakeholder	Stakeholders Issues	Date(s)
Scottish Natural Heritage (SNH)	Benthic Impacts, Interaction with Predators and Protected Species, Landscape and Visual Impacts, Noise, Socio-economic, Access and Recreation.	28th March 2019 (Scoping Response) 29th March 2019 (Meeting)
Marine Scotland Science (MSS)	Benthic Impacts, Water Column Impacts, Interaction with Predators, Interaction with Wild Salmonids, Other issues including Aquaculture Animal Health, Site Access, Disease Management Area, Stocking Density, Husbandry, Sea Lice, Containment	27th March 2019 (Meeting) 1st April 2019 (Scoping Response)
Scottish Environment Protection Agency (SEPA)	Benthic Impacts, Water Column Impacts	4th April 2019 (Scoping Response) 18th April 2019 (Meeting to discuss projects)
North Ayrshire Council (NAC)	Consideration of Alternatives, Site Selection, Landscape and Visual Impacts, Nature Conservation, Water Environment, Operational Measures, Noise, Historic Environment, Socio-economic Effects, Structure of the EIAR	18th January 2019 & 27th February 2019 (Meetings) 1st May (Scoping Opinion)

Stakeholder	Stakeholders Issues	Date(s)
Historic Environment Scotland (HES)	Historic Environment	25th March 2019 (Scoping Response)
Royal Yachting Association (RYA)	Recreational Navigation	21st March 2019 (Meeting)
Northern Lighthouse Board (NLB)	Navigation	8th March 2019 (Meeting)
Clyde Fishermen's Association (CFA)	Commercial Fisheries Commercial Fishing – queries regarding servicing of the site, consideration of socio-economic impacts and consideration of fisheries in the area.	19th June 2019 (Meeting)
Argyll District Salmon Fishery Board (ADSFB)	Wild fisheries	10th July 2019 (Meeting)

5.2 Gap Analysis

This Section of the report summarises the scoping responses received and highlights the issues raised. The tables below cover the following areas:

- Table 5.2: Non-statutory Consultees;
- Table 5.3: Benthic Impacts;
- Table 5.4: Water Column Impacts;
- Table 5.5: Interactions with Predators;
- Table 5.6: Interactions with Wild Salmonids;
- Table 5.7: Impacts upon Species or Habitats of Conservation Importance;
- Table 5.8: Navigation, Anchorage, Commercial Fisheries etc;
- Table 5.9: Landscape and Visual Effects;
- Table 5.10: Noise;
- Table 5.11: Marine Cultural Heritage;
- Table 5.12: Waste Management;
- Table 5.13: Socio-economic, Access & Recreation;
- Table 5.14: Traffic and Transport; and
- Table 5.15: Any Other Issues.

The GAP analysis illustrates where the stakeholder comments have been dealt with and closed out or where the issues will be dealt with via existing legislation or codes of good practice.

Table 5.2: Non-statutory Consultee Advice

Stakeholder	Stage	Response Date	Summary of main comments/issues	How comment has been addressed/SSC response	Cross reference	Any outstanding issue
Royal Yachting Association	Pre-application	21st March 2019	Recreational Navigation - No objection	None Required	N/A	None
Northern Lighthouse Board	Pre-application	8th March 2019	Navigation – No objection	None Required	N/A	None

Table 5.3: Benthic Impacts - Consultee Scoping Summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Marine Scotland Science (MSS)	Scoping Opinion	The applicant's proposal for 20 x 120 m cages and a combined biomass across 2 cage groups, would if permitted, represent one of the largest sites currently in Scotland. Modelling reports have been submitted for the 2 cage groups, North Arran A and North Arran B, which indicate that a benthic pass was obtained for the proposed biomass of 2500 tonnes per cage group. SEPA as the regulator will make the final decision with regard to biomass. Providing there are no changes to the proposal, no additional information is required, however the reports included should be submitted with any future planning application.	SEPA has assessed and approved all aspects of the CAR applications, including the modelling reports and, pending approval, granting of the licences is anticipated Q3 2019. As requested, the modelling reports for North Arran A & B have been re-submitted as supporting information for this EIAR. There have been no changes made to the proposal that require further information to be submitted.	Chapter 7 Appendix K & Appendix L (Modelling Reports)	None
Scottish Environment Protection Agency (SEPA)	Scoping Opinion	SEPA noted that baseline visual surveys of the seabed were carried out for this application in Oct/Nov 2018 and summarised the findings. SEPA also noted that modelling of the proposed location and cage configuration achieved a pass for a maximum biomass of 2500t held in each cage group.	Following discussions with SEPA through the CAR application process, SSC has undertaken additional ROV survey work at the Proposed Development. SEPA has assessed this footage and confirmed that it is of acceptable quality. The footage indicates that there are	Chapter 7 Appendix I (North Arran Seabed	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		The ITI=30 contour footprints for each group cover seabed areas of 156,009 m^2 and 130,439 m^2.	no features of significant conservation importance in the development area. The North Arran Seabed Video Report and additional report were used to inform EIA.	Video Report) Appendix J (Additional Seabed Video Survey Report)	
North Ayrshire Council (NAC)	Scoping Opinion	NAC have recommended that the EIA Report should include an assessment of potential changes to benthic habitats and species, including PMFs, including Burrowed Mud and the species living in it. An extended baseline benthic survey and a standard baseline visual survey will be required along with modelling and a modelling report including hydrodynamic and in-feed chemotherapeutant modelling. The supporting information notes the relatively large footprint of the proposal.	The potential interaction with the Proposed Development and the Priority Marine Feature 'Burrowed Mud' has been considered and is presented in Section 7.1-7.2. Baseline seabed surveys have been undertaken, in accordance with regulatory guidance. The summary reports are provided alongside this EIAR. The modelling report, which has been assessed and approved by SEPA, is also provided.	Chapter 7, Sections 7.1-7.2 Appendix I (North Arran Seabed Video Report)	None
Scottish Natural Heritage (SNH)	Scoping Opinion	SNH records indicate that a number of Priority Marine Features (PMFs) are potentially present in this general area. This proposal could therefore result in impacts on the sensitive receptors and that benthic impacts as a result of this proposal could result in significant environmental effects. A visual seabed survey is required in accordance with Annex F of SEPA's Fish Farm Manual in order to establish whether significant effects on benthic species or habitats of conservation importance are likely. Visual images should be of satisfactory resolution to enable the identification of habitats and species present. The survey extent should reflect the potential scale and direction of flows of waste and	This EIAR includes an assessment the importance of PMFs in the context of the Development and the significance of any impacts upon PMF habitats and species/protected features identified in surveys. The seabed survey reports are included as Appendices I & J. Visual seabed surveys have been undertaken in accordance with the regulatory guidance, summary reports are provided alongside this application. The summary report contains an assessment of the significant of any impacts upon PMF habitats and species/ protected features identified through the visual survey.	Chapter 7, Sections 7.1, 7.2, and 7.4 Appendix I & Appendix J	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		chemical residues from the immediate farm footprint. Ideally survey design should be sufficiently flexible to enable the extent of any biogenic features detected to be assessed. SNH recommend that the applicant seeks advice from SNH and SEPA on detailed survey design. The final environmental report should include an accompanying survey report and an assessment of the significance of any impacts upon PMF habitats and species/protected features that the visual survey identifies. It is also recommended that the applicant should submit modelling reports to identify the depositional footprint of waste and chemical chemo-therapeutants for the proposed site.	Benthic habitats in proximity to the Proposed Development were confirmed to be dominated by habitats and species of low conservation priority, with the exception of two component biotope species of the PMF Northern Sea Fan and Sponge Communities Potential development-related impacts were assessed as likely to be localised, temporary and of low magnitude and with embedded mitigation measures outlined in place, no significant environmental effects are predicted as a result of the Proposed Development. Depositional modelling for waste and chemotherapeutants has been undertaken and assessed and approved by SEPA. The summary report is provided with this application.	Appendices K & L	

Table 5.4: Water Column Impacts - Consultee Scoping Summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Marine Scotland Science	Scoping Opinion	The proposed site sits within an area currently not included in the Locational Guidelines. As such, appropriate modelling should be undertaken to demonstrate the degree of nutrient enhancement likely to result from the site and from any cumulative effects likely to result from interactions with any other consented biomass in the area. The applicant should be aware that there are several developments being screened and scoped in the area, therefore consideration should be given to any consented biomass that may be granted at the time any future planning application is submitted and a cumulative assessment submitted accordingly, where appropriate. Information submitted with any future planning application should include full details of the calculations.	An Equilibrium Concentration Enhancement (ECE) calculation has been undertaken and full details of calculations are provided with the application. The ECE calculation indicates that the degree of enhancement likely to result from the Proposed Development would be small and the potential for enrichment is minimised. At the time of application there are two other sites consented within approximately 20 km of the Development, SSC's Lamlash Bay to the south and Tarbert South to the north-west. Due to the large separation distances and location in open water these have not been included in calculations. The applicant is aware of several proposed developments at pre-application stage and a dynamic risk assessment has been undertaken to determine how existing DMAs may or may not overlap in relation to the Proposed Development and the other proposals. This has taken a building block approach to cumulative DMA risk assessment, incrementally assessing various scenarios.	Chapter 8 Appendix M (ECE Report) Appendix H (Dynamic Risk Assessment)	None
SEPA	Scoping Opinion	SEPA advised that the fish farm is situated in the Firth of Clyde, which is uncategorised according to MSS locational guidelines. SEPA noted that an ECE had been submitted estimating the input of dissolved inorganic nitrogen from the proposed fish farm. The ECE was calculated as 2.19µg/l; which when added to the UKTAG background level of 140µg/l (for open waters), is well below the UKTAG threshold (50% above background) of 210µg/l. However, the calculation was still to be checked by a SEPA expert.	An ECE calculation has been undertaken and full details provided with the application. This has been approved by SEPA as part of the CAR licence process.	Chapter 8 Appendix M (ECE Report)	None

Table 5.5: Interaction with Predators - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
SNH	Scoping Opinion	SNH have stated that existing marine habitats at the site provide habitat for several specially protected mobile species. The most significant of these are: • Fish eating birds; of the fish eating birds that are normally present in the area of the proposed development, the most sensitive are the Divers. The area around the development site is a recognised wintering zone for all of our native and migratory divers, however, Red-throated Divers are present throughout the year with regular breeding taking place. The Environmental Report should consider the impacts of disturbance and potential displacement of these specially protected birds. • Otter; Arran has a significant population of Otter which is largely focussed on the coast. The potential interactions with the resident otter population should be assessed in the ES. • Seal; the coast of Arran has a significant dispersed seal populations of both grey and common seal. While the largest haul out is located at Kildonnan at the south end of the island, there are local concentrations at Lochranza and between Sannox and Brodick. In addition there is also a well known haul out at Scalpsie Bay on Bute. It is therefore anticipated that there will be a significant presence of seal around the proposed location. • Cetaceans: Harbour porpoise are the most frequently seen cetaceans in the Clyde Sea and are likely to be present in the area of the proposal. There are occasional sightings of bottle-nosed and common dolphin. Minke and humpback whale have been recently recorded in the area of the development. Records of local	An assessment of the impacts of the Proposed Development on Predators has been undertaken with the results outlined in the EIAR. This has included all potentially sensitive receptors listed by SNH in their Scoping response. Potential interactions with cetaceans and basking shark have been considered and an assessment is provided in Sections 11.4 & 11.5. Potential interactions with otter, divers and seal are considered in Sections 9.2 & 9.3 No significant effects have been predicted with the good practice measures and innovative equipment as described in place. NTS were consulted but no response was received. The South West Scotland Environmental Information was also consulted but no response was received. Up to date NTS data for basking shark and cetaceans was uploaded onto the National Biodiversity Database, and this was used to inform the EIA.	Chapter 9 Chapter 11 Appendix C (EMP - PCP) Appendix G (ADD Deployment Plan)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		whale sightings are available from the record centre maintained by the National Trust for Scotland at Brodick Castle.Basking shark: Basking sharks are also recorded feeding close to the shore along this stretch of the Arran Coast. Again records of sighting are maintained by the NTS at Brodick			
North Ayrshire Council	Scoping Opinion	NAC have requested that an assessment should be made of any potential impact on cetaceans, otters, seal and basking shark.	Potential interactions with cetaceans and basking shark have been considered and an assessment is provided in Sections 11. & 11.3. Potential interactions with otter and seal are consider in Sections 9.2 & 9.3	Chapter 9 Chapter 11 Appendix G (ADD Deployment Plan)	None

Table 5.6: Interaction with Wild Salmonids - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Marine Scotland Science	Scoping Opinion	MSS provided data and links to research which should be reviewed. It is stated that the Development has the potential to increase risks to wild salmonids. MSS note that that sea trout are present in these inshore waters all year round, and not just during the spring smolt migration period. They suggest that strict control of sea lice should be practiced throughout the year. Additionally, it should be noted that adherence to the suggested criteria for treatment of sea lice stipulated in the industry CoGP may not necessarily prevent release of substantial numbers of lice from aquaculture installations. MSS note that for North Arran A & B providing a CAR licence is granted as per submitted modelling SLICE would be available in sufficient quantities to treat the maximum biomass up to 0.73 times which is a relatively low amount for the proposed biomass. MSS require confirmation that any potential impact on the predicted quantities of emamectin benzoate due to SEPA's interim position statement has been taken into consideration. Information on the maximum biomass that can be treated on site after consideration of the position statement should be clearly presented with any future planning application. Confirmation should be provided regarding the number of cages that can be treated with Azamethiphos within a 24 hour period.	An assessment of the interactions with wild salmonid populations, specifically in regards to the potential effects of sea lice infestation, is presented in Sections 10.2, 10.3 and 10.5. No significant effects have been predicted with the good practice measures and innovative equipment as described is in place. SSC's sea lice management strategy is documented within the EMP accompanying the EIAR. SSC operates to a higher treatment standard than that recommended in the SSPO CoGP. SSC's sea lice thresholds for treatment are significantly lower than those stated in the CoGP which allows time for resources to be organised and treatment to be administered without loss of lice control. SSC's threshold for intervention is 0.25 female lice when water temperature is above 10°C and 0.5 adult female lice when water temperature is below 10°C. AutoDepomod modelling indicates that a SLICE (emamectin benzoate) amount equivalent to 0.73 times peak biomass for North Arran A (northern cage group) and 1.49 times peak biomass for North Arran B (southern cage group) is consentable, which is in line with SEPA's interim position statement. This allows for effective use of SLICE as part of the SSC Integrated Sea Lice Management Plan. The EMP outlines the health strategies to be implemented at the Proposed Development and various lice interventions that are available, which subsequently reduces the requirement for SLICE use at Site. The bath modelling report (for Excis, Alphamax and Salmosan) has been provided alongside this application. The bath modelling results also form part of the SEPA CAR application. The recommended consent for Azamethiphos allows for 0.7 pens in three hours and does not allow for efficacious use of this medicine.	Chapter 10 Appendix C (EMP) Appendix K (Modelling Reports)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
North Ayrshire Council	Scoping Opinion	NAC have requested that details of containment, stocking details and escape management measures should be provided. An assessment of the impact of and measures to control sea lice and larvae will be required. This should consider availability of treatments in licensable quantities, potential dispersal and effects after mitigation. The pathways of salmon smolt migration in the Firth of Clyde with particular reference to Loch Striven, Loch Long, the Loch Lomond catchment and Ayrshire Rivers should be assessed. An assessment of the potential impact of the proposed farm on these routes should be made. In view of the likely implications for the wild fish environment an Environmental Management Plan addressing wild fish interaction should be provided as an appendix to the EIA Report.	An assessment of the interactions with wild salmonid populations, specifically in regards to the potential effects of sea lice infestation, is presented in Sections 10.2, 10.3 and 10.5. A detailed literature review and study of environmental parameters (such as tidal stream and weather data) was carried out (see Section 10.2) to predict the likely post smolt migration route of salmon in the Firth of Clyde (see Section 10.5). The Development was assessed to not be within proximity to likely salmon migration routes, and therefore significant effects have been predicted with the good practice measures and innovative equipment as described is in place. An EMP, containing detailed information on sea lice management and containment measures to be undertaken at the Proposed Development, has been included with this application.	Chapter 10 Appendix C (EMP)	None
Argyll District Salmon Fisheries Board	Scoping Opinion	The ADSFB recommends that the applicant: • Provide a production plan of their farming operations and how this related to existing farming in the Firth of Clyde (Kilbrannan Sound, Loch Fyne and East Arran); • Identifies the likely migration routes of salmon smots in the Firth of Clyde and how the farm may affect them • Provide detail of how the applicant will manage sea lice; implement control measures that can reduce emissions of sea lice larvae. • Ensure the health of wild fish populations are monitored to establish if the site can operate sustainable with minimal impact on wild fish in the longer-term • Provide a commitment to undertake all possible actions to recover escape farm fish and recognize damage to fishery amenity caused by	An assessment of the interactions with wild salmonid populations, specifically in regards to the potential effects of sea lice infestation, is presented in Sections 10.2, 10.3 and 10.5. Figure A3 of the EIAR shows all operational and pre-application sites in this. A detailed literature review and study of environmental parameters (such as tidal stream and weather data) was carried out (see Section 10.2) to predict the likely post smolt migration route of salmon in the Firth of Clyde (see Section 10.5). The Development is not assessed to be within proximity to likely salmon migration routes, and therefore no significant effects have been predicted with the good practice measures and innovative equipment as described is in place. An EMP containing detailed information on sea lice management and containment measures to be	Chapter 10 Figure A3 Figure A7 Appendix C (EMP)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		escapes	undertaken at the Proposed Development, has been included with this application. The EMP contains a Monitoring Strategy, which will enable the appropriateness of lice management at the Proposed Development to be monitored, assessed and optimised. The EMP also contains an Escapes Prevention and Contingency Plan.		

Table 5.7: Impacts upon species or habitats of conservation importance, including Sensitive Sites - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
SEPA	Scoping Opinion	The proposed farm lies within 1.5 km of the Arran Moors SPA, the qualifying feature of which are breeding Hen harriers. As these birds are terrestrial, they are unlikely to be significantly affected by a marine development, however *advice should be sought from SNH.* Otherwise there are no marine sites, designated under the Conservation (Natural Habitats etc.) Regulations 1994 (as amended), the Nature Conservation (Scotland) Act 2004, the Conservation of Habitats and Species Regulations 2010, or the Marine (Scotland) Act 2010, of concern within a 3 km search radius. The closest marine designation, South Arran MPA, lies ~13km to the south.	Potential connectively to the South Arran MPA is assessed in Sections 7.1 & 7.2 A Habitats Regulation Appraisal Screening for Arran Moor SPA, as well as Knapdale Lochs SPA, South-East Islay Skerries Special Area of Conservation (SAC), and River Endrick SAC is presented in Section 12.3. All sites were considered outwith the Zone of Influence of the Proposed Development, and therefore no further assessment, in the form of an Appropriate Assessment, is required.	Chapter 7 Chapter 12	None
North Ayrshire Council	Scoping Opinion	The EIA Report should include an assessment of potential changes to benthic habitats and species, transmission of disease to wild fish species and risk of entanglement and displacement of bird species of conservation importance, including red-throated divers. An assessment should be made of any potential impact on cetaceans, otters, seal and basking shark. An assessment should be made of impact on Priority Marine Features, including Burrowed Mud and the species living in it.	An assessment of the potential effect of the Proposed Development on benthic habitats and species is presented in Section 7.4 An assessment of the potential effect of the Development on wild salmonid via transmission of disease is presented in Section 10.5 An assessment of the potential effect of the Development on protected bird and mammal species of conservation importance, including entanglement and displacement of red-throated divers is presented in Sections 9.3 & 11.3. An assessment potential effect of the Proposed Development should be made of impact on Priority Marine Features, including Burrowed Mud is presented in Sections 7.4 & 11.3	Chapter 7 Chapter 10 Chapter 9 Chapter 11	None

Table 5.8: Navigation, Anchorage, Commercial Fisheries, other non-recreational maritime uses (MOD) - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
NLB and RYA		None	NLB and RYA noted, during pre-application discussions, that they had no significant concerns about, or objections to, the Proposed Development. The location of the Proposed Development will not impede navigation through the channel and is not considered to offer a significant amenity issue. Moorings will be kept as short as possible to minimise potential risk of obstruction. Navigational marking at the Site will be as per NLB recommendations.	Chapter 13 Appendix N (Baseline Marine Activity Report)	None

Table 5.9: Landscape and Visual Impacts - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Scottish Natural Heritage	Scoping Opinion	SNH noted serious concerns which could lead to an objection. Their opinion is that would be difficult to accommodate any scale of aquaculture development at this location without causing significant adverse effects on the North Arran National Scenic Area (NSA), and likely adverse effects upon an area of isolated coast. They also note that ZTVs indicate the development is unlikely to adversely affect the wild land qualities of the North Arran Wild Land Area. SNH detailed response and requirements are outlined below:	SNH concerns are acknowledged and a full SLVIA has been undertaken as part of the EIA for the Proposed Development. This is reported in the EIAR.	Chapter 14 Appendix O (SLVIA)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
SNH	Scoping Opinion	**Regional Pattern of Development** Development in this location would be contrary to the established pattern of aquaculture in this region. The assessment should include the location options considered and explain reasons for preferred location.	Background to the choice of location, layout and technology including other options considered is included in the EIAR.	Chapter 4	None
		Assessment and Guidance SNH recommend assessment follows GLVIA3, SNH aquaculture guidance, and other relevant guidance in particular in relation to assessment of effects on the NSA special qualities. The proposal is likely to affect both the NSA and the APQ. Consideration of effects on the NSA, and effects on the qualities for which the area is designated/ valued will be key. The introduction of lighting to this area of undeveloped, isolated coast should also be fully assessed. Impacts on wildness qualities including remoteness, inaccessibility and tranquillity should be fully considered. The Seascape/ Landscape Assessment of the Firth of Clyde (March 2013) provides useful context including strategic guidance and guidance on development for each coastal character area, such as the location of fish farms. The study confirms that this stretch of coastline is "one of the most remote stretches of coastline within the whole of the Firth of Clyde." We note that the applicant intends to use this study to inform their assessment.	The SLVIA has been undertaken in accordance with all appropriate guidance, as listed within the relevant Chapter of the EIAR. This identifies the impact of all aspects of the Proposed Development, including lighting, with an assessment of significance. An assessment of the NSA has been undertaken as part of the SLVIA. Impacts on wildness qualities are considered.	Chapter 14 Appendix O (SLVIA)	None
		North Arran NSA Specific assessment of impacts on North Arran NSA, in accordance with the most recent draft Guidance on assessing the impacts on Special Landscape Qualities.	An assessment of impacts on the NSA is provided within the SLVIA in Section 14.5.1	Chapter 14 Appendix O (SLVIA)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		Area of Panoramic Quality (APQ) An assessment of the effects on the special qualities of the adjacent APQ including the effects of lighting to be provided. In the absence of a detailed citation defining these qualities, the qualities would need first to be identified and then the effects on same assessed.	An assessment of impacts on the APQ is provided within the SLVIA.		
		S/LVIA The issues to be considered are set out in SNH's 'Siting and Design of Aquaculture in the Landscape: visual and landscape considerations', 2011, and our most recent guidance which supplements this 2011 guidance: 'Visualisations for Aquaculture- guidance note Aquaculture (2018) We highlight that an ES is likely to include: • Information from the appropriate spatial plans and development plan policies, including how the relevant advice and guidance has been used to help locate and design the proposal; • An explanation of how the proposed scheme responds to the key characteristics of the local coastal landscape, including details of how any predicted adverse impacts on the landscape character or visual amenity will be mitigated; • If appropriate, an explanation of how the proposal will avoid creating an adverse cumulative impact on the landscape; • A visual impact assessment; and • A map indicating key viewpoints, accompanied by illustrations or photomontages. These should illustrate how the final, mitigated proposal will be seen in context."	The SLVIA has been undertaken in accordance with all appropriate guidance, as listed within the relevant Chapter of the EIAR. The Chapter includes information on how the design responds to the landscape and highlights where mitigation has been embedded in the design to minimize effects. The SLVIA is accompanied by a suite of figures and visualisations including photomontages from selected viewpoints.	Chapter 14 Appendix O (SLVIA)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		Cumulative Effects Consideration of the strategic cumulative effects of locating aquaculture development in this location – remote, isolated coast; contrary to the regional development pattern should be provided. We understand there are several other current fish farm proposals in the Firth of Clyde area. The strategic implications of this should be considered. Sequential effects should also be assessed.	There were no cumulative landscape or visual effects identified as no cumulative sites were within the SLVIA study area. Although a number of sites are identified at the pre-application stage, these are at sufficient distance to the Proposed Development that no further assessment has been made within the SLVIA.	Chapter 14 Appendix O (SLVIA)	None
		Coastal Character Assessment The principles contained in SNH 'Guidance Note: Coastal Character assessment' (2017) are also relevant. Local Seascape Character Areas (LSCA) should be identified specifically for the S/LVIA. The S/LVIA should assess impacts and effects on the LSCA.	A Coastal and Landscape Character Assessment has been undertaken as part of the SLVIA in Section 14.5.2. LSCAs are identified (see Section 14.4.3)	Chapter 14 Appendix O (SLVIA)	None
		Landscape Character Assessment The new SNH Landscape Character Assessment has been published, though please note existing capacity studies take precedence.	A Coastal and Landscape Character Assessment has been undertaken as part of the SLVIA in Section 14.5.2. This refers to the new SNH LCA (Section 14.4.3)	Chapter 14 Appendix O (SLVIA)	None
		Landscape Experience The assessment should take account of how the proposal will affect the perceptual qualities and experience of the landscape. Impacts on wildness qualities including remoteness, inaccessibility and tranquillity are likely to be particularly relevant. The introduction of lighting to this area of undeveloped, isolated coast should also be fully assessed. Noise and odour should also be taken into account.	This is included within the SLVIA (see Section 14.5.2). In regards to assessing the impact of odour, the mort recovery system will remove fish directly from the pen and dispose them into a mort process unit. This unit is contained inside the hull of the barge and within closed compartments. The processing of the dead fish within this completely contained system ensures the dead fish will not be exposed to the local environment. Odour has therefore been scoped out of further assessment. Chapter 16 addresses the rationale regarding the assessment of noise impacts.	Chapter 14 Chapter 16 Appendix O (SLVIA)	Significant effect identified on experience of users of the Arran Coastal Path (ACP), from which the Proposed Development will be visible from a short section.

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		Visualisations and Figures We recommend that our visualisation guidance is followed – as you've already highlighted within your scoping response, however we'd draw your attention to these specific aspects, For digital terrain modelling (DTM) data, high resolution is required, with the accuracy set at +/- 1m. The viewer height of the ZTV should be set at a 2m ground level. We recommend that the technical details be confirmed and shown on the Figures and within the assessment. The chosen colour of the feed barge and other elements, if agreed, should be shown on photomontages to accurately represent the likely effects of this element of the proposal.	Visualisations have followed all appropriate guidance as indicated within the SLVIA, specifically within Appendix O Annex 2.	Chapter 14 Appendix O (SLVIA)	None
		Viewpoints/Assessment points Thank you for the list of draft viewpoints and general list of receptors (13.2.3). We welcome the inclusion of water based viewpoints, though we recommend VP 14 is brought closer (c1km) and an additional viewpoint from a similar distance from the south-east is provided to represent the views for craft passing close to the shore with the proposed development seen against open water and potentially more prominent. We also recommend that the visual receptors should also include random routes through the landscape (where there are no defined routes). Areas used for recreation such as picnic sites, wild camping, or attractions such as waterfalls should also be represented where appropriate. We recommend omitting VP 11 and VP12 given their distance. Similarly, VP11 may be better relocated given VP9 gives a similar but closer view. In addition, it is important to include/ add viewpoints to represent key views of/ from the NSA, illustrating the effects on the NSA and its special qualities. Views of	A total of fourteen viewpoints representative of the type of receptors likely to be affected by the Proposed Development are used in the SLVIA. The viewpoint locations are shown on Figure 8 and listed in Table 14.3. Photographs and photomontages of the Proposed Development from each viewpoint are shown in Figures 10 to 51. The viewpoint locations have been agreed with Scottish Natural Heritage and are provided based on a representation of worst case scenarios from sensitive receptors. Viewpoint selection and micro-siting of each viewpoint location accord with advice of technical guidance and therefore serve the purpose of allowing a competent technical SLVIA to be undertaken.	Chapter 14 Appendix O	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		Arran and its seascape setting illustrating the wider scenic composition will be particularly relevant. It would be helpful to highlight these views in the viewpoint justification. We would be happy to consider draft wirelines/ photomontages to aid viewpoint selection. Views should be selected to illustrate the size, scale and location of the proposed development at representative distance, locations, directions and elevations; selected to show the worst case scenario. Any supporting wireframes should show the height of the feed barges and nets, as well as show the horizontal extent of the development area, including as much detail as possible. Any assessment points that may be separate to the formal viewpoints included within the S/LVIA should be included as photos/ references.			
NAC	Scoping Opinion	NAC response covers points raised by SNH and outlined above. The landscape/seascape assessment should consider the fit and scale of the development to the coastal character of the north of the Isle of Arran. Particular regard should be had to the qualities of the Isolated Coast and Arran NSA. The area is adjacent to an APQ and the effects on this need to be addressed. This should include identifying the qualities of this area. Given the environmental sensitivity in this regard, it is considered a Landscape and Visual Impact Assessment should be carried out. This should be done under a methodology acceptable to SNH and draw on the advice of the Landscape Institute '*guidelines for Landscape and Visual Assessment (3rd Edition)'* 2013 and SNH's '*the Siting and Design of Aquaculture in the Landscape: Visual and Landscape Considerations'* 2011. The zone of Theoretical Visibility (ZTV) should inform	An SLVIA has been undertaken in accordance with appropriate guidance and is reported within the EIAR. See comments above in response to SNH and appropriate Chapter and appendices of the EIAR.	Chapter 14 Appendix O	As comments above for SNH

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		the selection of representation viewpoints, which should then be subject of photomontages. Guidance should be taken from SNH's `*Visualisations for Aquaculture Guidance Note'* 2018. Cognisance of the Seascape/Landscape Assessment of the Firth of Clyde (March 2013) should be shown. Consideration of cumulative impacts along with a Coastal Character Assessment, Landscape Character Assessment and consideration of the landscape experience will be required. See SNH's comments for details of specific guidance and notes on viewpoints.			

Table 5.10: Noise - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
SNH	Scoping Opinion	The impacts of noise generated through the operation and maintenance of the proposed site on specially protected wildlife and recreational users should be assessed in the ES.	An assessment of the effect of underwater noise on protected wildlife is addressed within the EIAR, specifically on cetaceans (Section 11.4.3) and basking shark (Section 11.5.4)	Chapter 11	None
NAC	Scoping Opinion	A Noise Impact Assessment should be produced that identifies the noise generating activities arising from the operation of the proposed developments. The assessment should demonstrate the likely impact on any noise sensitive receptors and impact on noise level at the nearest part of the coast. Any noise considered to have an impact on noise sensitive receptors, shall be assessed in accordance with BS4142:2014. An assessment of noise levels on recreational users of the area and protected wildlife should be made.	Chapter 16 addresses the rationale regarding the assessment of noise impacts.	Chapter 16	None

Table 5.11: Marine Cultural Heritage - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Historic Environment Scotland (HSE)	Scoping Opinion	HES confirmed that the proposed development lies approximately 300 m to the north of a scheduled monument; SM4882 Laggantuin deserted post-medieval settlement. According to the Scoping Report the development would lie within key views from the monument, but would not significantly alter its interpretation and understanding as a working coastal settlement. The Scoping Report also notes that the development would be visible from scheduled hillfort Torr an t'Sean Chiasteil Fort (SM412) but given its distance it would not significantly alter the monument's setting. HES agreed with the assessment presented in the Scoping Report that the development would not result in a significant alteration to the coastal setting of either scheduled monuments Laggantuin deserted post-medieval settlement (SM4882) or scheduled hillfort Torr an t'Sean Chiasteil Fort (SM412). HES are content for impacts on cultural heritage assets within the remit to be scoped out of the EIA assessment.	No further response required. This aspect was scoped out of further assessment.	N/A	None
NAC	Scoping Opinion	HES advise that they agree with the assessment that the development would not significantly alter the coastal setting of the nearby scheduled monument. This may be scoped out of any assessment.	No further response required. This aspect was scoped out of further assessment.	N/A	None

Table 5.12: Waste Management (non-fish) - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
NAC	Scoping Opinion	Required details to be provided on waste management procedures	The operation of the Proposed Development including waste management procedures is described within the EIAR and taken into account as one of the Proposed Development parameters for each individual assessment.	Chapter 3	None

Table 5.13: Socioeconomic, Access and Recreation - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
SNH	Scoping Opinion	**Arran Coastal Way (ACW) National Route** SNH have stated that while the proposed is sited in a remote location away from the main centres of population, the ACW passes very close to the development site. The ACW is recognized as one of Scotland's Great Trails and is a significant economic asset for the island community. SNH recommend that the Environmental Statement should consider the potential impact of the development on users of the ACW and make recommendations for mitigation if appropriate. **Geopark** SNH have stated that the local community is currently developing proposals for the designation of Arran as a Geopark. The proposed fish farm development will be located close to important geological features along the coastal edge, including the Laggan SSSI and the Fallen Rocks. The impacts on this recreational use is likely to be similar to those experienced by the users of the coastal way. **Sea Kayaking** SNH stated that due to the popularity of sea kayaking around the coast of Arran, the Environmental	An assessment is included within the SLVIA on users of the ACW in the vicinity of the Proposed Development (Section 14.6.1). Represented by Viewpoints 1, 2 and 4. As stated by SNH the impacts of users of the Geopark are likely to be similar. All receptors are considered to be of **high** sensitivity to change due to the popularity of the area with walkers and their principal reason for being there being for recreation purposes. Significant visual effects have been identified for land based receptors using the Arran Coastal Way. These are of a limited geographical extent, and effects occur across a relatively small Section (1-3 km), are limited by direction of travel and decrease very quickly by distance from the Proposed Development. Data on marine activity including recreational vessels in the vicinity of the Proposed Development has been reviewed and included as an Appendix. There is very low activity identified within the site boundary. The SLVIA includes assessment on receptors at sea including at close distances (e.g. Viewpoint 8).	Chapter 14 Appendix O (SLVIA) Chapter 13 Appendix N (Baseline Marine Activity Assessment)	Significant Effects identified on users of the ACP (see Sections 14.6.1 & 14.8)

		Statement should attempt to assess this usage and the level of impact that the installation of the fish farm could potentially cause.			
NAC	Scoping Opinion	The effects of the development in terms of direct and indirect employment along with supply chain benefits during the construction and the operation of the site should be assessed. Details of the location and impact of the shore-based operations, including any physical development proposed, is required. The impact of the proposals on the recreational and tourist economy of Arran should be assessed. This is with particular reference to impact on the walking route of the Arran Coastal Way, sea kayaking and recreation in relation to geological features. Details of any pre-application consultation with relevant interests should be recorded as should any community consultation.	A socio-economic assessment has been undertaken. This analysis is based on the Sustainable Livelihoods Approach (SLA) to identify impacts across the Scottish supply chain as well as effects local to Arran. It is based around the looking at the potential effects of the Proposed Development on the human, social, financial, environmental and physical.	Chapter 15, Appendix P (Social and Economic Impacts Report)	Significant positive effects identified

Table 5.14: Traffic and Transport - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
NAC	Scoping Opinion	Required details to be provided on access to site	All transport to the Proposed Development will be by boat. The shore base will be either at the exiting SSC site at Lamlash or potentially Brodick. Details are provided within the EIAR and technical assessments have taken these Development parameters into account as appropriate.	Chapter 3, Section 3.5	None

Table 5.15: Any other issue - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
Marine Scotland Science	Scoping Opinion	**Site Location & DMA** There are currently no sites registered with Marine Scotland Science within 1000m of the proposed new site (see attached map). The proposed location of the site is out with current disease management area (DMA) boundaries as currently defined in Marine Scotland DMA maps, available online. **However,** there are several other proposed new sites in the vicinity, currently in the screening and scoping process, that could further impact the designation of DMAs and their boundaries should these applications be progressed. Furthermore, the order in which all proposed sites are developed will also have bearing on the advice given as the applications progress as The National Marine Plan states new aquaculture sites should not bridge DMA's, therefore locations which join DMA's would not be supported by MSS. The nearest proposed site to the East of Millstone Point site, is positioned south east of the Island of Bute, East of Hawk's Nib and would result in separation distances from these sites overlapping and therefore the joining of DMA's. **Both sites cannot exist concurrently as they would lead to joining of DMA's which is particularly substantial as it potentially involves DMA 19a, 19b and 19c due to the position of proposed sites and their separation distances closing off water bodies and increasing epidemiological risk factors.** Further information on proposed sites in this area and potential impacts on DMA foreseen: Separation distances from all 3 proposed Dawnfresh sites at Cumbrae touch land on both sides, together or independently, therefore activation of any one or all	A risk assessment has been undertaken by SSC to determine how existing DMAs may or may not overlap in relation to this proposed Development. SSC have undertaken a building block approach to cumulative DMA risk assessment, incrementally assessing various scenarios in a staged approach.	Chapter 16, Appendix H (Farm Management Statement)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		sites will effectively close the water body in the Firth of Clyde North of West Kilbride and expand DMA 19b north in a single DMA, backfilling the water body to include Loch Goil, Loch Long, Gare Loch and west towards the River Clyde due to epidemiological risk factors (see map). With development at the East of Hawks Nib proposed site, the enlarged 19b would expand to include East of Millstone Point, which would subsequently result in the joining of 19b with 19a and 19c due to epidemiological risk factors which would not be supported by MSS as detailed above.			
Marine Scotland Science	Scoping Opinion	**Site Access** The location of the proposed site appears to be relatively exposed, to the east. Environmental data for the proposed location and details on the assessment made on its suitability should be provided. Information should be provided regarding how access to the site will be maintained, particularly during inclement weather conditions both for staff conducting routine husbandry operations, equipment checks and sea lice counts and also other visitors like divers and regulators, such as the FHI for inspection purposes, to ensure that the health and containment of fish on site is not compromised by the location. Reference should be made to the availability of suitable boats for access and husbandry in an exposed location and any technologies that may be utilised to aid remote observation of the site.	Information on site access and communications and how these will be maintained for effective operation in inclement weather conditions is provided in the EIAR. The Proposed Development will be routinely serviced from the existing SSC Lamlash shore base, where staff and work boats will depart to site. There is also the opportunity for vessels to depart from Brodick, however no additional facilities will be required. Access to the Proposed Development will be with covered fast boat (seating for 10) or landing craft, these boats will also be used to transport visitors/divers. A second open boat will be available on site for additional work around the pens.	Section 3.5: Access and Communications	None
Marine Scotland Science	Scoping Opinion	**Husbandry** Further information should be provided on the process of mortality removal using SeaSpine, the level of processing that is undergone at the barge and the disposal route for end products of waste from	Information on mortality removal, processing on site and waste removal are provided in the EIAR.	Section 3.4.3: Mortalities	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		processing. Reference 14: Fish mortality plan, in the draft escapes contingency plan is not included and it or information pertaining to this should be submitted. It should also be noted that the Predator Control Plan still states lift up systems are in use for mortality removal, this should be updated.	This is now included within the draft Escapes Contingency Plan The PCP has been updated to reference SeaQure Farm technology.	Appendix C (EMP - Annex PCP) Appendix C (EMP – Annex PCP)	
Marine Scotland Science	Scoping Opinion	**Sea Lice** Further information including stocking plans and risk assessments may be required depending on the status of other proposed developments at the time of submission of the planning application for this proposed site. Further information should be provided on the proposed approach to treating the two groups of 10x 120m cages. Practical treatment times for all 20 cages on site will likely be around 7 days which may increase the risk of reinfection of treated cages from untreated cages. Information in the EMP should be updated to reference the novel treatment practices and features of the SeaQure cages, SeaSpine fish transportation system and on barge treatment facilities. Further information should be provided on predicted treatment times that are practically possible to perform on an average day and further information on treatment methods and times with the novel swim through systems. Non-chemical physical removal methods with hydrolicers or thermolicers are also proposed for use. Any influence of the novel equipment proposed on physical removal methods should be provided, including further information on the proposed freshwater treatments. Evaluation of the measures in place for the	A dynamic risk assessment has been undertaken in relation to the potential overlapping or not of DMAs. This is provided in Appendix H to the EIAR. Practical treatment times have been estimated at 4 days for all 20 pens in the two groups. With the innovations (e.g. aeration of pens) plus SSC existing stringent processes for monitoring and lower thresholds for treatment, the potential for re-infection is minimal. In extreme cases, additional boat resource can be allocated to the site to help with treatments and increase the number of pens treated per day. Where resource is required to be shared between areas, 24 hour shifts can be organised to treat the site faster. The EMP has been updated to include reference to novel practices and features of the SeaQure Farm concept. Information on the SeaQure Farm infrastructure and how this influences operations is included in Sections 3.3 & 3.4. Measures for the control and management of sea lice are contained in the EMP	Chapter 16 Appendix C (EMP) Appendix H (Dynamic Risk Assessment) Appendices K & I (Modelling Reports)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		prevention, control and reduction of parasites and set actions to be taken during the escalation of a sea lice infestation in the first year at sea with minimal SLICE consent and biological control not yet in place, also taking into account the vast size of the farm, it's exposed location and the novel equipment proposed.			
Marine Scotland Science	Scoping Opinion	**Containment** The proposed contingency plan for dealing with an escape event is satisfactory. The information provided on equipment and strategies in place to minimise predator interactions at the site in question is satisfactory as far as can reasonably be foreseen. The information on equipment suitability provided in the submitted documents is noted. However, evidence that 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. In lieu of this, equipment specifications detailing the environmental conditions (current speed and wave height) the cages and moorings can withstand should be provided, in combination with details of the environmental conditions (current speed and wave height) experienced at the site location. Further information is sought on the operations of the SeaSpine system with the SeaQure cages, which allows stock and mortalities to be transported to the barge and back, with specific reference to ensuring containment of the aquaculture animals during these processes.	The Escapes Prevention and Contingency Plan and Predator Control Plans are provided as Annexes to the EMP. Attestations are provided from suppliers in Appendix B to this EIAR. Details on the SeaQure Farm system are provided within the EIAR. The central spine and pipes are made of high density polyethylene (HDPE), which is a proven reliable and robust product. This, with the addition of sensor technology in the system, will minimise any risk of fish being pumped out of the sealed system. The system will be fully valved, to ensure that only the open lines are operating (Section 3.3).	Chapter 3 Appendix B (Equipment) Appendix C (EMP EPCP/PCP)	None
SEPA	Scoping Opinion	SEPA note that the Sound of Bute has been classified as Good status in the 2017 classification scheme. Also that the proposal lies within 20 km of 3 new fish farm in Firth of Clyde proposed by another operator.	A dynamic risk assessment including the sites proposed by SSC and Dawnfresh has been undertaken and included as Appendix H.	Appendix H (Dynamic Risk Assessment)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
NAC		**Consideration of Alternatives** The current Regulations require that all EIA Reports should include an outline of the reasonable alternatives studied. This should include the main reasons for selecting the chosen option. The alternatives should include site location and layout and other design considerations.	Information on the alternative locations considered and information on choice of layout and technology is included in Chapter 4.	Chapter 4	None
NAC		**Site selection** Detailed assessment of the specific selection of the site. This should include operational considerations, landscape and visual considerations, nature conservation, navigational and hydrological interests. Awareness should be shown of known constraints presented by local and national landscape, nature conservation and special scientific designations.	Information on the alternative locations considered and information on layout and technology is included in Chapter 4.	Chapter 4	None
NAC		**Water Environment** The Environmental Statement should address the consequences of the development in terms of hydrological, waste management and pollution control considerations. An extended baseline benthic survey and a standard baseline visual survey will be required along with modelling, and a modelling report including hydrodynamic and in-feed chemotherapeutant modelling. All modelling should have regard to cumulative impact from other existing and proposed aquaculture development and be undertaken to satisfy published SEPA guidance	The EIAR includes the results of the assessment on all aspects of the water environment with the potential for significant effects as identified during the Scoping process.	Chapters 7 to 12	None
NAC		**Operational measures** Details of stocking, annual production, fallowing, working procedures and practices and contingencies should be documented to demonstrate how effects upon the receiving environment will be minimised. An escapes prevention contingency plan and a predator control plan should be submitted along with details of containment measures tailored to site-specific	Details of the Proposed Development operational procedures are outlined within Chapter 3 of the EIAR, specifically Section 3.4 Husbandry. The draft EMP (Appendix C) includes further details requested.	Chapter 3 Appendix C (EMP)	None

Consultee	Stage	Identified Actions	Project Response	Cross Reference	Any Outstanding Issues
		conditions, including appropriate manufacturer attestations. The Environmental Management Plan should include plans for monitoring wild fish interactions and how this will affect management of farm production. Information on how access to the site will be maintained, including in relation to inclement weather, should be provided. This should address vehicle use and remote observation.			
NAC		**Structure of the Document** The EIA should concentrate on those elements likely to have 'significant' consequences for the receiving environment. It should make passing reference to other issues of lesser importance to indicate that they have been considered. Short-term and long-term consequences should be identified with an indication of expected degree of magnitude and any mitigation measures advanced along with the degree of confidence as to the efficacy of such measures. Where significant effects are anticipated, mitigation measures should be identified and provided. This should include proposals for implementation and monitoring of those measures. A summarised table of the measures should be provided within the EIA report. In accordance with the requirements of the Regulations, the EIA should be accompanied by a non-technical summary of the issues addressed in the main document.	The EIA has followed guidance as outlined within Chapter 2 and the EIAR includes the required details as listed in Section 2.6. As indicated the EIA has focused on those elements where a potential for significant effects was identified. The scoping process was utilized to scope out elements where there was unlikely to be significant effects.	Chapter 2 Non-Technical Summary (NTS)	None

5.3 Summary of Assessment Requirements

A scoping request was submitted to NAC early in 2019 and returned on 1st May 2019. The scoping response from the statutory consultees provided details of what was specifically required to be covered within the EIAR including details of survey and data requirements. In line with the EIA Regulations, the EIAR focuses on the effects identified through the scoping process as having the potential to give rise to a significant effect. This EIAR presents an assessment of the potential effects of the Proposed Development upon the environment and the mitigation measures proposed to reduce the risk of these effects occurring.

Following completion of the gap analysis, the following assessments are included within the EIAR

- Benthic Impacts;
- Water Column Impacts;
- Interactions with Predators;
- Interactions with Wild Salmonids;
- Fisheries;
- Impacts on Species or Habitats of Conservation Importance;
- Need for Habitats Regulations Appraisal;
- Navigation, Anchorage, Commercial Fisheries and other Maritime Uses;
- Landscape and Visual Effects; and
- Socio-economic Effects.

Table 5.16 highlights specific technical areas which have been scoped out of further assessment as they are unlikely to result in potentially significant effects.

Table 5.16 Technical Areas Not Requiring Further Assessment (Scoped Out)

Technical Area	Elements not likely to give rise to a significant effect
Cultural Heritage	HES agreed with the assessment presented in the Scoping Report that the development would not result in a significant alteration to the coastal setting of either scheduled monuments Laggantuin deserted post-medieval settlement (SM4882) or scheduled hillfort Torr an t'Sean Chiasteil Fort (SM412). HES are content for impacts on cultural heritage assets within the remit to be scoped out of the EIA assessment.
Impacts on / resilience to climate change	The Proposed Development is inherently designed to reduce adverse effects of climate change by promoting a sustainable method of food production. The global warming potential of methane is estimated to be 28-36 times that of carbon dioxide. When comparing livestock farming, which is estimated to account for approximately 18% of the world's total greenhouse gas emissions due to methane emission, aquaculture does not emit methane and therefore is not a direct contributor to the causative issue of rising greenhouse gas emissions. The main elements of climate change that could potentially impact on aquaculture production are: • Temperature rise; • Storm events, and • Sea-level rise. Temperature rise could result in faster growth rates for some aquatic species such as Atlantic salmon but extended periods of warmer summer temperatures may result in thermal stress, especially to cold water and temperate water species e.g. cod and halibut. Thermal stress may also cause cultured species to become more susceptible to disease, and sea lice are likely to remain an issue with rising temperatures extending their season. Whilst storm events are predicted to increase, the pens are designed to withstand significant storm events. All pens, nets and moorings are checked on a routine basis.

Technical Area	Elements not likely to give rise to a significant effect
	Sea-level rise may result in a reduction or loss of suitable habitat for aquaculture. The UK Climate Projections 2018 (UKCP18)[11] became available in November 2018 and provide the most up to date assessment of how the climate of the UK may change over this century. Projections show variations in sea level rise around the UK, with the amount of sea level rise depending on geographic location and the level of emissions. The rises are greatest in the south of the UK, with lowest values centred around South-West Scotland. The UK Climate Projections Science Report: Marine and Coastal Projections 2009 estimates that sea level rise will most likely impact the south of the UK with minimal changes in Scotland. It is therefore predicted that no significant effects would occur in relation to impact on and resilience to climate change, as a result of the Proposed Development.
Vulnerability to disasters and major accidents	The main risk in terms of a marine fish farm's vulnerability to disasters and major accidents is the release or escape of a large number of Atlantic salmon and the potential negative effects both genetically and ecologically on local wild fish populations. This is discussed further in Chapter 10: Interactions with Wild Salmonids. SSC employs site specific escapes prevention and containment policies as recommended by the SSPO, SEERAD Escapes Working Group and the Industry Code of Good Practice. No other potential effects have been identified in terms of vulnerability to major accidents or disasters.

[11] UK Climate Projections: The Met Office (2018) [Online] Available at: https://www.metoffice.gov.uk/research/collaboration/ukcp (Accessed 23/07/2019)

6 SUMMARY OF DESIGNATIONS

6.1 Landscape and Natural Heritage Designations

A desk-based study was undertaken to identify statutory landscape and natural heritage designations with potential for impact from the Proposed Development. A search area of 50 km was applied to the Proposed Development, to account for the mobile and sensitive nature of marine species with potential for impact. The following designated sites were searched for (including candidate and emergency designated sites):

- Special Areas of Conservation (SAC);
- Candidate Special Area of Conservations (cSAC);
- Special Protection Areas (SPA);
- Sites of Special Scientific Interest (SSSI);
- Nature Conservation Marine Protected Areas (NCMPA);
- Designated Seal Haul Out Sites (SHO);
- Wild Land Areas (WLA)
- National Scenic Areas (NSA); and
- Biosphere Reserves.

The desk study was limited to designations of relevance to the Proposed Development, for example, any nature conservation site designated for solely terrestrial or geological features was excluded, due to an absence of potential for connectivity or interaction with the Proposed Development.

The results of the desk study are presented below in Table 6.1 and in Figures A4 and A5 (Appendix A), with assessment of potential for impact from the Proposed Development provided in Sections 7-14 and where pertinent, Habitat Regulations Appraisal (HRA) screening in Section 12.

Table 6.1: Landscape and Natural Designations located within 50 km of the Proposed Development

Site Name	Designation	Designated Feature (with potential for interaction with the Proposed Development)	Approximate proximity to the Proposed Development
Arran Moors	SPA	Hen harrier (*Circus cyaneus*)	1.5 km south-west
South Arran Marine Protection Area	NCMPA	Mearl beds; burrowed mud habitat; kelp and seaweed communities on sublittoral sediment and kelp; mearl or coarse shell gravel with burrowing sea cucumbers; ocean quahog aggregations; seagrass beds and shallow tideswept coarse sands with burrowing bivalves	13.5 south
Knapdale Lochs	SPA	Red Throated Diver (*Gavia stellata)*	29 km north-west
North Arran	NSA	Detailed in Section 14.4.2.1	Proposed Development is within the northern edge of the NSA
North Arran	Special Landscape Area (SLA)	Detailed in Section 14.4.2.2 Encompasses the North and Central Arran NSA	0.2 km west
Laggantuin	Scheduled Ancient	Laggantuin deserted settlement	0.4 south

Site Name	Designation	Designated Feature (with potential for interaction with the Proposed Development)	Approximate proximity to the Proposed Development
	Monument (SAM)		

South-East Islay Skerries Special Area of Conservation ('SAC') designated for harbour seal, is located approximately 54 km north-west of the Proposed Development. The closest designated site for Atlantic salmon to the Proposed Development is the Endrick Water Special Area of Conservation (SAC), located approximately 96 km by sea to the north of the Proposed Development.

6.2 Natural Heritage Designations Scoped Out of the Assessment

Justification and rationale for scoping out designated sites is presented in Chapter 12: Habitats Regulations Appraisal and Chapter 14: SLVIA. Where a particular feature is not mentioned, it is assumed that there is no connectivity between the area of the designation and the Proposed Development, largely due to the terrestrial nature of the features and marine location of the Proposed Development.

7 BENTHIC HABITATS

This Chapter assesses the potential effects of impacts related to the Proposed Development on benthic habitats. Potential significant impacts are believed to be limited to:

- Disturbance of benthic habitats by Development Installation;
- Deposition of operational organic waste on benthic habitats; and,
- Deposition of operational medicinal chemicals on benthic habitats.

7.1 Baseline Conditions

7.1.1 Designations

The closest marine designation to the Proposed Development is the South Arran Marine Protection Area (MPA), located 13.5 km to the south (Figure A5, Appendix A). The MPA encompasses the waters from just north of Drumadoon Point on the west coast, to Corriegills Point on the east and includes the current No Take Zone in Lamlash Bay.

The MPA is designated for: mearl beds; burrowed mud habitat; kelp and seaweed communities on sublittoral sediment and kelp; mearl or coarse shell gravel with burrowing sea cucumbers; ocean quahog aggregations; seagrass beds and shallow tideswept coarse sands with burrowing bivalves.

7.1.2 Benthic Habitats and Species

A Benthic ROV Survey was carried out by Aquasky Ltd between the 30th October 2018 and 31st October 2018, and largely covered the pen group. An additional Benthic ROV Survey undertaken by TRAC Oil and Gas Ltd was carried out over the 15th May 2019 and 16th May 2019 and largely covered the wider potential depositional area outwith the pen groups, to ensure full survey coverage of benthic habitat likely to be impacted by the Proposed Development. The footage recorded was analysed by SSC specialists. Details of the survey area, method and results are presented within the North Arran Seabed Video Report (Appendix I) and Additional Seabed Video Survey Report (Appendix J).

The aim of these surveys was to record the benthic baseline conditions under, and in the vicinity of, the Proposed Development and in particular, highlight any species or habitats of potential conservation importance. The survey used Remote Operated Vehicle (ROV) survey methods, and were carried out in accordance with survey guidance detailed within SEPA's Fish Farm Manual[12].

Benthic habitats recorded at the two pen groups varied slightly. At the north group, the benthos consisted of muddy sand with patches of mixed gravel and rocks. At the south group habitats were predominantly sand and gravel, with some areas of muddy sand recorded in deeper areas.

At the north group, squat lobster (*Munida rugosa*) and Turritella snails were the most common species recorded. Other notable species observed included Sea Squirt spp. and Norway lobster (*Nephrops norvegicus)* and various unidentified fish spp. The MNCR (Marine Nature Conservation Review) SACFOR classification (Superabundant; Abundant; Common; Frequent; Occasional; Rare) [13] indicated Squat Lobsters were recorded at the highest abundance 'Frequent', and Turritella, Fish spp. and Norway Lobster were recorded as 'Occasional. The SACFOR is commonly used to record the abundance or density of a variety of benthic fauna and flora, and was calculated for each species observed during the seabed survey.

At the south group, squat lobster was the most commonly recorded species, with the exception of Fish spp., which were noted as 'Frequent' using the SACFOR classification.

[12] https://www.sepa.org.uk/regulations/water/aquaculture/fish-farm-manual/
[13] https://www.marlin.ac.uk/glossarydefinition/typicalabundance

Squat lobster, as well as common urchin (*Echinus esculentus*), Norway lobster, Crab spp. and seven-armed Starfish (*Luidia ciliaris*) were recorded as 'Occasional', using the SACFOR classification.

Table 7.1: Total survey species frequency recorded under pen groups categorised by the SACFOR scale

Species	Pen Group	
	North	**South**
Common Starfish *(Asteria rubens)*	O	R
Common Urchin		O
Crab spp.		O
Cushion Star (*Asterina gibbosa)*	R	R
Fireworks Anemone (*Pachycerianthus multiplicatus)*	O	
Fish sp.	F	F
Hermit Crab (*Pagurus berhardus)*	R	
Norway Lobster	F	O
Octopus (*Octopus vulgaris*)	O	
Scallop (*Pecten maximus)*	R	
Sea Squirt sp.	F	R
Seven Armed Starfish	O	
Shrimp spp.	R	
Spiny Starfish (*Marthasterias glacialis)*	O	R
Squat Lobster	O	O
Turritella spp	R	R

The most commonly recorded benthic species (with the exception of fish) were Norway lobster and Sea Squirt. Both were recorded at both pen groups and were the only species recorded as frequent. The only other species/taxa recorded as present at both pen groups were; fish, squat lobster, cushionstar, spiny starfish and common starfish. Of species recorded, 16% of records were classified as 'Frequent', 44% as 'Occasional' and 40% as 'Rare'.

Between the pen groups, the seabed largely consisted of muddy sand, gravel and rocks towards the shore, but changed to bedrock and boulders east of the Proposed Development where the depth increased. Furthermore, the seabed recorded at the two pen groups varied slightly, with the north group consisting primarily of muddy sand with patches of mixed gravel and rocks, and the south group recorded as predominantly sand and gravel, with some areas of muddy sand recorded in deeper areas.

A summary of the results is presented in Table 7.2 below.

Table 7.2: Total survey species frequency recorded between pen groups categorised by the SACFOR scale

Species	Transect Number			
	M1	M2	M3	M4
Beadlet anemone (*Actina eqina*)	R			
Brown crab (*Cancer pagarus*)	O	O		R
Common Urchin	F	O	O	
Crab spp.	R	R	R	
Cup Coral (*Caryophyllia spp.)*		R		
Cushionstar spp.	O	O	R	R
Fish spp.	O	R		
Flat fish spp.	R			R
Goby spp.	R	R		R
Hermit crab	R	R	R	
Hydroid (*Nemertesia psp.*)	O	O	R	O
Hydroid spp.	O		R	
Lesser Spotted Dogfish (*Scyliorhinus canicula*)			R	
Northern Sea Fan (*Swiftia pallida*)		R		
Peacock Worm (*Sabella spp.*)		O		
Red Gurnard (*Chelidonichthys cuculus*)		R		
Scallop (*Pectinidae*)	R	O	O	R
Sea Squirt (*Ascidiacea*)	F	F	O	O
Seven Armed Starfish	O		O	
Spiny Starfish	O	O	O	O
Squat Lobster	F	F	R	F
Common starfish	O	O	R	R
Sunstar (*Crossaster papposu*)			O	
Tube Anemone (*Cerianthus lloydi)*		O	O	
Turitella spp.	R	R		

The most commonly recorded species was squat lobster which was classified as 'Frequent' in all but one transect (M3), where it was classified as 'Rare'. Other species classified as 'Frequent' were sea squirt (at transect M1 and M2) and common urchin (at M1 only). In addition to squat lobster, the only species/taxa recorded as present during all transects were; cushionstar, hydroid, scallop sea squirt, spiny star fish and common starfish. Of species recorded at all transects, 17% of records were classified as 'Frequent', 54% as occasional and 29% as 'Rare'.

Seabed habitats recorded during Transect M1 consisted of muddy sand and sand, with patches of gravel and rocks. The most common features recorded were squat lobster and sea squirt spp. Other features observed included unidentified fish spp., hydroid and common urchin. The SACFOR classification indicated squat lobster, sea squirts spp. and common urchin were recorded at the highest abundance 'Frequent'.

Transect M2 was carried out in deeper water over boulders and bedrock to a maximum depth of 62 m. The main features observed were sea squirt and squat lobster both noted as 'Frequent' using the SACFOR classification, however notably, three potential observations of northern sea fan were also recorded. This feature was classed as 'Rare' in accordance to the SACFOR scale (further details in Section 7.1.3, below).

Seabed habitat recorded during Transect M3 consisted of muddy sand and gravel and the depth ranged from 20 m to 35 m. The most abundant species observed were tube anemone and *Turitella* spp., however the SACFOR classification abundance of these species was 'Occasional' and 'Rare' respectively.

Transect M4 covered depths ranging from 39 m to 50 m, and recorded habitats of muddy sand and gravel throughout the transect. Squat lobster were observed to be the most common feature and were classed as 'Frequent 'using the SCAFOR scale.

7.1.3 Priority Marine Features

Priority Marine Features (PMFs)[14] are features characteristic of the Scottish marine environment, including habitats and species occurring in significant numbers, where they may be under threat or in decline and where they play an important functional role. The list offers no statutory protection under protected species legislation, but was developed to help focus future conservation action and marine planning, direct research and education and promote a consistent approach to marine nature conservation advice[15].

7.1.3.1 Northern Sea Fan and Sponge Communities

Northern sea fan was recorded on three occasions during Transect M2, and is a component species of the broad PMF habitat '*Northern Sea Fan and Sponge Communities'*. This PMF is characterised by dense aggregations of the northern sea fan and cup coral on rock or boulders with a thin layer of silt, and are usually found on vertical surfaces of bedrock and boulders in depths of 20 m to 65 m[16]. This PMF is made up of the following component biotopes:

- **CR.MCE.EcCe.CarSwi:** *Caryphyllia smithii* and *Swiftia pallida* on circalittoral rock; and
- **CR.HCR.XFa.SwiLgAs:** Mixed turf of hydroids and large ascidians with *Caryphyllia smithii* and *Swiftia pallida* on weakly tide-swept circlittoral rock.

Northern sea fan was classed as 'Rare' according to the SACFOR scale, and were recorded at a depth of 56 m to 60 m in a localised area of bedrock cliff and boulders, and area that accounted for approximately 5% of the transect length. Within this area a low abundance of cup coral was also noted and were classed as 'Rare' using the SACFOR scale. The absence of all associated biotope species and low abundance and localisation of observed biotope species (northern sea fans and cup coral), indicates that the PMF is not a significant example of Northern Sea Fan and Sponge Communities.

7.1.3.2 Burrowed Mud

The Benthic ROV Survey identified some features considered characteristic of the broad PMF habitat 'Burrowed Mud' beneath the pen groups. These features (although not PMFs themselves) included Norway lobster and fireworks anemone. Primary associated species for the two component biotopes in this PMF, phosphorescent seapen (*Pennatula phosphorea*), slender seapen (*Virgularia mirabilis*) and spoon worm (*Maxmuelleria lankesteri),* were not recorded during the surveys. As a result, the PMF 'Burrowed Mud' was assessed to be absent.

7.2 Important Ecological Features (IEF)

The following Section evaluates the nature conservation value of the benthic habitats and species present recorded. Each ecological feature has been assigned a level of importance

[14] SNH Commissioned Report 406: Descriptions of Scottish Priority Marine Features (PMFs)
[15] https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/priority-marine-features-scotlands-seas
[16] https://www.marlin.ac.uk/habitats/detail/386

in accordance with the geographical scale outlined in Chapter 2. Features assessed as regional importance or above are considered to be IEFs, and in accordance with CIEEM guidelines[17] must be further assessed within this Chapter.

7.2.1 Benthic Habitats

Benthic habitats are dominated by muddy sand, gravel and rocks which are common and widespread seabed habitats[18], of relatively low ecological value. The Proposed Development is located over 13 km north of the South Arran MPA and no qualifying features of the MPA were recorded with the Survey Area. The benthic habitats recorded are not protected by nature conservation legislation and are not listed as priority features on the National or Local priority lists, and therefore are assessed to be of **less than Local importance**, and are thus scoped out of further assessment within this Chapter.

7.2.2 Benthic Fauna (excluding PMFs)

Benthic fauna was dominated by common and widespread species typically found on muddy sand, gravel and rocks seabed habitats largely in relatively low abundances (predominantly 'Occasional' and 'Rare' of the SAFOR scale). The Proposed Development is located over 13 km north of the South Arran MPA and no qualifying features of the MPA were recorded with the areas surveyed. The benthic fauna recorded are not protected by nature conservation legislation and are not listed as priority features on the National or local priority lists, and therefore are assessed to be of **less than Local importance**, and are thus scoped out of further assessment within this Chapter.

7.2.3 Northern Sea Fan and Sponge Communities

The survey identified the presence of a small number of individual northern sea fans and cup corals during Transect M2, however component species of the PMF were recorded outwith the pen group footprint, where deposition modelling predicted lower levels of deposition. The species were only recorded south east of the North Arran B pen group footprint in an area were moderate to low deposition was predicted (1150-5000 g/m^2/year), and where abundance was noted as low and assessed as 'Rare' throughout the survey area, using the SACFOR classification.

The absence of all associated biotope species and low abundance and localisation of observed northern sea fans and cup coral, indicates the PMF observed during the survey is not a significant example of Northern Sea Fan and Sponge Communities.

PMF classification offers no statutory protection under protected species legislation, but does give each feature the status of a national conservation priority, especially as 97% of UK records of northern sea fan are from the west coast of Scotland.[19] Furthermore, the PMF is considered moderately sensitive to heavy siltation and smothering as well as de-oxygenation.

With consideration of the above, the PMF Northern Sea Fan and Sponge Communities is considered to be of **Regional importance**, and thus is an IEF, and therefore requires to be further assessed within this Chapter.

7.3 Embedded Mitigation Measures and Ongoing Monitoring Requirements

7.3.1 SeaQure Farm

The SeaQure Farm is a newly developed innovation which aims to ensure robust fish health and welfare and environmental sustainability, and will form an integral part of the design

[17] https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/
[18] http://marine.gov.scot/node/12813
[19] http://marine.gov.scot/information/northern-sea-fan-and-sponge-communities

and management of the Proposed Development. A key aspect of the SeaQure Farm concept is focused use of freshwater bath treatments (see Section 7.4.1.2) to reduce the potential environmental impact of chemical treatment of farm stock. Freshwater will be contained within a controlled environment which will ensure that any water used in the treatment is captured, and sea lice are removed and destroyed before releasing water to the environment, reducing the potential for detrimental impacts.

7.3.2 Environmental Management Plan

An Environmental Management Plan (EMP) will be implemented at the Proposed Development. A key aspect of the EMP is to ensure compliance with a quality assured integrated sea lice management plan (ISLM). The ISLM plan will focus on the use of non-chemical control such as biological control (i.e. the use of cleanerfish, see Chapter 10) and systems which physically remove sea lice, such as Hydrolicer flushing system, and Thermolicer, which will be utilised where appropriate and necessary.

The use of medicinal treatment will still play a part in sea lice management and its use will be regulated in line with Scottish Environmental Protection Agency (SEPA) Controlled Activities Regulations (CAR) licence conditions (see Section 7.4.1.2).

7.4 Impact Assessment

7.4.1 Northern Sea Fan and Sponge Communities

7.4.1.1 *Assessment of Installation Effects*

Disturbance of benthic habitats by Proposed Development Installation;

Installation of the Proposed Development moorings may result in some localised disturbance of the seabed, including the movement and suspension of sediment and substrate materials.

The Marine Life Information Network website (MarLIN) sensitivity tool[20] was used to assess the sensitivity of the northern sea fan against a range of impacts potentially associated with fish farm operations, which includes an increase in suspended material and smothering. This information was resourced from the MarLIN website to provide information on the intolerance, recoverability, and sensitivity of the component species to a variety of potential physical, biological, and chemical impacts. A review of the MarLIN sensitivity tool confirmed that both northern sea fan and cup coral are tolerant to both an increase in suspended sediment and an intermediate intolerance to smothering[21].

During the installation phase, moorings would be micro-sited to avoid potentially sensitive benthic habitats and species. ROVs would be utilised to carefully place the mooring anchors on the seabed and limit seabed disturbance. As the PMF components which were recorded in low abundances and localised where present, are likely to be tolerant to potential effects of installation-based disturbance, and good practise measure will be implemented to minimise the potential for impacts, the magnitude of the effect is considered likely to be low. Therefore, the installation effects on Northern Sea Fan and Sponge Communities, as well as other benthic species, are considered to be **not significant**.

7.4.1.2 *Assessment of Production Cycle Effects*

Deposition of chemicals on benthic habitats.

[20] https://www.marlin.ac.uk/habitats/az/M
[21] https://www.marlin.ac.uk/habitats/detail/34

During the production cycle of any salmon fish farm, waste in the form of feed and faeces, as well as chemicals used in medicinal treatments of stock may be released into the water environment. This increase in organic and inorganic material has the potential to impact the benthic environment, including fauna species.

In order to manage the risk of sea lice infestation (see Chapter 10), fish farm managers use a range of anti-parasitic chemicals to protect their stock and prevent accumulation that could potentially impact wild salmon. There are two predominant modes of treatment; bath treatment and in-feed treatment.

A topical 'bath' treatment, 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 chemicals used in bath treatments are Azamethiphos, Cypermethrin and Deltamethrin. Bath treatments usually result in a release of the treatment chemical in solution when the tarpaulins are removed, creating a surface plume that gradually disperses as it is carried away from the site on tidal currents.

An in-feed treatment is when the stock is fed a precise dose of pelletized feed impregnated with the anti-parasitic chemical, typically daily over a period of a week. In-feed treatments result in a release of the treatment chemical bound to solid material, however they enter the environment via uneaten feed pellets and to faecal material. The physical processes that determine the concentration of the chemicals in the environment over time, and their eventual fate, are different for the two treatment types, so different modelling tools are used for each.

One of the most widely used and effective in-feed treatment chemicals in Scottish salmon farms is emamectin benzoate (EmBz), also known as SLICE. A study by the Scottish Associate for Marine Science[22] indicated that the use of SLICE may affect some benthic macrofauna species, in particular crustaceans, the subphylum of organisms sea lice share with benthic macrofauna. In response to these findings SEPA has been regulating EmBz in-feed treatments in accordance with new interim environmental standards, in order to reduce the perceived risk.

As detailed in Section 7.3, as a result of the implementation of SeaQure Farm, and with the adoption of the EMP ensuring a strong focus of non-chemical treatment, the use of medical chemical required for the Proposed Development is likely to be less than what would otherwise be required in a chemical focus management. Where chemical treatment is used, it will be in accordance with SEPA regulations and will be closely managed and monitored.

As the PMF component species were recorded in low abundances and localised, and the embedded mitigation to be implemented is likely to reduce the use of chemicals in operation, the magnitude of the effect is considered likely to be low. Therefore, the installation effects on Northern Sea Fan and Sponge Communities, as well as other benthic species, are considered to be **not significant**.

Deposition of operational organic waste on benthic habitats.

During production, organic waste from feed and faeces can be deposited on the seabed immediately around fish farm pens. This increase in organic matter has the potential to impact the local benthic environment and can reduce the diversity of animals living there. Where waste deposition forms a 'footprint' of impact this can result in anoxia (oxygen depletion), eutrophication, growth of bacterial mats and lead to changes in the faunal

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

community. Furthermore, it has the potential to prevent filter feeding organisms, such as cnidarians, from effectively feeding.

Where waste is re-suspended and transported elsewhere in the marine environment, this may reduce the effect of the deposition on benthic habitats directly under the pens and in the immediate environs. Waste dispersion and deposition is dependent on local hydrographic conditions and coastal processes in the locale, which can either result in the direct deposition of waste under the pens, or re-suspension and transportation of waste elsewhere by near bed currents. Outwith the mixing zone, organic waste is carried away by currents, sometimes over considerable distances, usually diluting it to the extent that it has no detectible effect on the marine environment[23], however fish farm operators must manage their sites so that there is no significant adverse impact on benthos beyond the edge of the mixing zone. In order to ensure this, the volumes of chemicals and organic waste discharged is regulated by SEPA, who must grant any operating fish farm a Controlled Activities Regulations (CAR) licence.

In order to grant and determine the conditions of a CAR licence, computer modelling of discharge quantities is required. To facilitate this, SEPA developed a depositional model (AutoDEPOMOD) to determine the environmental impact of a fish farm on the local area[24], to allow appropriate consent limits for the CAR licence to be set, including limits of biomass and medicinal chemical use (both bath and in-feed treatments). The result of this modelling is presented in Modelling Report: North Arran A and Modelling Report: North Arran B (Appendix K).

North Arran A (the southern group of ten pens) is characterised by moderate current velocities. The resuspension frequency was assessed to be moderate, at 9 % >0.095 ms^{-1} at the near-bed cell. The near-bed residual direction is 119°. Modelling indicated that 10 % of waste deposited will be exported from the model domain, and that this exported mass is sufficient to theoretically affect an area of 0.5 km^2. It is predicted that 92 tonnes of diluted waste will be exported to the Firth of Clyde area, with the remaining waste being deposited locally within the mixing zone below the pens.

North Arran B (the northern group of sea pens) is characterised by moderate current velocities. The resuspension frequency was assessed to be moderate, at 17% >0.095m/s at the near-bed cell. The near-bed residual direction is 124°. Modelling indicated that 39% of waste will be exported from the model domain, and that exported mass is sufficient to theoretically affect an area of 2.1km^2. Modelling predicted that 394.2 tonnes of diluted waste will be exported into the Firth of Clyde area, with the remainder being deposited locally within the mixing zone below the pens.

As the majority of the matter deposited is organic it is absorbed into the environment by natural biological processes, and chemical concentration of the particles deposited are subject to natural decay over time. The half-life of EmBz once released into the water environment has been stated as between 175 days and 250 days (see Appendix L). Azamethiphos remains in aqueous phase until it is broken down into non-toxic derivatives, for which a decay half-life of 8.9-days has been determined (see Appendix L). Cypermethrin and Deltamethrin readily bind to particles and are hence removed from the aqueous phase under the biologically active conditions prevalent in Scotland's coastal waters. Thereafter it is incorporated into the sea-bed sediment where is it considered of negligible risk to the environment. It is also important to note that following the completion of the production cycle, the Proposed Development will be left fallow for a minimum of 2 months in order to allow waste deposited on the sea bed to be more quickly dispersed or

[23] https://consultation.sepa.org.uk/sector-plan/finfishaquaculture/supporting_documents/Finfish%20Aquaculture%20Sector%20Plan%20Single%20Pages.pdf
[24] https://www.sepa.org.uk/environment/water/aquaculture/modelling/

become chemically inactive, allowing the benthos to recover from any temporary effects of deposition.

A review of the MarLIN sensitivity tool confirmed that both northern sea fan and cup coral show a level of tolerance to the potential production phase impacts of the Proposed Development. Neither species are sensitive to an increase in suspended solids, nutrient enrichment and low levels of smothering and siltation, and as cnidarians, neither species are considered sensitive to EmBz. They show moderate sensitivity to heavy siltation and smothering and de-oxygenation.

Additionally, these species were only recorded on transect M2, which did not run directly within the pen footprint, but through the area in between the two proposed pen groups. Comparison of mapping of the modelling results (as presented in Appendix K & L) and the seabed survey results (Appendices I & J), confirms that both species of the PMF are located outwith the model domain pen group A, and in an area where moderate to low deposition was predicted for pen group B.

In light of the very low and localised abundance of this IEF, the temporary and localised nature of the effects, the adherence to SEPA CAR regulations, and the adoption of good practise management measures, the magnitude of the effects of this IEF is considered to be low. Therefore, the operational effects on Northern Sea Fan and Sponge Communities, as well as other benthic species, are considered to be therefore **not significant**.

7.4.2 Cumulative Effects

No significant impact on Northern Sea Fan and Sponge Communities are predicted, and the maximum extent of perceptible impacts associated with the Development is limited to 2.1 km^2. As no existing or proposed aquaculture sites lies within this proximity, **no significant cumulative effects** on Northern Sea Fan and Sponge Communities or other benthic species from the Proposed Development are predicted.

7.5 Statement of Significance

Benthic habitats in proximity to the Proposed Development were confirmed to be dominated by habitats and species of low conservation priority, with the exception of two component biotope species of the PMF Northern Sea Fan and Sponge Communities (which are considered to be IEF). Potential development-related impacts on this IEF were assessed as likely to be localised, temporary and of low magnitude. Furthermore, it is considered that the implementation of the embedded mitigation measures and adherence to national regulation would further reduce the likelihood of detrimental effects arising on both the IEF and the wider benthos. The above assessment is considered to be sufficiently robust and the effect on northern sea fan and sponge communities of any other benthic habitats or species, both individually and cumulatively, is **not significant** in terms of the EIA Regulations.

8 WATER COLUMN IMPACTS

8.1 Baseline Characteristics

The Proposed Development site is situated in the Clyde Sea, a semi-enclosed fjordic basin in south-western Scotland. The Proposed Development is be located north-east of Arran, the largest island in the Clyde Sea, approximately 0.3 km offshore. The Arran basin contains complex bathymetry; with narrow, steep and deep channels to the west, where water depths can drop to below 150 m, and relatively shallow water to the east. A notable feature of the site is the steep sloping seabed; water depths increasing from less than 10 m to more than 100 m depth across just a few hundred metres.

The Firth of Clyde is an area of complex water circulation exhibiting density stratification throughout the year. Tidal current speeds around the Proposed Development site are low, generally less than 0.1 ms^{-1}. Meteorological forcing was found to have a strong influence on the modelled current speeds at the site, resulting in a 2-4 increase in depth-averaged current speeds. Freshwater sources from rivers discharging into the Clyde Sea were found to have no discernible effect on the prediction of depth-average current speeds. The average current direction is towards the south-east.

Bathymetry data were derived by combining the digitised admiralty charts with results of a bathymetry survey, conducted on 21st August 2018. A Garmin portable chart plotter with acoustic sounder was used to conduct the survey. Boat GPS was used at the start of the survey to verify the accuracy of the equipment.

The processed data indicate that the site is likely to be moderately flushed, typical of an open location. The hydrography of this site is considered to be suitable for a development of this size and nature. The mean velocity of the site was 7.8 cm s^{-1}, with a maximum surface recorded velocity of 45.7 cm s^{-1}. The resuspension threshold of 9.5 cm s^{-1} was exceeded 9% of the time for the near bed data. This indicates that there is going to be some resuspension at the site, with export of released solids from the grid.

8.2 Embedded Mitigation Measures and Ongoing Monitoring Requirements

Although the nutrient input of the Proposed Development will be low, considerable effort will be made by SSC to reduce nutrient waste and potential for nutrient enrichment, primarily through the reduction of feed waste. Feed wastage is minimised by effective feed control and site management, and the following mitigation is proposed to achieve this:

- Routine monitoring of the seabed, stipulated in the SEPA CAR discharge licence, will be carried out to ensure environmental standards are adhered to. This involves a site specific program where seabed samples are collected and analysed for indicators of nutrient enrichment. As a result of this sampling regime, a site can be assessed for its assimilative capacity and biomass tonnages can be adjusted accordingly to keep within the consented limit;
- Fish feed used at marine farms has been developed to mimic the natural diet of salmon, and is highly digestible, reducing the potential for nutrient release into the water column. SSC has a specific Feed and Nutrition Team, whose role focusses on ensuring an optimal diet is produced and provided to SSC fish, with efficient nutrient conversion, which ensures that the amount of soluble nutrients released into the marine environment is minimised;
- The operational staff will be trained in feed usage and methods to reduce waste feed; and
- Feeding will be in accordance to established guides, and staff will be able to adapt feeding regimes as necessary e.g. if weather conditions are temporarily affecting feeding behaviour. The proposed SeaQure Farm feeding mechanism is fully automated with an inbuilt pellet detection system and associated feedback loop to ensure minimal waste.

8.3 Methodology

Nutrient enhancement budgets have been calculated which give a conservative representation of the amount of nutrient waste released from salmon farming. These budgets consider the expected total production from the consented biomass, and use the intended Feed Conversion Rate (FCR) to determine total feed input throughout the growing cycle. By using the feed manufacturer's value for nutrient content in the feed, and the relative nutrient content in the fish, the amount of particulate and soluble nutrient waste released to the receiving coastal environment can be determined.

The Equilibrium Concentration Enhancement (ECE) equation has been used to assess the impact of nitrogen loading into the surrounding waters and the potential for nutrient enrichment as a result of the Proposed Development. The ECE equation was developed by MSS for the Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters[25] (latest update March 2019). These classify waterbodies in terms of environmental sensitivity (Category 1, 2 or 3 areas) and are designated on the basis of MSS predictive models which estimate nutrient enhancement and benthic impact.

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 ECE model considers dissolved nitrogen but also emissions of particulate nitrogen and nitrogen which has re-dissolved into the water column from the seabed.

- $ECE = S * M / Q$

Where:

- S = Source Rate (kg N $T_{production}^{-1}$)
- M = Total Consented Biomass (T)
- Q = Flushing Rate (m^3 yr^{-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. In enclosed loch systems, the flushing rate is determined using the volume of the loch and flushing time, which is defined as the number of days it takes for 60% of the water in a well-mixed system to exchange with the open sea water outside of the loch.

The Development is located in an open water location (Sound of Bute) which is uncategorised within the Locational Guidelines. For the purpose of the calculation the flushing rate has been calculated using the mean low water volume and the flushing time both calculated from digitised admiralty charts and based on the Box Model Method. The low water volume is calculated for a 10 km^2 box area, based on the SEPA definition in AutoDEPOMOD depositional modelling that unconstrained water systems should be limited to a 10 km^2 box. This is detailed in Appendix L.

The estimates of enhancement of nitrogen concentration should be assessed against quality standards. The SEPA Environmental Quality Standard (EQS) for dissolved available inorganic nitrogen is 168µg/l (Working arrangement Requirements of Statutory Consultees (Scottish Environment Protection Agency, Scottish Natural Heritage, Marine Scotland Science and the District Salmon Fisheries Boards) and consultation protocol for marine aquaculture planning applications (July 2010) and calculated ECE values should be assessed against this SEPA EQS. In addition, the Oslo & Paris Commission (OSPAR) and UKTAG recommends that Cumulative Enhancement values should be added to locally relevant worst case (winter) background concentrations to assess the risk of potential enrichment. OSPAR sets a quality standard criteria for nutrients at 50% above background,

[25] Marine Scotland Science (March 2019). Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. Latest available at: https://www2.gov.scot/Topics/marine/Publications/publicationslatest/farmedfish/locationalfishfarms

therefore the calculated cumulative ECE, added to background levels, should not be more than 50% of locally relevant background winter concentrations.

8.4 Assessment of Installation Effects

The installation of the Proposed Development moorings may result in some localised disturbance of the water column due to the nature of the installation process, however ROVs would be utilised to carefully install the mooring anchors and limit disturbance. It is not expected to have any effect on the hydrography of the Site, and good practise measures will be implemented to minimise the potential for impacts. Therefore, effects during the Installation Phase is scoped out from further consideration.

8.5 Assessment of Production Cycle Effects

Excess feed released into the water column or onto the seabed in the vicinity of a fish farm site can potentially lead to an increase in locally available nutrient levels. This may result in localised changes to faunal assemblages, in both the pelagic and benthic environment.

The ECE for the Proposed Development is 2.19 µg L^{-1} (Table 8.2), a level which represents 1.30% of the SEPA EQS (168µg L^{-1}).

Table 8.2: Nutrient Enhancement Calculations for the Proposed Development

Total Biomass	Budget	Source Rate (kgN T^{-1} production)	Flush Rate (m^3 yr^{-1})	ECE (kg m^{-3})	ECE µg L^{-1}	% ECE of SEPA EQS
5000	Black	66.37	1.3097E+11	0.000002534	2.53	1.51
5000	OSPAR	57.63	1.3097E+11	0.000002200	2.20	1.3
5000	FRS	48.20	1.3097E+11	0.000001840	1.84	1.10
				Average	**2.19**	**1.31**

The calculation demonstrates that the level of nutrients released would be small and the potential for enrichment is minimised. As a result, as per the EIA Regulations, there are **no likely significant effects** predicted to occur. Full details of the ECE Calculations are provided in Appendix M.

8.6 Cumulative Effects

There are two other SSC sites operating within approximately 20 km of the Development, Lamlash Bay to the south and Tarbert South to the north-west. Due to the Development being located in open water and the large distance between the sites, these have not been included in calculations.

8.7 Residual Effects

Following implementation of embedded mitigation, residual effects are predicted to be limited and **not significant** in terms of the EIA regulations.

8.8 Statement of Significance

The total nutrient levels released in the area as a result of the Proposed Development are low, averaging 1.30% of SEPA EQS for dissolved inorganic nitrogen loading.

The level of nitrogenous waste estimated to be released from the Proposed Development can be considered a "worst case scenario" as 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 EQS is only

set for dissolved available nitrogen, with the result that a higher nitrogen loading has been used for comparisons with the SEPA EQS.

There has been concern regarding the contribution from fish farms to the total coastal nutrient budget and the carrying capacity of any specific region, and for these reasons the ECE equation has been developed. The data presented here suggest that the total impact from the nitrogen input of a fish farm releasing nutrients into an open water system is minimal and is **not significant** in terms of the EIA Regulations.

9 INTERACTIONS WITH PREDATORS

9.1 Baseline Characteristics

Studies at Scottish marine fish farms[26] have concluded that there are twelve key species/taxa that engage in predatory interactions with stocks in marine fish farms, these are;

- Grey seal (*Halichoerus grypus*);
- Harbour seal (*Phoca vitulina*);
- Shag (*Phalacrocorax aristotelis*);
- Grey heron (*Ardea cinereal*);
- Cormorant (*Phalacrocorax carbo*);
- Gull species;
- Otter (*Lutra lutra*);
- Gannet (*Morus bassanus*);
- Fulmar (*Fulmarus glacialis*);
- Guillemots (*Uria aalge/ Cepphus grille*) and
- American mink (*Neovison vison*).

Of these species, predatory interactions with harbour and grey seal were the most common, being recorded at 81% of sites. Therefore, seals are considered primary predatory species of finfish sites, with all others species listed above considered to be secondary species.

A desk-based search of publicly available data resources[27] has confirmed recent records (within 20 years) of eight potential predatory species with 5 km of the Proposed Development. This desk study area was informed by professional judgement, taking into account the scale and nature of the Proposed Development, the Zone of Influence (ZoI) of potential impacts, mobility of likely species and range of likely species. Desk study results are presented in Table 9.1 below.

Table 9.1: Predatory Species within 5 km of the Development

Species (*latin name*)	**Number of records**	**Dates Recorded**
Gull species (*Larus canus, L. marinus, L. argentatus, L. fuscus)*	61	2006, 2007, 2008, 2010, 2011, 2012, 2013, 2014, 2015, 2016
Grey heron	37	2006,2008, 2007, 2009, 2010, 2011, 2012, 2013, 2016
Shag	28	2008, 2009, 2010, 2011, 2012, 2014, 2015
Gannet	18	2002, 2005, 2006,2007, 2010, 2011, 2012, 2013, 2015
Cormorant	16	2001, 2002, 2003, 206, 2007, 2008, 2009, 2015
Great northern diver *(Gavia immer)*	13	2008, 2009, 2010, 2012, 2013, 2014
Otter	6	2007, 2011, 2014, 2018
Red throated diver *(Gavia stellate)*	2	2011, 2016
American mink	2	2015, 2016
Grey seal	1	2016

[26] Quick, N.J., Middlemas, S.J. & Armstrong, J.D. (2002). The use of Anti-Predator Controls at Scottish Marine Salmon Farms. Scottish Fisheries Research Report Number 03/02
[27] https://scotland.nbnatlas.org/. Accessed June 2019

Of the twelve identified key predatory species/taxa, eight were recently recorded within the Desk Study Area; the most abundantly recorded being gull species, and grey heron. Only one recent record of grey seal was found during the desk study, and no recent records of harbour seal.

The South-East Islay Skerries Special Area of Conservation ('SAC'), designated for harbour seal, is located approximately 54 km north-west (Figure A5, Appendix A) of the Development. Furthermore, five designated seal Haul-Out Sites ('HOS') lie within 50 km of the Development (although none within 25 km), however a number of undesignated haul out areas are also present on Arran. The largest haul out area is located at Kildonan (Sound of Pladda)[28] at the far south end of the island, approximately 35 km (by sea) from the Proposed Development. Additionally, three more local undesignated seal haul out areas are known to be present at Sannox, Lochranza, and Brodick, located 5 km, 7.5 km and 14.5 km from the Proposed Development respectively. Both species are considered likely to be present in the local area, however in lower abundances than other areas of Arran, in particular the south.

9.2 Importance of Ecological Receptors

9.2.1 South-East Islay Skerries Special Area of Conservation

South-East Islay Skerries SAC is designated for harbour seal, and is located approximately 54 km north-west (Figure A5, Appendix A) of the Proposed Development. An appraisal of the potential for impact from the Proposed Development on this designated site is presented separately in Section 12: 'Habitat Regulation Appraisal (HRA) and Information Needed to Support HRA'.

9.2.1.1 *Grey and harbour seal*

Both native seal species are protected by the Marine (Scotland) Act 2010, as well as the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), making it an offence to intentionally or recklessly kill, injure or take a seal at any time of year, except to alleviate suffering where Marine Scotland has issued a licence to do so[29]. It is also an offence to intentionally or recklessly harass seals at significant haul-out sites under the Protection of Seals (Designation of HOS) (Scotland) Order 2014.

Based on the core foraging range of grey seal and harbour seal of 50 km[30] and 30 km, respectively, the Proposed Development lies within connectivity to Sound of Pladda, Rubha nan Sgarbh, Lady Isle and Yellow Rock HOSs for grey seal[31], and Rubha non Sgarbh HOS for harbour seal. Local undesignated haul out areas (Sannox, Lochranza, and Brodick) all lie outwith immediate proximity, but within potential connectivity to the Proposed Development for both species.

Although the Proposed Development lies in a part of Arran that is of relatively low sensitivity for seals, both seal species are considered to be of **Regional importance**, and an IEF, and therefore are further assessed within this Chapter.

9.2.1.2 *Otter*

Otter are a European protected species and fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This means it is an offence, among other

[28] http://marine.gov.scot/node/12763

[29] https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/seals

[30] Cecile Vincent, Vincent Ridoux, Mike A. Fedak, Bernie J. McConnell, Carole E. Sparling, Jean-Pierre Leaute, Joffrey Jouma'a, Jerome Spitz, Foraging behaviour and prey consumption by grey seals (Halichoerus grypus)—spatial and trophic overlaps with fisheries in a marine protected area, ICES Journal of Marine Science, Volume 73, Issue 10, November 2016, Pages 2653–2665,

[31] http://marine.gov.scot/node/15167

things, to deliberately or recklessly disturb, injure, harass or kill an otter, or to damage, destroy, or obstruct access to a place otter used for shelter or protection whether or not an otter is present[32].

Otter are known to be present in close proximity to the Proposed Development (see Table 9.1) where they likely feed onshore and in coastal waters, potentially sheltering on nearby onshore habitats. Otter are widespread on Arran and the wider Firth of Clyde coastal area, and are abundant in west coast of Scotland in general. The species is considered of **Regional importance,** and an IEF, and therefore are further assessed within this Chapter.

9.2.1.3 Diver species

All diver species (red-throated, black throated and great northern diver) are protected under the Wildlife and Countryside Act 1981 (as amended) where they are listed in Schedule 1. Under Schedule 1 it is illegal to deliberately or recklessly kill, injure or take a bird, or to disturb, damage, destroy or interfere with a nest of any bird while it is in use or being built[33]. The closest designated site for diver is Knapdale Loch SPA, designated for breeding red-throated diver, located 29 km north-west of the Proposed Development.

Black and red throated diver breed on inland lochans in Scotland in the spring and summer, however great northern divers do not breed in Scotland. All species winter in offshore habitats, including the Firth of Clyde, however during this period legislative protection is limited. Diver species are considered of **Regional importance,** and an IEF, and therefore are further assessed within this Chapter.

9.2.1.4 Other species

All other species are considered regionally or nationally common and widespread species with limited, to no (in the case on American mink, a non-native invasive species) conservation value, and are therefore considered of Less than local importance, and thus are scoped out of further assessment.

9.3 Assessment of Potential Impacts

9.3.1 Seal species

As seals are common predators to marine fish farms, they are at risk from the effects of direct predator control measures. These measures include the effects of underwater noise via the implementation of ADDs and, should non-lethal measures be ineffective, through legal dispatch, the effect of which would be the mortality of individual rogue seals.

The primary method used to deter seal predation is indirect (passive) control via effective fish farm management. Effective management methods currently implemented across SSC sites would be implemented at the Proposed Development. These measures have been very successful across SSC sites at reducing seal predation of stock and predator interactions, and thus the effects on seal populations. All measures would be managed via the PCP presented as an annex of the EMP (Appendix C), which would include the following measures:

- Appropriate husbandry practices which aim to reduce stock mortality that may inadvertently attract predators;
- Selection of the most appropriate net designs and tensions, including the installation of Seal Blind (false bottom) and Seal Pro nets;
- Tensioned top nets with supports to prevent bird attacks; and,

[32] https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/protected-species-z-guide/protected-species-otters

[33] https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/protected-species-z-guide/protected-species-birds

- Maintenance of a Wildlife Log – to help assess and monitor changes in wildlife occurrence and distribution in marine habitats surrounding the Proposed Development over time.

In the event that the implementation of the PCP alone is ineffective in managing seal predation, direct control measures will be implemented, the effects of which are assessed below.

9.3.1.1 *Underwater Noise*

The most widely used direct predator control measure is the use of Acoustic Deterrence Devices (ADDs). ADDs generate a sound underwater to dissuade seal predation. The primary potential impact of ADD use is the disturbance or displacement of seals from important feeding or breeding areas within range.

ADDs to be installed at the Proposed Development (OTAQ devices), emit noise within the low frequency range of between 8 - 12 kHz (peak waveform will be centred on 10 kHz), and have a predicted detection range of 45 m[34]. Studies have shown that seals return to foraging areas soon after the ADD sounds cease, and when an ADD is positioned directly ahead of a seal's track, the animal would usually deviate from the track before returning to pursue its original direction[35]. This suggests that the effects of ADD are temporary, and are unlikely to have any impact on the animal's ability to utilise habitats in proximity to the Proposed Development for commuting and foraging.

As detailed within the PCP, ADDs would only be used temporarily, and only when required (i.e. when seal predation becomes a problem, and indirect measures have been demonstrated to be ineffective). Furthermore, the use of feedback loops would ensure that ADD noise is minimised as much as possible. This will ensure feedback of ADD performance is provided, via close monitoring and assessment of numbers of mortalities directly attributable to seals, and the number of seals observed in the immediate vicinity of the Proposed Development. This level of monitoring and assessment ensures that ADDs are not active for longer than is necessary, or if they are determined to not be effective, thus is minimising ADD noise as much as possible.

As the use of ADD will be occasional and triggered, and is only detectable at a close range, impacts will be limited to the temporary disturbance of small numbers of individual seal predators in close proximity to the Proposed Development. Due to the temporary and localised nature of impacts, the likely effects on the regional population will be of low magnitude, and therefore are **not significant**.

9.3.1.2 *Legal Dispatch related Mortality*

Should non-lethal direct measures be ineffective in managing seal predation, legal dispatch can be used, the impact of which would be the mortality of individual rogue seals. Legal dispatch is legislatively controlled, and thus only permitted following issue of the relevant licences under the Marine (Scotland) Act 2010, by Marine Scotland.

To date, non-lethal measures i.e. ADDs to reduce seal predation have been very successful across SSC sites, including sites where very high densities of seals are recorded, meaning the use of rogue dispatch is highly uncommon. No requirement for lethal dispatch has been required at the SSC Lamlash site in the last 5 years, which lies on the south-east of Arran, 9.5 km north of the Sound of Pladda HOS (the Development lies 35 km from this HOS). Effective management and ADD use at the Proposed Development, would mean that the need for rogue dispatch would remain very low.

[34] https://www.otaq.com/sealfence/

[35] St Andrews University Sea Mammal Research Unit (2015) Marine Mammals in Scotland A summary of scientific research in support of policy. Contract No. MMSS/001/11 2011 – 2015

In light of the above, the effects of legal dispatch are likely to only impact, if at all, very small numbers of local individual rogue seals. Therefore, the magnitude of this effect will be very low, and therefore, effects on the regional seal population will be **not significant**.

9.3.2 Otter

9.3.2.1 Entanglement Risk

Otter are known to be present within proximity to the Proposed Development, however these species are not considered to be primary predators of fish farms, and the risk of entanglement for otter with aquaculture infrastructure (moorings, nets and pens) is generally considered low[36]. Furthermore, otters are widespread on Arran and the wider First of Clyde[27], and have abundant access to suitable terrestrial and coastal foraging habitats, but may be attracted to the Proposed Development as a potential food resource.

A net tensioning system using specialist Seal Pro nets and sinker tubes is to be installed to hold the pen net uniformly taut. This presents a "wall" to any underwater predator with no slack areas for entanglement or purchase on the net through which an otter can grab or bite fish. The use of a net tensioning system removes the need for predator nets which further reduces the risk of entanglement for predators. The use of net tensioning is recognised as good practice in terms of predator control.

Entanglement has the potential to cause harm or mortality to individual otters, were they to engage in predatory interactions at the Proposed Development. However, with ample foraging habitats available locally the likelihood of otter predating on stock is low, and with the use of net tensioning, the risk of entanglement is also low. Therefore, the magnitude of potential effects is considered low, and therefore, effects on the regional otter population will be **not significant**.

9.3.2.2 Disturbance and Collision Risk from Marine Vessel Usage

Vessel activity would primarily comprise access to the feed barge, which is permanently moored alongside the pens at the Proposed Development; a well boat, which will be moored over the 1 to 2 months of the production period; and a slow-moving vessel used over short distances.

Otter may potentially be at risk from collision when foraging offshore, however, otter are largely nocturnal and crepuscular, and there is little to suggest that otter are at risk from fish farm vessels, for example, in Shetland, otters have regularly breed under the islands' ferry terminals, as well as jetties at Sullom Voe at the time that it was Europe's largest crude oil export terminal[37] .

Feed will be administered via a feed barge, which causes low/negligible noise levels compared to boat and raft methods (greater levels of noise can be created by open generators and feed sprayers). The vessel will be operated in accordance with best practise methods (such as the Scottish Marine Wildlife Code)[38]. Although vessel activity could result in temporary avoidance behaviour in foraging otter, the effect will be temporary and of very low magnitude.

In light of the above, the effects of marine vessel usage regional otter population is **not significant.**

[36] Quick, N.J., Middlemas, S.J. & Armstrong, J.D. (2002). The use of Anti-Predator Controls at Scottish Marine Salmon Farms. Scottish Fisheries Research Report Number 03/02

[37] Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

[38] Scottish Marine Wildlife Code. Available at: https://www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas/scottish-marine-wildlife-watching-code. Accessed 13th Jan 2019

9.3.3 Diver Species

The Firth of Clyde area is known to support a population of wintering red-throated diver which can exceed 1% of the overall UK population, however black-throated diver and great northern diver are considered less abundant with their numbers below 50 individuals, at the last count[39]. All three species are known to be present in the local area and key regional areas identified for these species are understood to be offshore areas south of the Kilbrannan Sound, as well as the northern and eastern Firth of Clyde along the Inverclyde, Ayrshire, and Dumfries and Galloway coast[40].

9.3.3.1 *Entanglement*

Divers are not recognised as key predators of fish farms, and only utilise marine habitats during the over-wintering, non-breeding period. However, the potential for injury or mortality via entanglement in nets as a result of predatory interaction with the Proposed Development cannot be entirely ruled out.

A net tensioning system is to be installed to hold the pen net uniformly taut. This presents a "wall" to any predator, with no slack areas for entanglement or purchase on the net. The use of a net tensioning system removes the need for predator nets and therefore reduces the risk of entanglement for predators and is thus recognised as a good practice measure in terms of predator control. Whale and Dolphin Conservation ('WDC') consider that if tension nets are used and maintained correctly, so that there is no loose netting, the risk of entanglements to birds (as well as basking sharks and marine mammals) is significantly reduced[41]. In additional to the above, measures would also be implemented, such as optimal mortality removal, to ensure birds are not attracted to the Proposed Development.

As a result of the low risk posed by the Proposed Development, the temporary nature of any perceptible impact (winter only), and the above embedded mitigation measures, the magnitude of the effect of net entanglement is considered to be low, and therefore effects on regional diver population will be **not significant**.

9.3.3.2 *Displacement and Disturbance*

Due to the presence of wintering divers in the local area, the potential for displacement and disturbance to wintering birds may exist.

Given the small scale of the Proposed Development in the context of the Firth of Clyde, the temporary nature of any perceptible impact (winter only), and the Proposed Development's location outwith key areas identified for divers within the Firth of Clyde, the potential effects of both disturbance and displacement on are considered to be of very low magnitude, and therefore effects on regional diver population will be **not significant**.

9.4 Cumulative Assessment

There are two other existing finfish farms with the Firth of Clyde; Lamlash, located 22.5 km south of the Proposed Development and Eilean Grianain, located 24 km to the south-west. As these distances are outwith the likely foraging and commuting range of otter and wintering divers no cumulative effects on these species are predicted.

[39] Lawson, J., Kober, K., Win, I., Bingham, C., Buxton, N.E., Mudge, G., Webb, A., Reid, J.B., Black, J., Way, L. & O'Brien, S. 2015. An assessment of numbers of wintering divers, seaduck and grebes in inshore marine areas of Scotland. JNCC Report No 567. JNCC, Peterborough.

[40] Balmer, D.E., Gillings, S., Cafferty, BJ & Swann, RL (2013) Bird Atlas 2007-2011: the breeding and wintering birds of Britain and Ireland. BTO Books, Thetford

[41] WDC (2002) Environment, Climate Change and Land Reform Committee Environmental impacts of salmon farming. Written submission from Whale and Dolphin Conservation (WDC) http://www.parliament.scot/S5_Environment/Inquiries/065_Whale_and_Dolphin_Conservation_(WDC).pdf

The two sites noted above are within the seal foraging range of the Proposed Development, and lie within 10 km of designated seal HOSs. However, given the Proposed Development's location outwith close proximity to any designated HOS, and the implementation of predator control measures that have been successful in reducing interaction of predatory species at other SSC sites, the magnitude of any potential cumulative effect is likely to be very low.

In light of the above, cumulative effects of the Proposed Development on predator species are predicted to be **not significant**.

9.5 Statement of Significance

Potential predator species are present throughout the local environment; therefore, it is recognised that there is potential for predator interaction with the Proposed Development. However, the PCP, which prioritises the use of non-lethal management measures, has proved successful and low impact at the other SSC sites, it is anticipated that the PCP will be successful at the Proposed Development. Therefore, the effect of interaction with predatory species, including otter, seal species and diver species is considered of low magnitude.

In light of the assessment presented within this Chapter, the effect on predatory species including otter, seal species and diver species, both individually and cumulatively, is considered **not significant** in terms of the EIA Regulations.

10 INTERACTION WITH WILD SALMONIDS

The rivers and coastal waters of Arran currently support populations of both Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) which migrate through, and feed in, the Firth of Clyde and Sound of Bute, where the Proposed Development would be located. Based on Marine Scotland Science (MSS) data[42] from 2016, ten rivers on Arran (Figure A6, Appendix A) are known to support salmon. It is important to note that MSS state that although it is believed that this data are largely accurate, for some areas it has not been updated or checked since 1986. Therefore, MSS data contain rivers that are at least historically known to support salmon, the closest of which is Sannox Burn, which meets the sea approximately 5 km south of the Development.

Atlantic salmon (also referred to as 'salmon') is an Annex II protected species in freshwaters throughout the European Union, however this protection does not extend to marine and estuarine sites[43], yet some protection exists in the form of exploitation controls within fisheries legislation. Atlantic salmon are anadromous, living in freshwater habitats as juveniles but migrating as juveniles to open sea in the North Atlantic before returning to their native rivers to spawn as adults. Spawning occurs from November to December, but may extend from October to late February. When a juvenile salmon leaves a home river for the first time and enters the coastal environmental it is classed as a 'post-smolt'.

Neither form of trout (sea or brown) receives much protection within conservation legislation, however like salmon, some protection exists within fisheries legislation[44]. A proportion of river (brown) trout migrate to the sea in spring where they are termed 'sea trout'. They spend the summer in the marine environment before returning to freshwater to spawn in the autumn and early winter, although sea trout can still be recorded using inshore coastal waters outwith migration or spawning periods.

10.1 Baseline Conditions

10.1.1 Designated Sites

The closest designated site for Atlantic salmon to the Proposed Development is the Endrick Water SAC, located approximately 96 km by sea to the north. An appraisal of the potential for impact from the Proposed Development on this designated site is presented separately in Section 12: 'Habitat Regulation Appraisal (HRA) and Information Needed to Support HRA'

10.1.2 Local Salmonid Populations

In order to ensure compliance with the Conservation of Salmon (Scotland) Regulations 2016, which manages the killing of Atlantic salmon in inland waters, categorisation of the conservation status of wild river salmon stock[45] is carried out on an annual basis by the Scottish Government. The assessment for 2019 gradings was carried out on a river by river basis on a total of 173 'designated salmon rivers' (graded rivers for which catch returns are provided), with the exception of those areas where fishery catches cannot be assigned to individual rivers. Three designated salmon rivers are located on Arran (Iorsa District) and are; Glenrosa Water, Iorsa Water and Machrie Water[46]. The River Sannox is not currently a designated salmon river, and despite historical presence (MSS data), the river does not currently support salmon (see catch returns data for between 2007-2018, provided by

[42] http://marine.gov.scot/information/atlantic-salmon-distribution-scotland
[43] http://jncc.defra.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=s1106
[44] https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/brown-trout
[45] https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/status
[46] https://www2.gov.scot/Resource/0054/00546374.pdf

Argyll District Salmon Board[47]) therefore the closest river known to support salmon is Glenrosa Water, which is located 14 km south of the Proposed Development.

Table 10.1: Argyll District Salmon Board Catch Returns for River Sannox

Year	Salmon	Grilse	Sea Trout	Finnock
2019	No catch return			
2018	0	0	8	0
2017	No catch return			
2016	0	0	3	0
2015	No catch return			
2014	0	0	6	8
2013	0	0	7	10
2012	No fishing			
2011	1	3	11	0
2010	0	1	6	0
2009	0	3	8	0
2008	0	0	64	0
2007	0	2	3	0

Glenrosa and Iorsa Waters are currently graded "3". A grading of "3" indicates that 'exploitation is unsustainable therefore management actions required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods)'. The Machrie Water is graded "2". A grading of "2" indicates that management action is necessary to reduce exploitation: catch and release should be promoted strongly in the first instance. The need for mandatory catch and release will be reviewed annually.

Further rivers identified by MSS to historically support salmon on the east coast of Arran are Glen Shurig Burn and Strathwillan Burn, located immediately south of Glen Rosa. Additionally, Benlister Burn and Monamore Burn are located 25 km south of the Proposed Development in Lamlash Bay.

Charts 1 & 2 below present MSS catches data[48] for Atlantic salmon from 1952 – 2017 in the Iorsa Statistical District (covering the whole of Arran) within which the Proposed Development is located. Salmon and sea trout catches have remained low in recent years, however where salmon catches appear to fluctuate, (Chart 1), sea trout numbers have remained fairly stable. It is important to note that these data may not be representative of the catches in close proximity to the Proposed Development, but it does provide an indication of catch trends in the area. Catch data itself is limited, as it is only able to show general population trends, and can be influenced by external factors. For example, it is feasible that a recent reduction in catches is at least in part due to the implementation of the recently introduced river grading fishing restrictions.

[47] Established via consultation with Alan Kettle-White- Argyll Fisheries Trust (email dated 22/07/2019)
[48] https://data.marine.gov.scot/dataset/salmon-and-sea-trout-fishery-statistics-2017-season-reported-catch-and-effort-method

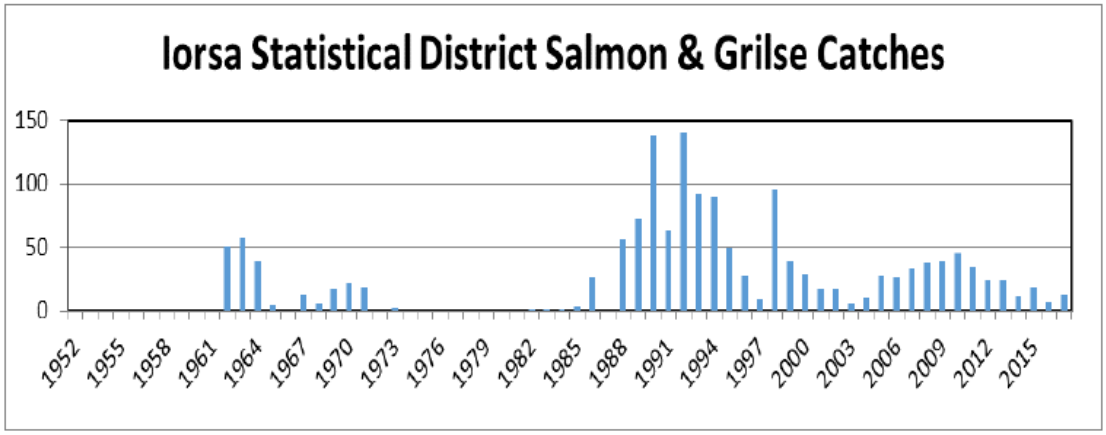

Chart 1: Iorsa District salmon and grilse (salmon returned to freshwater after 1st winter) catches between 1952 and 2017.

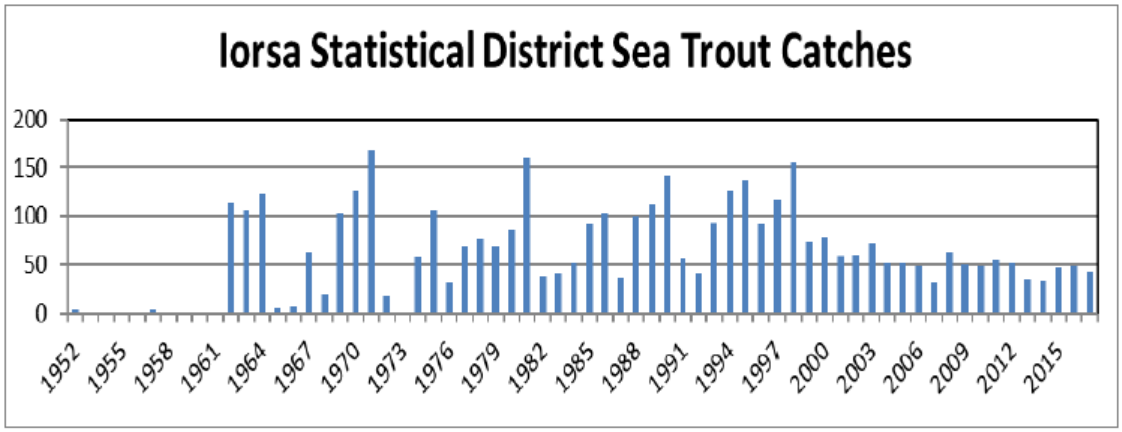

Chart 2: Iorsa District sea trout catches between 1952 and 2017.

10.2 Potential for Interaction with Salmon Farms

The potential impacts on wild salmonid populations associated with salmon farms are believed to be limited to the effects of:

- sea lice interactions (Section 10.2.1); and,
- farmed fish escape events (Section 10.2.2).

10.2.1 Sea Lice Interactions

It is recognised that salmon farms can increase the number of sea lice in the local environment and that this may have an impact on wild salmonids. Sea lice are a naturally occurring parasite on many wild fish species, with *Lepeoptheirus salmonis and Caligus elongatus* being the species that most commonly parasitizes salmon and sea trout in Scotland. A healthy wild host can support several sea lice without detriment; however, as salmon farms involve a large number of potential hosts being held in one place, an unchecked outbreak at a farm can potentially increase local sea lice populations above typical background levels, increasing the potential risk to wild salmonid populations in the local area. The most crucial factors which determine the potential for interactions of salmon farm derived with salmonid populations are considered to be salmonid migration and sea lice dispersion, as well as fish farm management.

10.2.1.1 *Salmonid Migration*

As sea lice are not tolerant of fresh water, salmonids only come into contact with sea lice when utilising marine habitats. Although sea lice tend to naturally avoid brackish water[49,50] found in some coastal habitats where fish farms are found, it is during the coastal migration phase that salmonids are most susceptible and vulnerable to sea lice infestation[51]. Studies have shown that sea lice infestation of salmonids can affect the numbers returning to home rivers to spawn[52], with newly migrated post-smolts believed to be most vulnerable to both the exposure and the effects of sea lice [53,54]. Furthermore, freshwater impacts such as agricultural pollution and river acidification can have a notable impact on migrating salmonids before entering coastal waters, for example, post-smolt survival studies showed that post-smolts were increasingly susceptible to sea lice infestation after exposure to even moderate levels of acidification[55].

The extent to which post-smolts are affected by sea lice is dependent on the migration route after leaving inshore areas, with greater risk assigned to those who stay in coastal areas for longer periods[56]. Although little is known about the migration pathways of post-smolts or returning adults, post-smolts are known to use the currents of the ebbing tide to migrate rapidly and actively towards open marine areas after leaving their source rivers. They are understood to use near-shore areas during coast migration, following the coastline in a seaward vector, and have generally been found utilising brackish water at shallow depths of typically 1 -3 m (but up to 6 m)[56]. Studies of post smolt salmon suggest that behaviour could be at least in part an adaptation to avoid sea lice[56], who tend to avoid water with lower salinities[49,50]. Additionally, smolts leave rivers during spring when ocean temperatures are low, and volumes of sea lice in coastal waters are also low[57]. Post-smolt migration is largely nocturnal, therefore as sea lice are positively phototactic and exhibit a daily vertical migration, rising during the day and sinking at night, this is likely to be a further adaption migrating smolt have to avoid interactions with sea lice[56].

Although post smolt salmon move through coastal waters quickly during migration, spending the majority of their life stages earlier at sea or in home rivers, sea trout normally remain in coastal waters for longer periods in the spring and summer. As a result, sea trout are potentially more vulnerable to the effects of sea lice infestation than salmon are. Studies

[49] Bricknell, I. R., Dalesman, S. J., O'Shea, B., Pert, C. C. & Luntz, A. J. M. (2006). Effect ofenvironmental salinity on sea lice Lepeophtheirus salmonis settlement success. Diseases of Aquatic Organisms 71, 201–212.

[50] Heuch, P. A., Bjørn, P. A., Finstad, B., Holst, J. C., Asplin, L. & Nilsen, F. (2005). A review of the Norwegian national action plan against salmon lice on salmonids: the effect on wild salmonids. Aquaculture 246, 79–92

[51] Thorstad, E.B., Whoriskey, F., Uglem, I., Moore,A., Rikardsen, A.H., and Finstad, B. (2012) A critical life stage of the Atlantic salmon Salmo salar: behavioural and survival during the smoilt and initial post-smolt migration. Journal of Fisheries Biology (2012) 81.500-542

[52] Scottish Government, 2016. The interactions and effects of sea lice on wild salmon. Available at: https://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/Aqint/sealice Accessed 13th September 2018

[53] Revie, C., Dill, L., Finstad, B. & Todd, C. D. (2009). Sea Lice Working Group Report. NINA Special Report 39, 1–17

[54] Finstad, B., Bjørn, P. A., Todd, C. D., Whoriskey, F., Gargan, P. G., Forde, G. & Revie, C. W. (2011). The effect of sea lice on Atlantic salmon and other salmonid species. In Atlantic Salmon Ecology (Aas, Ø., Einum, S., Klemetsen, A. & Skurdal, J., eds), pp. 253–276. Oxford: Wiley-Blackwell.

[55] Finstad, B., Kroglund, F., Strand, R., Stefansson, S. O., Bjørn, P. A., Rosseland, B. O., Nilsen, T. O. & Salbu, B. (2007). Salmon lice or suboptimal water quality - reasons for reduced postsmolt survival? Aquaculture 273, 374–383.

[56] Thorstad, E.B., Whoriskey, F., Uglem, I., Moore,A., Rikardsen, A.H., and Finstad, B. (2012) A critical life stage of the Atlantic salmon Salmo salar: behavioural and survival during the smoilt and initial post-smolt migration. Journal of Fisheries Biology (2012) 81.500-542

[57] Boxaspen, K. & Naess, T. (2000). Development of eggs and the planktonic stages of salmon lice (Lepeophtheirus salmonis) at low temperatures. Contributions to Zoology 69, 51–55

have shown that although both sea lice species, are recorded on salmon in Scotland, C. elongatus was largely absent from sea trout[58].

Despite the above beneficial migratory behavioural adaptations, studies have shown that post-smolt migrating locally to fish farms can be attracted to them, where they feed on waste feed pellets. This has the potential to increase sea lice infection (the obvious exception being if the feed contains lice treatments such as Emamectin benzoate (EmBz)). Additionally, migrating post-smolts may enter fish farms and be predated by farmed fish[56].

10.2.1.2 *Sea Lice Dispersion*

The sea louse has three non-host feeding planktonic larval stages that drift with the prevailing current until they mature to copepodid phase and encounter a host fish to attach to[59]. In addition to coastal currents, studies in Loch Torridon have highlighted the importance of the wind-driven circulation for larval lice transport and suggest that local environmental conditions have considerable impact on the probability of sea lice infection spreading between wild and farmed fish populations[60].

Modelling results in Loch Sheildaig demonstrated that viable louse larvae could be transported many kilometres from their source and dispersed throughout the sea loch, with lice aggregations occurring at the head of the loch under certain wind conditions. Recent studies into the dispersal of sea louse larvae concluded that mean nauplius (larval stage) abundance peaked near the point source, and decreased rapidly with increasing distance, however, copepodids peaked between 7 to 12 km seaward of the source[61].

The infection risk to wild salmonids depends not only on peak louse abundance, but also on the persistence of louse activity or 'occupation time'; i.e. the amount of time that copepodids are present in the surface layer. Recent studies into the dispersal of sea louse larvae suggested that sea louse are transported by different combinations of river flow and wind forcing, and tend to accumulate along inlets such as a river mouth or embayment (areas where salmonids are likely to congregate)[59]. Therefore, sheltered areas with weak currents are more likely to support sea lice aggregations than more exposed waters.

10.2.1.3 *Potential for Effects on Wild Salmonid Population*

Although no empirical information currently exists on the impacts of fish farm derived sea lice on wild populations of salmon or sea trout in Scotland, studies of the population-level effects of salmon lice in Ireland and Norway show that lice-induced mortality in farm-intensive areas can lead to an average of 12-29 % increase in wild salmon mortality[51]. Although sea trout were not assessed, the study suggested their mortality is likely to be higher than salmon as they usually remain in coastal waters longer[51]. However, caution should be taken when applying these (and similar) studies to Scotland.

Scottish studies have shown that farmed salmon contributed to 95% of the total production of sea lice nauplius (an early non-feeding stage) in the mid-west coast region[61]. Furthermore, studies in Loch Shieldaig have shown that the biannual cycle of louse abundance along the shoreline at the head the loch, matched the production cycle of the

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

[59] Gillibrand P.A & Willis K,J (2007) Dispersal of sea louse larvae from salmon farms: modelling the influence of environmental conditions and larval behaviour. Aqwuatic Biol Vol 1:63075, 2007

[60] Amundrud, T.L & Murray, A.G (2009) Modelling sea lice dispersion under varying environmental forcing in a Scottish sea loch. J Fish Dis. 2009 Jan;32(1):27-44. doi: 10.1111/j.1365-2761.2008.00980

[61] Gillibrand P.A & Willis K,J (2007) Dispersal of sea louse larvae from salmon farms: modelling the influence of environmental conditions and larval behaviour. Aqwuatic Biol Vol 1:63075, 2007

local salmon farms, with the appearance of louse copepodids (feeding phase) lagging behind farm louse burdens by 1 to 3 weeks[62].

A large-scale Irish study found that 31% of the sea trout in bays with fish farms had salmon lice levels above a critical threshold (0.7 chalimi per gram fish mass), compared to 3% in bays without farms[58]. A further Scottish study of Scottish west coast and Outer Hebrides, found that 13% of the sea trout carried salmon lice levels above the critical threshold (13 mobile lice per sea trout)[58]. However, in a separate study, high lice infection levels were recorded on the east coast as well as in the west and northwest, and that fish sampled in late summer and autumn did not have lice. This study established no clear links between lice intensity and proximity of salmon farms[63]. The study also found that that although fish on farms could be heavily infested in April and May, wild sea trout nearby had only scarce or no infections from sea lice[63].

Although studies suggest an elevated risk of salmon lice induced mortality of sea trout can be present in areas with high salmon lice levels, no studies have been able to provide a quantitative estimate of the population effects for sea trout in farm-intensive areas. This is likely further complicated by the premature return of salmon lice-infested sea trout from the sea to freshwater. This behaviour has been documented in Scotland, and is believed to be an adaptive response to allow for recovery of trout from salmon lice infestation[58]. Although this behaviour is likely to help reduce sea lice related mortality in sea trout in the short term, in the long term, reproduction productively may be impacted as a result of a shortened sea migration[58].

Although the magnitude of any impact in relation to overall mortality levels is not known for Scotland, it is possible that declines in catches of both salmon and sea trout on the Scottish west coast, may at least in part be linked to impacts from aquaculture, by adding to the various anthropogenic pressures already placed on these species from unrelated human activities. Although studies comparing the salmon abundance on the west coasts of Scotland found a reduction in the catches and counts correlated with an increased production of farmed salmon, the same data for the east coast, where fish farms are absent, showed the same trends of decline[64]. Sea trout has suffered greater decline on the west coast than salmon on the west coast, but this decline predates the establishment of salmon farming there[64].

This suggests that although fish farms can generate high levels of sea lice, larger scale factors such as climate change and overfishing are likely to have a far greater impact on salmonid population decline than fish farming. However, fish farms have the potential to add further pressures to populations that may already be existing below their carrying capacity.

10.2.2 Farmed Fish Escapees

Farmed fish escapees can also pose a risk to wild salmonid populations in the form of the reduction in survivability (such as reduced fitness and susceptibility to disease) through genetic dilution of wild populations, via interbreeding between escapees and wild salmon population, or increased competition over resources with escapees. Escape events at fish farms are rare and generally result from operational accidents, predator interaction, equipment failure or adverse weather events.

[62] McKibben M.A., Hay D.W. (2004) Distributions of planktonic sea lice larvae Lepeophtheirus salmonis in the inter-tidal zone in Loch Torridon, Western Scotland in relation to salmon farm production cycles. Aquaculture Research 35(8), 742-750.

[63] Green DM, Penman DJ, Migaud H, Bron JE, Taggart JB, McAndrew BJ (2012) The Impact of Escaped Farmed Atlantic Salmon (Salmo salar L.) on Catch Statistics in Scotland. PLoS ONE 7(9): e43560. https://doi.org/10.1371/journal.pone.0043560

[64] Marine Scotland Science - Scottish Salmon and Sea Trout Fishery Statistics.
Available online at: https://www2.gov.scot/Topics/marine/Publications/stats/SalmonSeaTroutCatches

There are several studies that investigate the extent of hybridisation existing in the wild salmon population in Scotland, however this still remains inconclusive, and the population level effects of such hybridisation is still largely unknown. The prevalence of Norwegian farmed strains in the Scottish aquaculture industry allows genetic markers to be used to distinguish Norwegian farmed strains from wild fish (both Norwegian and Scottish). Using this method, a study by the River and Fisheries Trust of Scotland looked for Norwegian genes in wild salmonid populations on the west coast of Scotland. Across the sites monitored 25.1% individuals were identified as hybrids; notably higher than those seen on the east coast[65].

However, a separate study based on catch data showed that salmon recaptures account for less than two per thousand of the reported escapes, with the fate of the vast majority of escapes unknown[66]. Furthermore, a weak positive correlation was found between local escapes and subsequent sea trout catch was seen, the opposite of what would be expected if salmon escapes negatively affected wild fish numbers[64]. This study suggested that escaped salmon either have very low survival in the wild, disperse without returning, or are less readily caught by anglers[64], and concluded there is no evidence of depressed salmon or trout catch, or firm evidence of elevated prevalence of escapes in the salmon catch in the years immediately following reported escape events.

Studies in the North Atlantic have shown that salmon released in autumn before attaining sexual maturity appeared to survive poorly to sexual maturation, whereas salmon escaping later in winter showed greater survival. In general, released salmon appeared to move with the currents and have a very weak, to no, homing instinct. This same study suggested that large adult salmon escaping from fish farms in Scotland during winter and spring, may move with the currents and, during the following summer or autumn, may enter spawning populations far away from the site of escape, when they become sexually mature[67].

10.3 Importance of Ecological Features

10.3.1 Atlantic Salmon

Atlantic salmon are protected under EU legislation although this protection does not extend to marine and coastal sites. However, salmon have been declining for over half a century in Scotland, with declines on the west coast mirrored by declines on the east coast, where fish farms are not located. Therefore, Atlantic salmon are considered to be of **Regional importance** and thus are an IEF, and therefore require to be further assessed within this Chapter.

10.3.2 Trout

Although protected from fishing exploitation through fisheries legislation, trout are not protected by any form of conservation legislation. Nationally, trout have been declining at a similar rate to salmon, however MSS catch data suggest that the local population appear to have remained relatively stable since the early nineties. Therefore, trout are considered to be of **Local importance** and thus are not considered an IEF, and therefore will not be further assessed within this Chapter. However, it is important to note that due to extensive overlap in range, behavioural ecology, and potential effects from fish farms, measures recommended to safeguard salmon populations are very likely to equally benefit wild trout populations.

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

[66] Green DM, Penman DJ, Migaud H, Bron JE, Taggart JB, McAndrew BJ (2012) The Impact of Escaped Farmed Atlantic Salmon (Salmo salar L.) on Catch Statistics in Scotland. PLoS ONE 7(9): e43560. https://doi.org/10.1371/journal.pone.0043560

[67] Hansen, L.P (2006) Migration and survival of farmed Atlantic salmon (*Salmo salar L.*) released from two Norwegian fish farms

10.4 Embedded Mitigation

10.4.1 SeaQure Farm

The SeaQure Farm is a newly developed innovation which aims to ensure robust fish health and welfare and environmental sustainability, and will form an integral part of the design and management of the Proposed Development. A key aspect of the SeaQure Farm concept is focused use of freshwater bath sea lice treatments (see Section 7.4.1.2) to reduce the potential environmental impact associated with chemical treatment of stock.

10.4.2 Integrated Lice Management Plan (ISLM)

Appendix C (EMP) will be implemented at the Proposed Development. A key aspect of the EMP is to ensure compliance with a quality assured ISLM. Although regulated medical treatment will form a part of the sea lice management at the Proposed Development, the ISLM plan will aim to focus on the use of non-chemical control such as biological control and systems which physically remove sea lice, which will be utilised where appropriate and necessary (see below).

10.4.2.1 *Biological Control – Cleaner Fish*

The deployment of cleaner fish as a biological control forms a key aspect of the ILSM Plan at the Proposed Development. Cleaner fish represent an effective biological method for the removal of sea lice and offer an alternative to chemical treatments for sea lice control. For this reason, the sustainable use of cleaner fish is a key aspect of ongoing development and research within the aquaculture industry.

Historically wild wrasse have been used as cleaner fish, but wrasse tend to become inactive in winter, and are often wild caught resulting in sustainability concerns. Lumpsuckers continue to feed on sea-lice at low temperatures, and commercial production is favoured over wild catches. Lumpsuckers also have higher activity rates than wrasse and cover the whole pen area, rather than just edges and corners favoured by wrasse[68].

Across SSC sites, 90% of the cleaner fish are from farmed origin. The SSC biology department will choose to deploy farmed lumpsuckers, wild caught wrasse or farmed wrasse based on criteria such as availability, effectiveness and sustainability. In order to safeguard areas in which wild wrasse are sourced, SSC has signed up to the Scottish Salmon Producers Organisation's "Voluntary control measures for the live capture of Scottish wild wrasse for salmon farmer's" standard.

10.4.2.2 *Physical Removal Systems*

As presented within the ILSM, systems which physically remove sea lice, such as the Hydrolicer and Thermolicer will be utilised where appropriate and necessary. Treatments conducted by the Hydrolicer have achieved at least 85% clearance of all stages of sea lice. Lice bags are used to capture all removed lice from the system, so sea lice are not returned to the water.

SSC has conducted several treatments in 2018 using a Thermolicer vessel on loan from another fish farming business, with excellent results. Clearance with the Thermolicer was a minimum of 85% all stages and this option is available for the Proposed Development should it be required.

[68] Brooker, AJ., Papadopoulou, A., Gutierrez, C., Rey, S., Davie, A., Migaud, H. (2018) Sustainable production and use of cleaner fish for the biological control of sea lice: recent advances and current challenges Veterinary Record 183, 383

10.4.2.3 Fallowing

Following the completion of each production cycle, the Proposed Development will be left fallow for a minimum of 2 months. This will reduce the potential for sea lice accumulation and, should sea lice be present, allow the levels to return to natural background levels.

10.5 Assessment of Potential Effects

The Scottish salmonid population has been in decline for over half a century and, due to the anadromous nature of these species, and the multitude of anthropogenic factors likely to be involved, the reason for this decline is not fully understood. As stated in Section 10.2, studies into the population level effects on salmonids in Scotland are inconclusive, but they do suggest that fish farms may to be one of the factors impacting salmon populations, already in decline largely as a result of overfishing and climate change.

It is crucial to note that the aim of this assessment is not to investigate whether fish farms can impact wild salmonids populations. The application of the 'precautionary principle' insists that due to the uncertainly involved in our current scientific understanding we must assume that they do. The aim of this assessment is to investigate whether the Proposed Development is likely to impact wild salmonid populations, and enough imperial evidence exists in the current scientific literature to carry out an informed and robust assessment of the significant of potential effects.

10.5.1 Assessment of Production Cycle Effects

It is acknowledged that the Proposed Development could potentially impact wild salmonids during the production phase but, due to the low impact nature of deployment, no perceptible effects from the deployment phase are predicted. The potential impacts on wild salmonid populations associated with the Proposed Development are believed to be limited to the effects experienced during on-growing, specifically:

- sea lice infestation; and
- escape events.

10.5.1.1 Sea lice infestation

For this assessment it is important to consider the ecological, environmental and geographical variables that are likely to determine the significance of any perceived effect related to the Proposed Development. To understand the magnitude of effects, is it crucial to assess both the likelihood of migrating salmon being exposed to Development related sea lice accumulations, and the likelihood that sea lice will accumulate at the Proposed Development.

As discussed previously, salmon populations are most exposed and vulnerable to sea lice infestation during their post-smolt migration phase, however certain aspects of their behavioural ecology can reduce their exposure to sea lice. Post-smolts leave home rivers rapidly in spring and early summer when sea lice levels are low. Additionally, studies have shown that post-smolts are likely to migrate at night when sea lice are not active. Furthermore, migration occurs largely with shallow depths of 1 m to 6 m in brackish water, conditions not favoured by sea lice.

The above information suggests that the majority of salmon migration occurs outwith temporal and spatial parameters that would put them at particular risk of exposure to sea lice occurring, even in high concentrations, in the natural coastal environment. However, studies have suggested that in some cases, migrating salmon can be attracted to nearby

fish farms due the presence of waste feed where they could be exposed to high densities of sea lice that they are not able to avoid[69].

In addition to migration behaviour, the location of migration routes is crucial in determining the level of exposure to sea lice that migrating wild salmon have the potential to be subjected to. The importance of migratory routes is reflected in Recommendation 45 and 46 of the Environment, Climate Change and Land Reform (ECCLR) Report on the Environmental Impact of Salmon Farming[70]. The ECCLR Report advises that fish farms should be sited outwith the vicinity of the migratory routes of wild salmon. Although there is an absence of empirical data to confirm the location of migration routes of salmon around Arran, and the wider Firth of Clyde, much is known about the migratory movements of salmon in the north Atlantic. This information can be used to accurately predict the likely migration routes of salmon post-smolts in the Firth of Clyde, and thus the likelihood that migrating salmon would be affected by potential sea lice accumulations at the Proposed Development.

Salmon tend to migrate quickly from home rivers using the ebbing tidal currents through shallow waters (1-6m), following near shore habitats in a seaward vector towards open sea marine habitats. Arran lies in the northern part of the Firth of Clyde, with the only route to the sea being south. As all salmonid rivers on Arran are already south of the Proposed Development, new post smolts from Arran are not likely to pass by the Proposed Development. Furthermore, the Proposed Development is located 240 m from the shoreline, over deeper water of between 30 m to 50 m (Figure A7, Appendix A). Therefore, in the unlikely event that the Arran migration route did past the Proposed Development, they would unlikely to be in immediate proximity of the Proposed Development where the greatest risk of exposure exists.

It is also crucial to note that sea lice are introduced to fish farm by wild salmonids, therefore sites located outwith migration routes are not only less likely to transmit sea lice to wild populations, but less likely to be exposed to sea lice in the first place.

Arran lies north of the seaward exit of the Firth of Clyde, below several sea loch and firths containing salmon rivers. These include Loch Long, Loch Fyne and Loch Striven, as well as the Loch Lomond catchment, which includes the River Endrick SAC, designated for salmon. Therefore Arran, the Kintyre coast, the Ayrshire coast and the Dumfries and Galloway coast lie geographically between migrating salmon's home rivers and their migration destination, the open sea. For this reason, the potential for salmon from northern rivers to migrate past Arran, and thus the Proposed Development, may exist. However, as discussed above, salmon migrate from home rivers using the ebbing tidal currents, following near shore habitats at shallow depths in a seaward vector. These behavioural parameters mean that it is very likely that salmon follow the quickest, most energy efficient near shore route to the sea, utilising ebbing currents to preserve energy. Through the analysis of tidal stream[71] information as well as behavioural and geographic parameters it is possible to predict the likely direction of salmon migrations for the wider Firth of Clyde area.

An ebbing tidal current enters from the north-east in the Firth of Clyde between Bute, the Cumbraes and North Ayrshire (see Chart 3, below). This is the most direct route into the Firth of Clyde for salmon from the Loch Lomond, eastern Argyll (i.e. Loch Long area), Ayrshire and the Clyde catchment. Once in the Firth of Clyde, currents travel south-eastwards towards the Ayrshire coast, and out to the Irish Sea off the coast of Dumfries and Galloway. Therefore, it is very likely that migrating salmon would follow the ebb current over near shore areas on the Ayrshire and Dumfries and Galloway coast, well outwith

[69] https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/brown-trout

[70] Environment, Climate Change and Land Reform Committee (2018): report on the environmental impacts of salmon farming. Avaiallbe online at: https://www.parliament.scot/S5_Environment/Inquiries/20180305_GD_to_Rec_salmon_farming.pdf

[71] Tidal Stream Atlas: Firth of Clyde and Approaches (Admiralty Tidal Stream Atlas): United Kingdom Hydrographic Office

proximity to the Proposed Development. There is no clear justification that salmon would take an alternative, less direct and energy efficient route, as this would involve crossing open water against currents to reach Arran, only to have to swim over open water south to the Irish Sea, or west to the Kilbrannan Sound, entering the Irish sea at the south of the Kintyre Peninsula.

For rivers within the Kyles of Bute, such as the River Ruel, prevailing ebb currents between the Sound of Bute and Loch Fyne are likely to push salmon southward toward the Kilbrannan Sound and down the west coast of Arran, or south-east towards the Ayrshire Coast. Salmon heading out of Balnakailly Bay are most likely to follow the optimal route south-east of Bute, where they would enter the Firth of Clyde in the north-east (following the Ayrshire route as described above), however for the River Ruel both a south-eastern and south-western direction is possible. If salmon head out of the River Ruel down the south-western Kyles of Bute, they will likely utilise the nearshore habitats close to Bute or the Argyll coast. It is likely that those following the coast of Bute would continue to do so and enter the Firth on the north-east to continue down the East Ayrshire route. For those following the Argyll coast, it is likely that they would follow prevailing currents between the south west of Bute and Loch Fyne down the Kilbrannan Sound. Although a separate ebb current passing the east of Arran could be taken, this route is less direct and would involve moving across open water north and south of Arran, with no obvious benefits over other routes, this direction is considered unlikely.

For salmon migrating from Loch Fyne, it is likely that they would also follow the quicker route along nearshore areas utilising the ebb current between the south west of Bute and Loch Fyne down the Kilbrannan Sound.

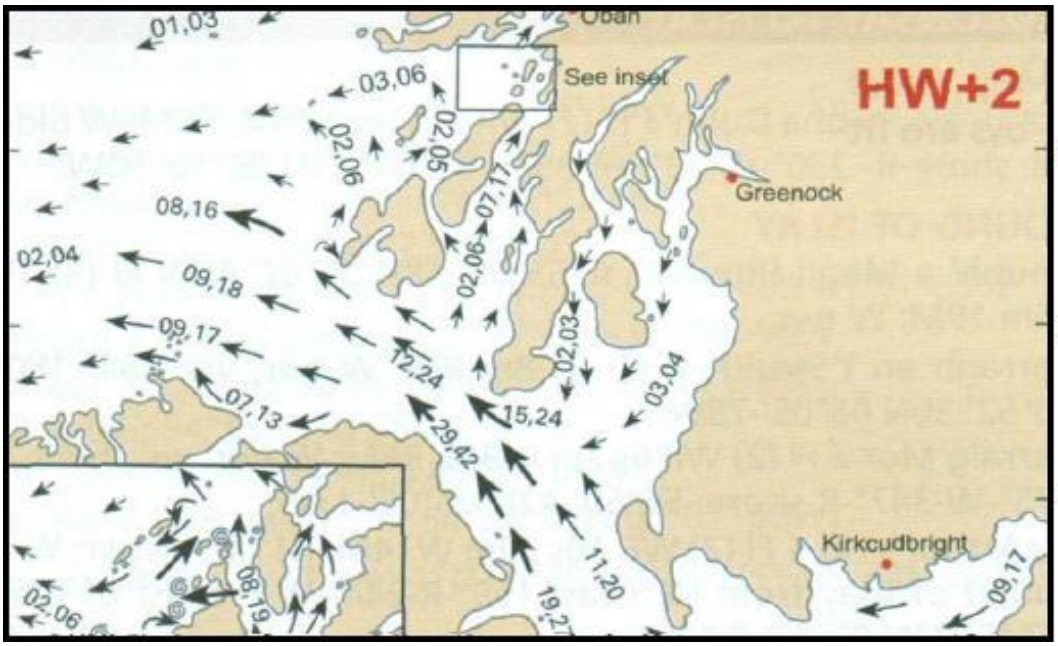

Chart 3: Tidal stream direction for ebb tide in the Firth of Clyde and Wider south west Scotland Region (at 2 hours HW Dover (0040 after HW Greenock)). Although streams change locally through the ebb period, the above is reflective of general trends in current directions during the ebbing tide[72].

Salmon are known to follow the same routes they took during migration utilising imprinted and environmental parameters recorded as post-smolts[56]. Flood tides for the Firth of Clyde are essentially the reverse of ebb tides, it is therefore reasonable to state that returning

[72] Tidal Stream Atlas: Firth of Clyde and Approaches (Admiralty Tidal Stream Atlas): United Kingdom Hydrographic Office

salmon and grilse are likely to follow the same routes outwith proximity to the Proposed Development when returning to home rivers to spawn.

Following the detailed assessment of the likely migration routes of salmon in the Firth of Clyde presented above, it can be confirmed that is it likely that the Proposed Development is located outwith the vicinity of the migratory routes of wild salmon, and therefore satisfies Recommendation 45 of the ECCLR Report. Although proximity to migratory routes is a key consideration when assessing the risk posed to wild salmonid populations, it is important to note that risk may not only exist in close proximity to a fish farm, as sea lice can disperse some distance from their point source.

As the most likely migratory routes for salmon are down the eastern coast of the Kilbrannan Sound, west of Arran (north of the Proposed Development), and the eastern coast of Ayrshire (over 18 km from the Proposed Development at the closest point), it is considered unlikely that sea lice generated at the Proposed Development would be dispersed sufficiently to impact migrating salmon in the Firth of Clyde.

No likely salmon migration routes lie with 7 to 12 km seaward (south) of the Proposed Development, the distance and direction where studies have shown peak copepodids concentrations can accumulate[59]. As discussed above, sea lice larvae dispersion is strongly influenced by both wind and current. Prevailing and strongest wind direction in the west coast of Scotland comes from a south to north west direction[73]. Analysis of wind and current data suggests that when the wind is coming from a southerly direction, during the last two hours of a flood tide, conditions could push sea lice north to areas between the Sound of Bute and the eastern Firth of Clyde, within potential range of salmon migration routes. Outwith these specific conditions, currents and wind are likely to disperse sea lice west and southward, in line with the seaward vector shown in copepodids dispersal studies. Therefore, should these specific environmental conditions occur during the period in which salmon are migrating locally, a potential for interactions with sea lice generated by the Proposed Development and migrating salmon, is feasible, however outwith these conditions, it is not likely.

If sea lice are generated at the Proposed Development, the potential to disperse seaward towards salmon rivers on the east coast of Arran does exist. However, as current and wind direction at the north of Arran where the Proposed Development is located are more likely to push sea lice south-west in the wider Firth of Clyde, rather than directly south along the eastern coast of Arran, the risk is considered low.

In addition to assessing both likelihood of migrating salmon being exposed to Development related sea lice accumulations, it is important to assess the likelihood that sea lice will accumulate at the Proposed Development. Sea lice are more likely to accumulate in sheltered areas, rather than more exposed areas found at the Proposed Development, where their accumulation is reduced by the greater environmental influences that exist such as stronger winds and currents. The exposed and open nature of the coast where the Proposed Development lies means that accumulations of sea lice are less likely, and if occurring are likely to be of lower magnitude than those in less exposed and flushed areas.

In addition to appropriate siting, the application of embedded mitigation is also critical in determining whether sea lice are likely to accumulate. Embedded mitigation measures to reduce the risk posed by sea lice would be put in place at the Proposed Development via the EMP (see Appendix C), which outlines a Sea Lice Management Strategy ('SLMS').

The SLMS provides details of the active management, monitoring, treatment, reporting and veterinary review measures to be implemented to reduce and manage the risks posed by sea lice at the Proposed Development. Within the SLMS, the ISLM plan will aim to focus

[73] Met Office. Western Scotland: Climate. Available online at; https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/western-scotland_-climate---met-office.pdf. Accessed July 2019

on the use of non-chemical control such the use of sustainable cleanerfish, Hydrolicer and Thermolicer, all of which have be used effectively at other SSC sites.

Within the SLMS, the Sea Lice Action Plan ('SLAP') translates the management strategy into a method statement, enabling informed decisions to be made. The SLMS is an active document and would be revised for every generation, and as necessary to ensure effective sea lice management.

Additionally, SeaQure Farm, with the central SeaSpine, is designed to allow the recovery of fish back to the barge, where the barge has been designed to offer large fish welfare improvement space. This allows fish to be treated for lice in a controlled environment using multiple in line and proven non-medicinal solutions.

In light of the above embedded mitigation, as well as the siting of the Proposed Development outwith the likely migration routes of wild salmon, and the low magnitude risks from sea lice dispersion, it is considered that wild salmonid populations are of low sensitivity to a potential increased risk of sea lice infestation from the Proposed Development. Although low level effects on individual or small numbers of wild salmon cannot be ruled out, the magnitude of impact of the regional wild salmon population is considered low, the overall significance of effect is minor and is therefore **not significant**.

10.5.1.2 *Farmed Fish Escapees*

As discussed, farmed fish escapees may pose a risk to wild salmonid populations in the form of the reduction in survivability through interbreeding, or increased competition over resources with escapees. However, studies investigating the extent of hybridisation existing in the wild salmon population in Scotland are inconclusive, and the population level effects of hybridisation is largely unknown. Although genetic studies suggest that hybrid salmon can make up a significant proportion of a wild salmon population, catch studies suggest hybrids are very rare, potentially due to low survivability of escapee salmon.

Studies have also shown that escapee salmon are likely to move with the current and have very weak, to no, homing instinct, however should large adult salmon escape in winter and spring, they may be able to follow currents out to sea and eventually enter spawning populations far away from the site of escape when they become sexually mature[67] This suggests that under the correct conditions, escapees could interbreed with native populations, but they are unlikely to impact populations local to their point source.

Escape events at finfish farms generally result from operational accidents, predator interaction, equipment failure or adverse weather events and are rare in their occurrence, for example, SSC have approximately 60 sites across Scotland, over which 15 escape events took place in the last ten years. The only escape event to take place at the nearby Lamlash site occurred in 2009[74].

In order to further mitigate the risk of escapes, the Proposed Development would be managed in accordance with the Escapes Contingency Plan ('ECP'), present with the EMP. The ECP would employ specific escapes prevention and containment policies as recommended by the Scottish Salmon Producers' Organisation ('SSPO'), Scottish Executive Environmental and Rural Affairs Department ('SEERAD') Escapes working group and the Industry Code of Good Practice. The ECP would ensure the same effective measures put in place across SSC sites would be adopted and maintained at the Proposed Development. The EMP also includes a PCP which includes appropriate husbandry practices, the selection of the most appropriate net designs and tensions and the used of Acoustic Deterrence Devices (ADD). The PCP is discussed further in Chapter 9. As stock predation, largely by seals, is a key cause of escape events, appropriate predator control and management is likely to notably reduce the occurrence and magnitude of escape events.

[74] http://aquaculture.scotland.gov.uk/data/fish_escapes.aspx

In light of the above, and assuming embedded mitigation measures are adhered to, the magnitude of effect of escapees from the Development the regional wild salmon population is considered low, the overall significance of effect is minor and is therefore **not significant**.

10.6 Cumulative Assessment

No significant impact on regional wild salmon populations are predicted, and the maximum extent of the predicted perceptible effect associated with the Proposed Development is limited to 12 km (maximum likely sea lice dispersal distance[62]). As no existing or proposed aquaculture sites lies within this proximity, **no significant cumulative effects** on regional wild salmon populations from the Proposed Development are predicted.

10.7 Statement of Significance

Due to the siting of the Proposed Development outwith the likely migration routes of wild salmon, the low magnitude risks posed from sea lice dispersion and salmon escapees, as well as the implementation of the above embedded mitigation measures, it is considered that potential effects related to the Proposed Development on this IEF are likely effect of low magnitude. The above assessment is considered to be sufficiently robust, and the effect on Atlantic salmon, both individually and cumulatively, is considered **not significant** in terms of the EIA Regulations.

11 IMPACTS ON SPECIES OR HABITATS OF CONSERVATION IMPORTANCE

11.1 Baseline Conditions

This Chapter summarises the potential impacts of the Proposed Development on species and habitats of conservation importance, excluding protected species and habitat discussed separately in the other Sections of this report. Impacts on benthic habitats are presented in Chapter 7; the impacts of interaction with predators are presented in Chapter 9; and impacts of interactions with wild salmonids are presented in Chapter 10.

A desk-based search of publicly available data resources within 5 km of the Proposed Development found recent records (within 20 years) of several protected marine and aquatic protected species. Desk study results are presented in Table 11.1.

Table 11.1: Protected Marine/Aquatic Species within 5 km of the Development

Species	Number of records	Dates Recorded
Basking shark *(Cetorhinus maximus)*[75]	38	2002-2016
Bottle-nosed dolphin *(Tursiops truncates)*	1	2014
Common dolphin (*Delphinus delphis)*	1	2011
Harbour porpoise *(Phocoena phocoena)*	2	2013, 2016
Minke whale *(Balaenoptera acutorostrata)*	2	2012, 2013

11.2 Importance of Ecological Features

11.2.1 Cetacean species

All cetaceans found in UK waters are afforded full protection under European protected species legislation[76]. Cetaceans were recorded at very low numbers within the desk study, and were limited to minke whale, harbour porpoise, bottlenose dolphin and common dolphin. More than 20 cetacean species can be seen in Scottish waters, but seven species, including the four species recorded in the desk study, are relatively common to Scottish coastal waters[77].

In light of the above, cetacean species are considered to be of **Regional importance**, an IEF, and therefore require further assessment within this Chapter.

11.2.2 Basking Shark

Basking shark was the most commonly recorded protected species in the desk study. In Scotland the basking shark is afforded full legal protection under Schedule 5 of the Wildlife and Countryside Act 1981[78]. The basking shark is also a PMF and has recently been included within one of four additional MPA proposals.

In light of the above basking shark are considered to be of **Regional importance**, an IEF, and therefore require further assessment within this Chapter.

11.3 Assessment of Potential Effects

Potential impacts from installation activities are limited to temporary noise and vibration associated with the assembly and installation of the Proposed Development. As the majority of assembly and construction would be done off-site (on land, but not on coast

[75] Includes publicly available data from the National Trust as well as other resources.
[76] https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/protected-species-z-guide/protected-species-dolphins-whales-and
[77] https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/dolphins-whales-and-porpoises
[78] https://www.nature.scot/sites/default/files/2018-10/Protected%20species%20list%20-%20WCA%20schedules%205%20%26%206.pdf

adjacent to the Proposed Development) and without the use of heavy plant or sea vessels, the predicted impact is considered to be negligible. As a result, this impact has been scoped out of further consideration.

Impacts associated with operation of the Proposed Development that may affect marine protected species within the local area are considered to be:

- Removal of non-target and target species (i.e. entanglement of protected marine species in fishing gear and removal of prey species);
- Contaminants (i.e. pollution resulting in effects on water quality and bioaccumulation which may then affect the survival and productivity of protected marine species);
- Underwater noise; and
- Death or injury by collision (predominantly with fast moving vessels).

11.4 Cetacean Species

11.4.1 Entanglement Risk

The risk of entanglement for cetaceans with aquaculture infrastructure (moorings, nets and pens) is generally considered very low. There is little current scientific information regarding cetacean entanglements, however there is one documented case of a humpback whale (*Megaptera novaeangaliae*) entanglement in a salmon aquaculture sea pen in Scotland[79]. Therefore, although entanglement cannot be ruled out, the likelihood of it occurring is very low. Whale and Dolphin Conservation ('WDC') consider that if tensioned nets are used and maintained correctly, so that there is no loose netting, the risk of entanglements to marine mammals (as well as other species such as basking sharks and birds) is significantly reduced[80].

Cetaceans are recorded very occasionally in proximity to the Proposed Development, and net entanglement is considered to be a very rare occurrence, therefore the likely risk is considered likely to be very low. Embedded mitigation implemented via the PCP included within the EMP (Appendix C), such as responsible maintenance of tensioned nets, would be adopted at the Proposed Development, to further minimise the already low risk of accidental net entanglement. As a result, the effect on the regional cetacean population from entanglement is considered to be of very low magnitude, and therefore **not significant**.

11.4.2 Contaminants

Cetaceans are at risk of bioaccumulation from chemical pollution, principally from persistent organic pollutants (POPs), due to their toxicity and abundance in the marine environment. The main pollutants currently believed to be affecting cetaceans include chlorinated hydrocarbons (used in insecticides), brominated flame-retardants (used in electronics, paint and plastics) and polycyclic aromatic hydrocarbons (from burning fossil fuels and organic matter) [8189.]

With regard to pollution from aquaculture developments, waste may contribute a mix of organic and inorganic compounds to waters, potentially leading to eutrophication and oxygen depletion. It is acknowledged that any impact on the environment from organic pollutants is likely to be of a localised nature[82]. The coastal processes of the Proposed

[79] https://www.parliament.scot/S5_Environment/General%20Documents/20180125_SAMS_Review_of_Environmental_Impact_of_Salmon_Farming_-_Report.pdf

[80] WDC (2002) Environment, Climate Change and Land Reform Committee Environmental impacts of salmon farming. Written submission from Whale and Dolphin Conservation (WDC)

[81] IAMMWG, Camphuysen, C.J. & Siemensma, M.L., 2015. A Conservation Literature Review for the Harbour Porpoise (Phocoena phocoena). JNCC Report No: 566, JNCC, Peterborough 2015.

[82] Russell, M., Robinson, C.D., Webster, L., Walsham, P., Phillips, L., Dalgarno, E., Malcolm, R., Watson, D., Scurfield, J., Avery, D.J., Devalla, S., Gubbins, M., Davies, I.M., & Moffat, C.F., 2010. Persistent Organic Pollutants and Trace Metals in

Development location would likely result in the dispersal and dilution of waste deposits in the vicinity. The local area is characterised by moderate to strong current velocities (Modelling Report: Appendix K) providing a moderately flushed site, resulting in the dispersal and dilution of waste deposits. Therefore, it is likely that any impact on the environment from pollutants will be of a localised nature. Furthermore, as cetaceans are highly mobile and far ranging species, and were recorded very rarely within the desk study, the risk is considered to be very low.

The Proposed Development will maintain high standards of practice for the application of chemical treatments and waste management measures undertaken in accordance with the site specific EMP (Appendix C). This will ensure strict adherence to statutory regulations and the Scottish Salmon Producers Organisation (SSPO) Code of Good Practice as a minimum.

In light of the above, the magnitude of this effect is considered low, and therefore the effect of contaminants on the regional cetacean population is **not significant**.

11.4.3 Underwater Noise

It is recognised that active ADDs have the potential to cause disturbance and habitat exclusion of cetaceans, where present within the detectable range, however the magnitude of this effect will be dependent on cetacean species presence and abundance, as well as the ADD type and usage.

Not all delphinids (marine dolphins and porpoises) are similarly affected by ADDs, largely due to variation in hearing ranges. At-sea trials have shown that ADDs that produced an evasive response by bottlenose dolphins, failed to elicit any similar behaviour in common dolphins[83], with other research showing little notable response at all to ADDs from bottlenose dolphin. Typically, frequency dependent variability reflects a species' life style and the spectral range of its vocalisations.

High frequency specialists such as the harbour porpoise, have extremely good sensitivity in the high ultrasonic range, specifically around 120 kHz, the dominant frequency in their echolocation clicks. Bottlenose dolphin and common dolphin are mid-frequency specialists, and have the greatest sensitivity to frequency ranging from 40 kHz to 100 kHz[84]. Common dolphin are thought to have a similar hearing range, with the common sounds heard from common dolphins ranging between 50 kHz and 100 kHz. Minke whale are a low frequency specialist, and thus have a lower optimal hearing frequency range understood to be between approximately 30 Hz and 25 kHz[85].

A recent evaluation of mid-frequency ADDs and harbour porpoise noise criteria found avoidance was recorded at ranges of between 1 km and 7.5 km[86]; however other trials using different types of ADD found weak or minimal responses[87]. It is therefore acknowledged that potential impacts to cetaceans from underwater noise are dependent on a number of factors including; noise characteristics of the ADD deployed; how the device

Sediments Close to Scottish Marine Fish Farms. Scottish Marine and Freshwater Science Volume 1 No 16. Edinburgh: Scottish Government, 37 pages. doi: 10.7489/1457-1

[83] Berrow, S., Cosgrove., R., Leeney. R.H., O.Brien. J., McGrath. D., Dalgard.J. and Le Gall. Y.(2009) Effect of acoustic deterrents on the behaviour of common dolphins (*Delphinus delphis*) Journal of Cetacean Research Management. 10(3):227–233, 2008

[84] Ridgway, S.H, and Au, W. (2010) Hearing and Echolocation in Dolphins. Encyclopaedia of Neuroscience 2009, vol 4, pp 1031-1039

[85] Tubellib, A. A. & Zosuls, A. (2012) A prediction of the minke whale (Balaenoptera acutorostrata) middle-ear transfer function. J Acoust Soc Am. 2012 Nov; 132(5): 3263–3272.

[86] Tougaard, J., Wright, A.J., Madsen, P.T., 2014. Cetacean Noise Criteria revisited in light of proposed exposure limits for harbour porpoise. Marine Pollution Bulletin.

[87] Northridge,S.P., Coram, A., Gordon, J., 2013. Investigations on seal depredation at Scottish Fish Farms, Scottish Government, Edinburgh

is used; local marine topography; and the importance of the habitat to cetaceans where the ADD is deployed.

Seals have best sensitivity at lower frequencies (-15 kHz)88, as well as having poorer overall sensitivity than cetaceans. Therefore, in order to target predatory seals, and minimise impacts on cetaceans, ADDs at the Proposed Development (OTAQ devices), will emit noise within the low frequency range of between 8 - 12 kHz[88]. Although this is outwith the optimal hearing frequency range of high and medium frequency cetaceans it is noted however that this is within the hearing range of minke whale.

Due to the variation in findings for ADDs studies to date, should ADDs be used at the Proposed Development, impacts on cetaceans using habitats within close proximity to the Proposed Development cannot be ruled out, however to understand the magnitude of any potential effect, it is important to consider the value of habitats to cetacean species within the potential ADD range.

Harbour porpoises are the most commonly recorded cetacean species sighted in Scotland, with over 90% of the global population is found in UK waters. Areas which are particularly important for the harbour porpoise include: Shetland, Inner Hebrides, the Outer Moray Firth and Firth of Clyde[81].

A study reviewing the habitat preferences of porpoise on the west coast of Scotland identified physical factors including depth, slope, spring tidal range and distance to land as important in porpoise distribution, with consistent preference for inshore areas with water depths between 50 m and 150 m and highly sloped regions[89]. These depths are largely a reflection of the habitat suitably for their prey species. Bathymetry data (Figure A7, Appendix A) show the water depth beneath the pen group is between 30 m to 50 m, with relatively flat benthic topography, which do not represent the habitat preferences for harbour porpoise.

An assessment of seabed data in the local area shows that benthic habitats are present below the Proposed Development are in the wider local area comprise of muddy sand, gravel and rocks, bedrock and boulders. Porpoise feed mainly on small shoaling fishes from both demersal and pelagic habitats, with sandeels (*Ammoydytidae*) and whiting (*Merlangius merlangus*) comprising the key prey species in Scottish waters89. Sandeels have a close association with sandy substrates between approximately 30–150 m depth89. Whiting can be found in benthopelagic areas over mud and gravel benthic habitats, or on sand or rock, however they are found at depths largely greater the those found in close proximity to the Proposed Development89 (at depths of 30 -100 m, see Appendix A, Figure A7)

From the above it can be concluded that habitats in proximity to the Proposed Development do not represent habitats of good value to harbour porpoise, and therefore utilisation by the species is likely to be relatively low when compared to more suitable areas elsewhere in the wider Firth of Clyde.

Common dolphins are typically open water and coastal specialists associated with warmer waters, however recent evidence suggests they occur in UK waters more regularly now, potentially as a result of rising sea temperatures. Common dolphins are one of the most numerous offshore cetacean species in the temperate north-east Atlantic, and important areas in Scotland include the Sea of the Hebrides and The Minch. The species are only seasonal visitors to the west coast of Scotland[90] and, although they are occasionally seen

[88] Coram, A., Gordon, J., Thompson, D. and Northridge, S (2014). Evaluating and assessing the relative effectiveness of non-lethal measures, including Acoustic Deterrent Devices, on marine mammals. Scottish Government.
[89] IAMMWG, Camphuysen, C.J. & Siemensma, M.L., 2015. A Conservation Literature Review for the Harbour Porpoise (Phocoena phocoena). JNCC Report No: 566, JNCC, Peterborough 2015.
[90] Hebridean Whale and Dolphin Trust Website. https://hwdt.org/shortbeaked-common-dolphin

in the far north-western Firth of Clyde, the vast majority of the Firth of Clyde is outwith the range associated with this species in Scotland[91].

The main Scottish bottlenose dolphin population is predominately found on the east coast, between the Moray Firth and St Andrews Bay, however a smaller west coast population inhabits the waters between the Inner Hebrides and the Argyll coastal mainland, and the waters around the Sound of Barra in the Outer Hebrides[92]. Although there is no resident population in the Firth of Clyde, a small number of individuals (likely from the Hebridean population) are occasionally seen in the area.

Minke whales are the most commonly recorded baleen whale in Scotland, with areas thought to be particularly important being the Inner and Outer Hebrides, Skye, and the Outer Moray Firth[93]. Although the Firth Clyde is not considered an important part of their range in Scotland, a small number of individuals are occasionally recorded.

It is planned that ADDs would only be used temporarily, and only when required (i.e. when seal predation becomes a problem, and passive measures have been demonstrated to be ineffective), as detailed in the PCP (Appendix C, EMP). Furthermore, the use of feedback loops (see Section 9.3.1) would ensure that ADD noise is minimised as much as possible.

Sightings of seals in close proximity to the Proposed Development would be recorded by site staff in the Wildlife Log. Seal activity within the Proposed Development area, associated with a threat to fish health and welfare, would result in appropriate action being taken in line with the PCP.

In summary, cetacean species have been recorded in low abundances and the Proposed Development is not located within the key known range of cetacean species, with the exception of harbour porpoise, for which optimal feeding habitats are absent. ADD use would be occasional and closely managed, and noise emitted by the ADD will be outwith the key hearing range for the majority of cetacean species (which the exception of minke whale). Therefore, although occasional temporary effects on individual cetaceans cannot be ruled out, the magnitude of the effect will be low, and therefore the effect of underwater noise on the regional cetacean population is **not significant**.

11.4.4 Disturbance and Collision Risk from Marine Vessel Usage

There is a potential risk of disturbance, injury and mortality to cetaceans from marine vessel activity associated with the Proposed Development. Although cetaceans may potentially be at risk from collision when foraging offshore, there is little evidence to suggest that they are at risk from collision from fish farm vessels.

Vessel activity would primarily comprise access to the feed barge, which is permanently moored alongside the pens at the Proposed Development; a well boat, which will be moored over the 1 to 2 months of the production period; and a slow-moving vessel used over short distances. Vessels would be operated in accordance with best practice methods (such as the Scottish Marine Wildlife Code). Feed administered via a feed barge causes low/negligible noise levels compared to boat and raft methods (which can create greater levels of noise from open generators and feed sprayers).

Although vessel activity could result in temporary avoidance behaviour in occasionally foraging or commuting cetaceans, the effect would be temporary and of very low magnitude. In light of this, the effect of disturbance and collision risk from marine vessel usage on the regional cetacean population is **not significant**.

[91] http://www.wdcs.org/national_regions/scotland/shorewatch/common_dolphin.php
[92] http://www.wdcs.org/national_regions/scotland/shorewatch/bottlenose_dolphin.php
[93] http://www.wdcs.org/national_regions/scotland/shorewatch/minke_whale.php

11.5 Basking Shark

Basking sharks are a migratory species, and return to Scottish waters in the summer months. Tagging studies have shown that the Scottish population demonstrates high levels of fidelity to summering areas, with the areas around Hyskeir, Coll and Tiree, as well as the west coast between Skye to Mull considered to be "hotspots" for the species[94]. Although the Firth of Clyde does not represent a key aspect of their range they are recorded annually in small numbers in the area, including the coast of Arran.

Although the basking shark is not considered a key sensitive species to fish farm development, perceptible impacts could include the effects of entanglement with infrastructure, collision with development-related marine vessels, contaminants and underwater noise.

11.5.1 Entanglement and Collision Risk

The Marine Biological Association's ('MBA') Marine Line Information Network ('MarLIN') tool[95] shows the basking shark demonstrate a medium level of sensitivity to collision risk and physical barriers to movement. However, fixed fishing gear has been reported to cause mortalities in the basking shark, which in large part account for the medium level of sensitivity given to the species in the tool. The MBA considers that it is likely that, as the species is highly mobile, it would be able to swim around aquaculture infrastructure, resulting in little more than small-scale energy loss[95]. Furthermore, WDC considers that if tension nets are used and maintained correctly, the risk of entanglements to basking sharks is significantly reduced[80].

Embedded mitigation implemented via the of the PCP included within the EMP (Appendix C), such as responsible maintenance of tensioned nets would be adopted at the Proposed Development, to further minimise the already low risk of accidental net entanglement. As a result, the effect on the regional basking shark population from entanglement is considered to be of low magnitude, and therefore **not significant**.

11.5.2 Disturbance and Collision Risk from Marine Vessel Usage

Due to the species' habit of feeding very close to the surface and at slow speeds[96], as well as its noted tolerance of the presence of boats[97], basking shark may be at risk from accidental collision with boat traffic. Although it is difficult to quantify the impact of collisions on the basking shark, with only 63 boat collisions with the species recorded over 21 years[98], the occurrence appears to be very low. Vessel activity associated with the Proposed Development would primarily involve the workboat required for the Proposed Development, a slow-moving vessel, only used over short distances and would be operated in accordance with best practice methods (such as the Scottish Marine Wildlife Code). As the feed barge is stationary not perceptible collision related impacts are predicted. Although feed administered via a feed barge does create some noise, this is temporary and levels are low/negligible, therefore the risk of disturbance is considered very low.

Although vessel activity could result in temporary avoidance behaviour in basking shark, the effect would be temporary and of very low magnitude. In light of this, the effect of

[94] Witt, M.J., Doherty, P.D., Godley, B.J. Graham, R.T. Hawkes, L.A. & Henderson, S.M. 2016. Basking shark satellite tagging project: insights into basking shark (Cetorhinus maximus) movement, distribution and behaviour using satellite telemetry. Final Report. Scottish Natural Heritage Commissioned Report No. 908

[95] https://www.marlin.ac.uk

[96] Sims, D.W., 2000. Filter-feeding and cruising swimming speeds of basking sharks compared with optimal models: they filter-feed slower than predicted for their size. Journal of Experimental Marine Biology and Ecology, 249 (1), 65-76.

[97] Compagno, L.J.V., 1984. FAO species catalogue. Vol. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1 - Hexanchiformes to Lamniformes. FAO Fisheries Synopsies, 125, 1-249

[98] Solandt, J-L. & Chassin, E., 2013. Marine Conservation Society Basking Shark Watch Overview of data from 2009 to 2013. Ross on Wye, UK: Marine Conservation Society, 6 pp.

disturbance and collision risk from marine vessel usage on the regional basking shark population is not significant.

11.5.3 Contaminants

The 'MBA MarLIN' tool95 shows the basking shark is not sensitive to hydrological pressure, or chemical pressures such as de-oxygenation, nutrient enrichment or organic enrichment, or to changes in the level of suspended solids. As a result, the species are unlikely to be sensitive to development related contaminants and the effect on the regional basking shark population is **not significant.**

11.5.4 Underwater Noise

The 'MBA' 'MarLIN' too95 shows the basking shark is not sensitive to underwater noise or visual disturbance. As a result, the species are unlikely to be sensitive to underwater noise related to the Proposed Development, and the effect on the regional basking shark population is **not significant.**

11.6 Cumulative

There are two other existing finfish farms with the Firth of Clyde, Lamlash, located 22.5 km south of the Development and Eilean Grianain, located 24 km to the south-west. Both of these sites also lie outwith the key range for basking shark and cetacean species, with the exception of harbour porpoise, and outwith the range of any predicted effect from the Proposed Development. Therefore, **no significant cumulative effects** on Regional cetacean or basking shark populations from the Proposed Development are predicted.

11.7 Statement of Significance

Protected species known to be present in the local marine area around the Proposed Development with the potential to be impacted by the Proposed Development, are limited to common cetacean species and basking shark, all of which are considered likely to be only present seasonally or occasionally. As a result, the risk of potential impacts to these protected species is considered to be low, and any perceived effect is considered likely to be of low magnitude and temporary. Furthermore, the implementation of embedded mitigation measures would further reduce the likelihood of detrimental effects arising. The above assessment is considered to be sufficiently robust, and the effects on cetacean species and basking shark, both individually and cumulatively, are considered **not significant** in terms of the EIA Regulations.

12 HABITATS REGULATIONS APPRAISAL (HRA) AND INFORMATION NEEDED TO SUPPORT HRA

Under the Habitats Regulations (European Union Council Directive 92/43/EEC), it must be considered whether a development will have a 'likely significant effect' on a Natura site, which includes Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar Sites[99]. This is known as Habitats Regulations Appraisal (HRA). The first phase on the HRA is screening for likely effects. HRA screening aims to identify international sites in and around the project, examine conservation objectives of the interest feature and consider the potential for perceptible effects on these sites, including cumulative effects. If no effects are considered likely, no significant effects are predicted and the HRA goes no further. However, if effects are judged likely or a notable level of uncertainty exists, the precautionary principle applies to ensure the HRA moves on to Stage 2; Appropriate Assessment.

In an Appropriate Assessment, a 'competent authority' (such as a Local Planning Authority) will carry out a detailed assessment of the potential effect of the project on the designated site, and decide whether there is enough evidence to conclude that the proposals will not have adverse effects on the site's integrity (i.e. compromise the conservation objectives). If, following the development of mitigation, the effect is still assessed as significant or uncertainty remains, the process would proceed to Stage 3.

In Stage 3 alternative solutions and modifications of the development plans will be considered, 'imperative reasons of overriding public interest' (IROPI) economic, social, environmental, human health, public safety' will be investigated, and compensatory measures will be developed and proposed.

12.1 HRA Requirements

In accordance with the requirements of the Habitats Directives, where a 'project or plan' (i.e. the Extension) has the potential to have a significant effect on a Natura 2000 Site (and Special Area of Conservation (SAC), or Special Protected Area (SPA)) while not directly connected with, or necessary to the nature conservation management of the Natura 2000 Site, that plan or project requires to be subjected to Habitat Regulations Appraisal (HRA) to identify any implications for the SAC in the view of its conservation objectives.

The Proposed Development is not associated with the management of the SAC, and therefore must at least undergo the first stage of the HRA process; screening.

12.2 Screening Methodology

A key aspect of HRA screening involves establishing the likely 'Zone of Influence' (ZoI) of the plan or project. The ZoI will vary between Natura Sites and Qualifying Features/Interests (QF), depending on the character and ecology of QFs, as well as the nature of the potential impacts of the plan or project. In addition to the ZoI, the HRA screening must also consider if a given feature is present, or likely to be present within the ZoI.

Sites assessed to be potentially within the ZoI are:

- Arran Moors SPA; due to proximity to the Development;
- Knapdale Lochs SPA; due to its designation for red throated diver;
- South-East Islay Skerries SAC; due to its designation for harbour seal; and
- River Endrick SAC; due to its designation for Atlantic Salmon.

[99] https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra. Accessed Feb 2019

12.3 HRA Screening

12.3.1 Arran Moors Special Protection Area

The Arran Moor SPA is designated for Hen harrier (*Circus cyaneus*). This species is a terrestrial ground nesting bird associated with heathland habitats, and does not feed on fish or utilise marine or coast habitats. As there is no likely perceptible way in which the species could interact with, or be affected by, the Proposed Development, the SPA is considered outwith the ZoI of the Proposed Development and **no further assessment**, in the form of an Appropriate Assessment, is required.

12.3.2 Knapdale Loch Special Protection Area

Knapdale Loch SPA, designated for breeding red-throated diver, is located 29 km north-west of the Proposed Development. Although wintering and migratory red-throated diver were recorded in proximity to the Proposed Development in winter, in accordance with SNH guidance, the Proposed Development lies outwith connectivity with the SPA; which is up to 10 km for black-throated diver and up to 8 km for red-throated diver[100]. The SPA is therefore considered outwith the ZoI of the Proposed Development, and **no further assessment**, in the form of an Appropriate Assessment, is required.

12.3.3 South-East Islay Skerries Special Area of Conservation

South-East Islay Skerries Special Area of Conservation ('SAC') is designated for harbour seal, and is located approximately 54 km north-west of the Proposed Development. As the core foraging range for harbour seal is 30 km[101], the SAC is considered outwith the Zone of Influence of the Proposed Development, and therefore **no further assessment**, in the form of an Appropriate Assessment, is required.

12.3.4 Endrick Water Special Area of Conservation

The closest designated site for Atlantic salmon to the Proposed Development is the Endrick Water Special Area of Conservation (SAC), located approximately 96 km by sea to the north of the Proposed Development.

Based on previous advice provided by SNH[102] it was stated that they consider a distance of approximately 35 km as being at the periphery of where a measurable effect upon individual salmon could feasibly be detected, but that any impact at a population level would be associated with sites much closer.

Although this advice was in relation to a separate development located in the Inner Hebrides and in the context of salmon as a host species to freshwater pearl mussel (*Margaritifera margaritifera*), as the Proposed Development lies almost three times the stated distance, as well as consideration of the effects predicted in Chapter 10, it is likely that the SAC is outwith the ZoI of the Proposed Development, and therefore **no further assessment,** in the form of an Appropriate Assessment, is required.

[100] Scottish Natural Heritage (2016) Assessing Connectivity with Special Protection Areas (SPAs)

[101] D. J. Tollit, A. D. Black, P. M. Thompson*, A. Mackay, H. M. Corpe, B. Wilson, S. M. Van Parijs, K. Grellier and S. Parlane (1998) 'Variations in harbour seal Phoca vitulina diet and dive-depths in relation to foraging habitat' J. Zool., Lond. 244, 209±222 # 1998 The Zoological Society of London Printed in the United Kingdom

[102] SNH Scoping Response letter – Geasgill Fish Farm, Ulve Ferry, Isle of Mull. Via email dated 14/02/2019

13 NAVIGATION, COMMERCIAL FISHERIES, AND RECREATIONAL MARITIME USES

Anatec Ltd was commissioned to carry out a baseline assessment of marine activities (shipping, fishing and recreation) in the vicinity of the Proposed Development. The study area is based on a 2 nautical mile (nm) (approximately 3.7 km) buffer around the proposed mooring area which provides a wider context for the traffic analysis. This analysis is based on data collected within the study area between April 2018 and March 2019 and full details are in the Marine Activity Baseline Report[103] included as Appendix N.

13.1 Baseline Characteristics

The Site lies on the south side of the Sound of Bute which connects Inchmarnock Water to the Firth of Clyde and lies between the Isles of Arran and Bute. The total area of the Proposed Development moorings is approximately 1 km^2, with charted water depths within the proposed mooring area ranging from 24 m to 88 m below lowest astronomical tide. At its furthest point, the proposed mooring area extends approximately 900 m offshore.

The Pilot Book[104] for the area notes that Lochranza, entered between Coillemore Point and Newton Point, is often frequented by fishing vessels. A Navy Exercise Area passes through the middle of the Sound of Bute. The waters surrounding North Arran are submarine exercise areas and it is likely that submarines (surfaced and dived) will be present in the vicinity of the proposed mooring area.

13.1.1 AIS Shipping Analysis

From the 12 months of data from 2018, on average 3 to 4 vessels per day were recorded passing within the study area. May was the busiest month with on average 6 vessels per day and on the busiest day (26th July 2018) 12 vessels were recorded passing within the study area. High levels of recreational traffic coincide with the more favourable weather associated with the summer season (April - October inclusive). This is broken down further as follows:

- Commercial - On average, one commercial vessel (e.g. passenger ships) passed through the study area every one or two days;
- Fishing - On average, one fishing vessel per day passed the study area;
- Recreational - On average, one to two recreational vessels per day passed through the study area; and
- Miscellaneous - On average, one vessel (e.g. military) passed through the study area once every one or two days.

The highest density area is an east-west route passing approximately 2 km north of the proposed mooring area.

There is a low volume of traffic passing through the proposed mooring area. Of the tracks within the proposed mooring area, 46% were fishing vessels and 41% were recreational vessels. On average, one vessel passed within the proposed mooring area every three days. The average length recorded for vessels passing within the proposed mooring area was 15 m. The longest vessel recorded was the 63 m cargo ship *Red Princess*.

A small number of recreational vessels pass within the proposed mooring area, with some intersecting the proposed location of fish farm pens. There are also fishing vessels passing within the area of the proposed mooring area further offshore.

[103] Anatec Limited (June 2019) North Arran Fish Farm: Baseline Marine Activity Assessment (Appendix N to North Arran Marine Fish Farm EIAR.
[104] UKHO (2011). Admiralty Sailing Directions NP66 West Coast of Scotland Pilot, 17th Edition. Taunton: UKHO

In conclusion, on average, one vessel passed within the proposed mooring area per three days with some intersecting the proposed locations of fish farm pens. The majority of these vessels were recreational, with a number of fishing vessels also passing within the proposed mooring area further offshore. The volume of recreational traffic is significantly higher during the months of April to September associated with favourable weather conditions.

13.1.2 Non-AIS Fishing Data

Relevant information from non-AIS fishing data in the study area includes the following:

- July was the most commercially valuable month during 2017-2018 (> £1.4 million landings value in 2018) and March accounted for the most monthly effort, while January was the least commercially valuable month and December accounted for the least monthly effort.
- *Nephrops* (Norwegian lobster) was the most valuable species, accounting for approximately £7.3 million per year (66% of total value), followed by scallops which accounted for approximately £1.3 million per year (11%).
- Trawls were the most used gear type, accounting for approximately 62% of annual effort, followed by traps/creels which accounted for approximately 18% of annual effort.
- The Proposed Development lies south of a general boating area[105] in Inchmarnock Water, with sailing clubs and training centres in the general area. These areas are densely populated by recreational vessels between April - October during the yachting season[106].

A meeting was held between SSC and CFA in June 2019 where CFA indicated that this is a heavily fished area and that towing takes place here in the wider area.

13.2 Assessment of Installation Effects

There are no effects during the Installation Phase which is scoped out from further consideration.

13.3 Assessment of Production Cycle Effects

13.3.1 Navigation

As demonstrated above there is a very low volume of shipping traffic passing through the proposed mooring area. The Proposed Development is outwith the high density route going east-west, and to the south of densely populated general boating area in Inchmarnock Water. As such it will have no effect on navigation in these heavily used routes.

Mooring lines will be kept to the minimum appropriate length and SSC will follow the NLB's recommendations on site marking. The recommended markings will be installed at the same time as the site equipment.

A Marine Licence will be acquired for the Proposed Development and the relevant bodies will be consulted as standard.

13.3.2 Commercial Fisheries

The Proposed Development is not within the vicinity of landing ports and on average one fishing vessel per day passed through the study area. There was a very low activity within the mooring area of the Proposed Development, approximately one fishing vessel every 6

[105] RYA (2016). UK Coastal Atlas of Recreational Boating.

[106] UKHO (2011). Admiralty Sailing Directions NP66 West Coast of Scotland Pilot, 17th Edition. Taunton: UKHO

days (based on estimate 50:50 fishing/recreation vessels passing through). Fishing vessels tend also to travel through the outer edges of the mooring area i.e. not where the pens with be located. In relation to the activity in the wider area this is a low magnitude of effect and is **not significant** in relation the EIA regulations.

SSC will inform fishermen of new mooring positions and keep moorings as short as is safe to do so, in order to maximise the available fishing area.

Consultation with the West Coast Regional Inshore Fisheries Group (WCRIFG) has been initiated by SSC, although at the time of writing no response had been received. Consultation has been undertaken with CFA as noted in Table 5.2.

13.3.3 Recreational vessels

The location of the Proposed Development is not a general boating area and on average one to two recreational vessel per day passed through the study area. There was very low activity within the mooring site (about one vessel every 6 days) (based on estimated split of 50:50 fishing/recreation vessels). A number of these did pass where the pens will be located, but the Proposed Development does not present an obstacle to recreation vessels moving around the coast. In relation to the activity in the wider area, particularly within the general boating areas to the north this is a low magnitude of effect and is **not significant** in relation the EIA regulations.

13.4 Cumulative Effects

Other consented finfish farms are all at sufficient distance from the Proposed Development that during the operational phase, the cumulative effects on navigation and commercial fishing will be negligible.

13.5 Embedded Mitigation Measures and Ongoing Monitoring Requirements

Beyond the maintenance of the required navigational markings and lighting no monitoring or mitigation is proposed.

Exclusion of commercial fishing activities will be mitigated by maintaining minimum appropriate length of mooring lines. The location of the Proposed Development adjacent to and parallel with the shore minimises any interactions with commercial fisheries.

Following installation, the majority of the area taken up by mooring lines will still be accessible for static gear fishing with full exclusion only required during maintenance of mooring lines or boat operations on site. No ongoing monitoring is proposed.

13.6 Residual Effects

The proposal will not obstruct general navigation or commercial fishing operations. A Marine Licence will be acquired for the Proposed Development and the relevant bodies will be consulted as standard. It is anticipated that some recreational activities may require to pass around the pens at a distance slightly further from the shoreline, but will not pose an obstacle to these activities.

13.7 Statement of Significance

Given the overall size of the Sound of Bute and the limited scale of the Proposed Development, the effects on navigation, commercial fishing and recreational maritime uses are predicted to be **not significant** under the EIA Regulations.

14 SEASCAPE, LANDSCAPE AND VISUAL IMPACT ASSESSMENT

14.1 Introduction

14.1.1 Appointment and Scope of Works

This Seascape, Landscape and Visual Impact Assessment (SLVIA) has been prepared by Arcus Consultancy Services Ltd (Arcus) on behalf of The Scottish Salmon Company (SSC) ('The Applicant'). The Applicant is proposing to submit an application for an Atlantic Salmon marine fish farm to the north-east of Arran ('the Proposed Development') The Proposed Development comprises 20 X 120 m circumference fish pens, a feed barge and other associated infrastructure. The SLVIA has been undertaken by a Chartered Landscape Architect in accordance with current best practice guidance.

14.1.2 Document Structure

This report has been structured in line with the main components of the SLVIA assessment process "table 3.1 Components of the EIA process and the role of the LVIA"[107], taken from Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (2013) (GLVIA3) and illustrated in Table 14.1 below.

Table 14.1 Components of SLVIA

Component of EIA Process	Brief of description of action in this part of the process
Project description / specification	Provides a description of the Proposed Development for the purpose of the assessment, identifying the main features of the proposals and establishing parameters such as maximum extents of the development or sizes of the elements.
Baseline Studies	Establishes the existing nature of the landscape and visual environment in the study area, including any relevant changes likely to occur independently of the development proposals. Includes information on the value attached to the different environmental resources.
Identification and description of effects	Systematically identifies and describes the effects that are likely to occur, including whether they are adverse or beneficial.
Assessing the significance of effects	Systematically and transparently assesses the likely significance of the effects identified.
Mitigation	Makes proposals for measures designed to avoid/prevent, reduce or offset (or compensate for) any significant negative (adverse) effects.

The scope and extent of the assessment, along with the general approach to EIA as set out in Chapter 2 of the EIAR: Approach to Assessment, has been determined by a combination of professional judgement and the Scoping Opinion issued by NAC.

The Chapter is supported by Technical Appendix O, which is structured as follows:

- Annex 1: Assessment of Potential Landscape and Visual Effects;
- Annex 2: SLVIA, Zone of Theoretical Visibility (ZTV), Photography and Photomontage Methodology; and
- Annex 3: Figures, Viewpoints and Photomontages.

[107] Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Routledge, London.

The Chapter is supported by a number of figures and viewpoint photography which are provided as Figures 1 to 50. All figures referenced are within Technical Appendix O, Annex 3 unless otherwise referenced.

14.2 Methodology

The following Section reviews relevant policy and guidance, and sets out the methodology used for undertaking the assessment. A detailed description of methodology has been provided in Appendix O, Annex 2: SLVIA Assessment, ZTV, Photography and Photomontage Methodology.

14.2.1 Summary of Approach

The SLVIA assesses the effects of the development upon both landscape and visual receptors which are defined as follows:

Landscape Receptors

"…the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the character of the landscape." [108]

Visual Receptors

"…the people who will be affected by changes in views or visual amenity at different places." [109]

The SLVIA uses a structured methodology that combines both objective assessment and subjective assessment (or professional judgement).

It is important to understand the distinction between impacts upon landscape character and amenity and impacts upon visual amenity.

Landscape Character is defined as:

"…a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse."

Landscape Amenity

The landscape is comprised of elements: individual components such as trees and hedges which make up the landscape; and features, which are particularly eye-catching elements such as tree clumps, church towers or wooded skylines. The way in which people perceive the pattern of elements gives landscape character.

Effects of development on landscape character occur when physical elements are altered such that the pattern of elements in the landscape changes. The level of change is dependent on the elements which are affected and the extent to which the pattern of the landscape and people's perception of it will change. As a result of this the distinctiveness of character or the difference between one character area and another could be affected.

Visual Amenity

Visual amenity can be defined as the quality of views of the landscape experienced by people. Visual amenity will vary depending on the location of an individual in the landscape and whether or not they are static or moving. Impacts of development on visual amenity occur when there are changes to views experienced by people. Impacts may improve or decrease the quality of views or visual amenity with the level of change dependent upon

[108] Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Routledge, London. Paragraph. 3.21, page 36.
[109] Ibid. 2.

the size and scale of the development and the geographical area over which such changes may occur.

14.2.2 Cumulative Effects

There were no cumulative landscape or visual effects identified within the scoping stage as no cumulative sites were within the SLVIA study area. Although a number of sites are identified at the pre-application stage, these are at sufficient distance from the Proposed Development that no further assessment has been made within the SLVIA.

14.2.3 Relevant Guidelines

The principal source of guidance used to inform the overall methodology of the SLVIA will be GLVIA3. The methodology for the assessment of sensitivity, magnitude of change on landscape and visual resources is strictly based on Chapters 5 and 6 of GLVIA3 alongside the matrix in Table 14.2 below.

Table 14.2 Landscape and Visual Significance of likely effects

Visual Receptor Sensitivity	**Magnitude of Change**				
		Substantial	**Moderate**	**Slight**	**Negligible**
	High	Major	Major/ Moderate	Moderate	Moderate/ Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ negligible

This guidance will be used in conjunction with the following additional sources:

- The Landscape Institute (2013), GLVIA3 Statement of Clarification 1/13;
- Scottish Natural Heritage and The Countryside Agency (2002) Landscape Character Assessment Guidance for Scotland and England;
- Landscape Institute (2011) Advice Note 01/11 Photography and Photomontage in Landscape and Visual Impact Assessment;
- Scottish Natural Heritage (2002) Wildness in Scotland's Countryside. Policy statement 02/03;
- Scottish Natural Heritage (2018) Visualisations for Aquaculture;
- Scottish Natural Heritage (2011) The siting and design of aquaculture in the landscape: visual and landscape considerations;
- Scottish Natural Heritage (2008) Guidance on Landscape/Seascape Capacity for Aquaculture;
- Scottish Natural Heritage (2010) The special qualities of the National Scenic Areas. Scottish Natural Heritage Commissioned Report No. 374;
- Scottish Natural Heritage (1998) Ayrshire Landscape Assessment, Scottish Natural Heritage Review No 111;
- North Ayrshire Council Local Development Plan (May 2014);
- North Ayrshire Council Proposed Local Development Plan (April 2018); and
- Seascape/Landscape Assessment of the Firth of Clyde (March 2013), Firth of Clyde Forum.

14.2.4 Information Sources

A number of different sources of information are also used to help understand the site and its surrounding context as follows:

- OS mapping at 1:50,000, 1:25,000 and 1:10,000;
- Aerial Photography;
- Google Earth, Street View and Maps;
- Arcus suite of Figures 01-50; and
- North Ayrshire Council Website.

14.2.5 Study Area

The study area covers a radius of 10 km with a core study area with a radius of 2 km where the greatest effects will likely be found. This is defined based on the ZTV, and site assessment, and following guidance within Chapter 29 of the Scottish Natural Heritage (2018) Visualisations for Aquaculture[110] guidance which suggests the following:

- "where a development is proposed for a steep-sided, narrow loch with limited access and no high-level views, the visual effect is likely to be restricted within the loch system. A ZTV with a radius of 2km may suffice.
- for elevated views, the nature of view will differ and it will probably be necessary to consider a greater distance;
- where a proposal is sited in an open or expansive coast, the ZTV radius will be greater, e.g. 7km or up to 10km".

It is assessed that due to the site's location off the sharply rising north-east coast of the Isle of Arran, the visual effects of the Proposed Development on water-based visual receptors are generally restricted to the north and east of the site with landscape receptors and land based visual receptors restricted to the immediate west and south. The presence of more elevated views from the south and west, due to the steep sided ridge/rising topography, is illustrated in Figure 8 (ZTV). The ZTV demonstrates that there are opportunities to view the development from several national and local designations, and receptors including the following:

- North Arran National Scenic Area (NSA);
- Special Landscape Area (SLA);
- Sound of Bute Landscape Character Area (LCA), Firth of Clyde Seascape/Landscape Assessment, 2013;
- Ayrshire Landscape Assessment and Landscape Character Types: Coastal Headland – AYS4;
- Laggan Cottage bothy;
- Core Paths, coastal footpath and elevated views; and
- Views from boat users travelling through the Sound of Bute and along the coastline.

Although there are opportunities to view the Proposed Development from a range of receptors and elevations, it is assessed that 10 km (13 of 14 receptors are within a 5 km area) is an appropriate extent for the study area, beyond which the Proposed Development will unlikely be perceptible within the landscape due to its limited scale, low profile, and the reduction of visual effects over distance.

[110] Scottish Natural Heritage (2018) Visualisations for Aquaculture

14.3 Project Description

14.3.1 Development Description

14.3.1.1 Infrastructure

The Proposed Development is comprised of the following key components which are described in further detail in Chapter 3: Description of the Proposed Development:

- Pens – The Proposed Development will comprise two groups of 10 pens of 120 m circumference (19.1 m radius). The surface area is approximately 2.3 hectares (ha). The total surface area of the Proposed Development including moorings is 0.97 km^2;
- Feed Barge – The feed barge would be fully automated, have a feed holding capacity of 600 tonnes and would potentially include an integrated 140 tonne freshwater treatment facility;
- Moorings – The pens would be secured within a rope and chain matrix arranged in a grid layout;
- Pen Nets – This site will utilise Seal Pro nets, which are designed to reduce the potential for seal interactions. The proposed net depth is 10 m;
- Pen Lighting – All pens [when stocked with fish] would be fitted with low energy, long life underwater lights suspended at a depth of 6 m.
- Navigational Lighting – All lighting requirements would be agreed with the Northern Lighthouse Board (NLB);
- Bird Nets – These would be positioned over the top of each pen and supported by 16 x 5 m support poles per pen; and
- SeaSpine - A central spine would run between the pens and the feed barge, to allow transfer of the fish to the barge and back to the pens. There are also additional pipes in the spine, which would allow mort recovery.

14.3.1.2 Potential Effects

The Proposed Development has the potential to affect the following landscape and visual resources during deployment and operation:

- Landscape/Seascape character of the Proposed Development site and the surrounding area;
- Landscapes designated for their special qualities or scenic beauty; and
- The visual amenity of people in the surrounding area.

The SLVIA considers the effects of the Proposed Development during deployment and operation. The focus of the appraisal is upon the operational stage of the Proposed Development as deployment effects will be limited in extent and of very short duration.

14.4 Baseline Studies

14.4.1 Seascape and Landscape Context

The Site is located off the north-east coast of the Isle of Arran in the Sound of Bute and sits to the south of the Cock of Arran, a local landmark. Two small coastal settlements, Lochranza and Sannox, lie roughly equidistant from the Proposed Development to the north-west and south-east respectively (see Figure 1). This Section assesses the existing landscape and visual baseline based on an assessment undertaken during a site visit on the 27th June 2019. This site visit, alongside desk based assessment, forms the basis against which the Proposed Development is assessed.

14.4.1.1 *Local Context and Setting*

The Proposed Development will be located approximately 0.2 km off the north-east coastline of the Isle of Arran. The coastline rises sharply forming a long ridgeline of high land running north-west to south-east between the A841 road and the coastline with the highest point at 444 m AOD between Creag Ghlas Laggan and Fionn Bhealach, and lies approximately 1.75 km to the west of the Proposed Development. This stretch of the coastline is rugged with exposed rock/boulders and a mix of native low lying vegetation (rush, grassland, heath, scattered trees and scrub, and bog) and recently harvested forestry plantation to the south. This part of the coastline is sparsely populated with a small traditional cottage (white washed walls and grey slate roof) the nearest building to the Proposed Development. The cottage is uninhabited and derelict, appearing to be used as a bothy. The Arran Coastal Way follows this coastline passing in front of the cottage. The shoreline consists of shingle beaches, large boulders and rock slabs. To the north and east lies the open water of the Sound of Bute with distant views to the Argyll and Bute mainland to the north-east and views of the Firth of Clyde and mainland to the east.

The shoreline changes noticeably from the south of the Site at North Sannox to the north at the Cock of Arran. North Sannox consists of an open coastal campsite surrounded by trees with open views across the sea to the mainland. The landscape is influenced by human activity with an access road, bridge and mown grass campsite and car park. Here the effects of the recently harvested plantation woodland are visible exposing the landform rising to the north and north-west. North Sannox forms the mouth of the North Sannox Burn with a campsite located to the north of the Burn surrounded by woodland and trees to the north, south and west. The Arran Coastal Way (Core Path) runs parallel to the coastline in a north-west orientation. North of North Sannox, the Arran Coastal Way consists of a vehicular metalled track through narrow woodland with landform rising to the west of the route and wooded coastline to the east. Here the landscape and views are enclosed by woodland and landform with evidence along the route of forestry harvesting and associated construction such as a metalled loading area and concrete jetty assumed to have been used for forestry extraction. Views to the sea and shoreline are filtered through existing trees and tall bracken.

Further north (approximately 1 km from North Sannox) along the coastal edge the woodland ceases and views of the coast to the north are available. From this point the track begins to narrow and human activity is limited to the more informal track, a single line of telegraph poles and white masts of coastal beacons. The sea (Sound of Bute), rocky shoreline and ridgeline from this point become the defining landscape features with landscape variation defined by the meandering foreshore, dramatic ridgelines, vegetation and geology of rocks and boulders. Exposed rock varies in colour predominantly in two bands between red/orange, and grey/black colouration, returning to red/orange nearing the Cock of Arran.

Vegetation responds to the changing soil moisture with grasses dominating pockets of dry coastal edge and rushes and woodland found in areas of bog and along an irregular arrangement of natural springs and streams draining the ridgeline into the sea. This creates a visually cohesive seascape but such subtle changes create interest and help to naturalise the coastline.

Beyond Fallen Rocks the coastal views open further and the influence of human activity continues to reduce. Adjacent to the southernmost boundary of the Proposed Development lies the last coastal beacon at which point the timber telegraph poles cease along the coastal edge and are visible no further than Millstone Point. Beyond Millstone Point the landscape becomes more dramatic with the higher ridgeline reaching Fionn Bhealach and Creag Ghlas Laggan with views to the north extending to Tor Meadhonach and the mainland. From Millstone Point, Laggan Cottage is visible in the distance on the coastal edge. Beyond Laggan Cottage the seascape becomes more enclosed by coastal landform

and the emergence of wooded streams. The presence along the Arran Coastal Way of Laggan Salt Pans and Coal Pits Scheduled Ancient Monument (SAM) creates interest and character along the coastline and geographic features such as Ossian's Cave create local features of interest.

A Core Path runs in a north-westerly direction from Laggan Cottage over the ridgeline passing between Tor Meadhonach and Creag Ghlas Cuithe. Travelling to the north-west along the Core Path views are dominated by the ridgeline and increasingly elevated views across the Sound of Bute. The vegetation is generally low and dominated by grassland and some heath, with rushes found along the edges of streams. Evidence of old steadings and sheep pens are visible in the hillside creating interesting features of historic human presence in the landscape and contributing to the character of the landscape. At the highpoint of the Core Path it is possible to walk over bogs, heath, rushes and grassland to reach the peaks of the ridgeline to: Tor Meadhonach (332 m); Creag Ghlas Cuithe (330 m); Creag Ghlas Laggan (410 m) and Fionn Bhealach (444 m). The landscape along the ridgeline is dominated by views to the sea to the east across the Sound of Bute and to the mainland, and to the west by the island's interior with views across Glen Chalmadale to towards the ridges of Cir Mhor (799 m) and Goatfell (874 m). Views travelling south-east extend along the ridgeline toward Fionn Bhealach and are dominated by open skies and the ridgeline and views travelling north-west create a focal point of sea beyond Lochranza framed by Tor Meadhonach and Meall Mor (469 m).

14.4.2 Landscape Designations

The designations below are shown on Figure 6.

14.4.2.1 North Arran National Scenic Area (NSA)

The site lies within the northern edge of the North Arran National Scenic Area (NSA), classified as a statutory designation.

The special qualities of the North Arran NSA are listed below:

- A mountain presence that dominates the Firth of Clyde;
- The contrast between the wild highland interior and the populated coastal strip;
- The historical landscape in miniature;
- A dramatic, compact mountain area;
- A distinctive coastline with a rich variety of forms;
- One of the most important geological areas in Britain;
- An exceptional area for outdoor recreation; and
- The experience of highland and island wildlife at close hand[111].

Features of the NSA which are particularly sensitive to the Proposed Development are; any impact on the experience of the footpath users particularly along the core paths closest to the Proposed Development including the Arran Coastal Way [112] which is an important outdoor recreation trail.

14.4.2.2 Special Landscape Area (SLA): North Arran

The Proposed Development lies approximately 0.2 km to the east of a Special Landscape Area (SLA), a local landscape designation as shown in Figure 6. The SLA encompasses the North and Central Arran NSA and is designated to protect the area from insensitive development.

[111] Scottish Natural Heritage (2010) The special qualities of the National Scenic Areas. Scottish Natural Heritage Commissioned Report No. 374, pg 59

[112] Scottish Natural Heritage (2010) The special qualities of the National Scenic Areas. Scottish Natural Heritage Commissioned Report No. 374

14.4.2.3 Historic Designations

The Proposed Development lies approximately 0.4 km to the north from the Laggantuin SAM, a deserted settlement, and 2.35 km south east of the Laggan Salt Pans and Coal Pits scheduled monument. Whilst these historic designations inform an assessment of the landscape character, the quality of the landscape and how the landscape has been shaped, the SLVIA does not assess the impact upon this designation. A dedicated cultural heritage assessment has been scoped out of the EIA for the Proposed Development (see Table 5.11, Chapter 5).

14.4.3 Landscape Character

The Landscape Character Areas and Types below are shown on Figure 7. There are other LCT's and LCA's within the SLVIA study area, however these were excluded during the scoping stage as there would be no inter-visibility due to distance and intervening topography and vegetation.

14.4.3.1 Seascape/Landscape Assessment of the Firth of Clyde (March 2013)

The Proposed Development lies within the Seascape/Landscape Assessment of the Firth of Clyde assessment area within the Landscape Character Area of the **Sound of Bute.**

The **Sound of Bute** is defined as follows:

"*The Sound of Bute forms a more expansive seascape as the confined west Kyle of Bute opens to the south beyond Ardlamont Point, an area of sea framed by the northern coast of Arran and the west coast of the Isle of Bute*."[113]

The Seascape /Landscape Assessment of the Firth of Clyde (March 2013) describes this stretch of coastline as "*one of the most remote stretches of coastline within the whole of the Firth of Clyde*… at least 10 km of coastline *which can only be accessed on foot or by bike or sea kayak…. This coastal character area lies within the North Arran NSA, and forms the landward foreground plinth to views of the rugged peaks of Arran from across Bute and from marine traffic at the mouth of Loch Fyne and the Sound of Bute. This visual interrelationship contributes to the wider scenic composition between Arran and its seascape setting. The diversity of the coastline geology is also cited as a special quality."* The key characteristics of the LCA within the study area include:

- **Maritime influences and experience from the sea** - The Sound of Bute is expansive in this area where the broader entrances to Loch Fyne and the eastern Kyle of Bute are present. This coast is orientated north east, and forms the south western edge to the Sound, rising abruptly and uniformly from the sea, in contrast to the more layered and irregular coast and hinterland of the Isle of Bute. From the centre of this wide channel, the expanse of the seascape is reinforced by the views of more distant higher ground, including the rugged peaks of north Arran.
- **Maritime development and activity -** There is no development within the maritime element of this seascape. There is both sailing and kayaking especially during the summer months, but there are no anchorages off this coast.
- **Character and experience of the coastline -** The coastline is rocky, with sandstone slabs worn smooth by wave action, large boulders, pebble shores and shingle beach, generally backed by a very narrow coastal strip which rises quickly and abruptly to form long concave, 'outward facing' slopes. The varied geology along this coastline is a particular characteristic, and forms the basis of many of the key features. In 1787, James Hutton found evidence at Newton Point to support his theory that the earth was much older than supposed at the time.

[113] http://www.clydemarineplan.scot/wp-content/uploads/2016/05/12-Sound-of-Bute.pdf (January 2019)

- **Topography and land use of hinterland** - Most of this coastline is upland grassland, although there is some commercial conifer woodland with poorly designed straight margins at the eastern end of this coastal area. Broadleaved woodland, substantial in places, extends along the coast at the edge of this woodland. There is also semi-natural regenerating woodland in more sheltered glens and against rocky outcrops.
- **Settlement pattern, built development and infrastructure -** There is no settlement along this coast, apart from tiny white-washed cottages at Fairy Dell and at Laggan. This latter cottage is near the site of the former Duchesse Anne's salt pans, which formed the basis of a larger settlement, now evidenced by ruins, including a farm and a small coal mine (fuel for the salt works). A footpath, which is partly a more formal access route at the eastern end, extends around the coast and forms part of the Arran Coastal Route.
- **Setting of landmarks and features -** There are a number of natural features, including caves, the Fallen Rocks, huge rugged boulders which toppled into the sea, the similar An Scriodan rockfall and beaches of smooth coloured pebbles. The Cock of Arran, a shapely boulder which marks the most northerly point on the island, is a further local feature.
- **Experience of isolated coast** - The lack of development along this long length of coast, the difficulty of access, the correspondingly sparsely developed shoreline across the Sound on Bute, and the prevailing sense of naturalness which is reinforced by a strong sense of natural processes dominating the coastline creates an isolated coast. This section of coast also lies within an NSA, and therefore is recognised as having environmental value, which would make it 'isolated coast' in terms of the Scottish Planning Policy definition.
- **Aesthetic qualities** - The diversity of the coastline – largely informed by the variety of geological features, contributes to appreciation of this coast.
- **Visual amenity and key viewpoints -** This seascape is an important foreground to views to Arran from across the Sound of Bute, Loch Fyne and the northern Kilbrannan Sound. Views from this coast reflect its wide arc, taking in the Cumbraes and the north Ayrshire coast to the east round to northern Kintyre and including views up the West Kyle of Bute towards Arrochar. Views along the coast emphasise its precipitous slopes.

14.4.3.2 *Scottish Natural Heritage National Landscape Character Assessment*

Landscape Character Type 62 - Coastal Headlands

The Proposed Development lies 0.2 km to the east of the **Coastal Headlands LCT (62)** which is situated adjacent to the Site on the Mainland and is defined as follows:

"Key Characteristics

- Distinctive headland, consisting of hills with bluffy almost craggy summits, flanked seawards by raised beaches.
- Varied geology formed by igneous rocks and a combination of sandstones, carboniferous rocks and lavas.
- Sheltered slopes consist of pastures enclosed by hedgerows, with rough grazing on exposed slopes and gorse and outgrown field boundary trees on summits. Semi-natural woodland is found on some of the more sheltered slopes with some areas of coniferous woodland also present.
- Settlement quite sparse and limited to small settlements, single houses and farmsteads on lower slopes.
- Sites for communications infrastructure, including a number of masts.
- Exposed, open and highly visible landscape, with panoramic views over the coastal edge and Firth of Clyde.

Landscape Character Description

Landform

To the south of Ayr lies a distinctive area of high ground (the Carrick Hills) forming a headland at the southern end of the Ayrshire bay. The prominent landmark hills often have bluffy, almost craggy summits, flanked to their seaward side by raised beaches comprising old cliff lines and level coastal terraces. The underlying geology is formed by igneous rocks. The landform is rugged and complex, with varied interlocking terrain, shallow valleys and steep slopes.

On the north eastern flank of Arran stands a distinctive headland, distinguished from the rest of the upland by its differing geology and by 'The Boguille' pass which divides it from the northern slopes of the Goat Fell group. The headland comprises a combination of sandstones, carboniferous rocks and lavas. The headland is elongated, running from northwest to south-east with a very steep northern face and shallower south facing slopes.

Landcover

The coastal headlands tend to have a pattern of agriculture which reflects the combined influence of exposure, gradient and soil quality. The landcover pattern is small scale and diverse. On the lower, more sheltered slopes, enclosed pastures prevail, though this quickly gives way to rough grazing on more exposed, higher slopes, with some wet moor and conifer woodland. Summits are characterised by gorse and lines of outgrown field boundary trees. Semi-natural woodland is found on some of the more sheltered slopes. In places, the contraction of farming is evident in the abandonment of higher enclosures and the presence of outgrown beech hedges. A number of small to medium sized coniferous forests are found on the coastal headlands. These are sometimes geometric in appearance, though replanting in accordance with design guidance should lead to their improvement in due course. There is some semi-natural woodland on lower slopes, as well as riparian woodland. To the east of the Carrick Hills policy woodland is present, associated with larger houses overlooking the Doon Valley. On Arran, and although the south-eastern most part has been forested, much remains under heather or rough grassland.

Settlement

Settlement is generally quite sparse and limited to small settlements, farmsteads and single houses on lower slopes, connected by a network of narrow roads. The settlement of Lochranza is sited around a sheltered natural harbour at the western end of the Cock of Arran. This dispersed village includes a 13th Century hall house, a scatter of traditional cottages and the more recent distillery development. The headlands also provide sites for communications infrastructure, most notable on the Carrick Hills which include a number of masts which are highly visible from this prominent location.

Perception

This is an exposed, open and widely visible landscape. The hills are often perceived as being higher than they actually are, and have a sense of seclusion in more rugged and seminatural upland areas. They provide easily recognised, prominent landmark hill summits in South Ayrshire, contributing to the setting of adjacent character types. They create the immediate backdrop to a number of smaller scale and lower lying Landscape Character Types. The headlands provide the backdrop to Ayr and contribute to the setting of Culzean Castle. Panoramic views over the coastal edge and Firth of Clyde are available from the headlands themselves. Views of the headlands can be gained from the A77, A84, Arran, the Ayrshire Coastal Path and a number of nearby settlements including Ayr and Maybole."

14.4.4 Visual Receptors

Visual receptors are limited to recreational users of Core Paths and elevated viewpoints and boat users within the Sound of Bute and along the coastline.

Views are limited to the users above as illustrated by the ZTV (Figure 8). Laggan Cottage is the closest building but is uninhabited and seems to be used as a bothy.

14.4.4.1 Laggan Cottage

Appears derelict but seems to be used informally as a bothy and is located at the intersection between Core Path 12, 2 and 3 and the Arran Coastal Way.

14.4.4.2 Core paths and recreational routes

There are several well-defined Core Paths within the immediate setting of the Proposed Development and one known walking route from Lochranza to the summit of Creag Ghlas Laggan and Fionn Bhealach. Core Paths within the SLVIA study area most likely to be affected include the following:

- AR03 Laggan to Fallen Rocks – 3.8km (length);
- AR12 Lochranza to Laggan – 3.9km (length);
- AR04 Fallen Rocks to Picnic Site - 2km (length); and
- AR02 Newton Point to Laggan – 5.6km (length).

The Core Paths AR02, AR03 and AR04 form part of the Arran Coastal Way, a circular 65 mile walk around Arran. The section from Sannox to Lochranza is described as being '*the best section of the Coastal Way'.*[114]

These routes are used by recreational receptors with potential views of the Proposed Development from all four paths, in particular from AR03 which lies directly opposite the Site.

14.4.5 Water Users

There are several mobile water-based receptors using the north-east Arran coastline including ferry users on the Sound of Bute, kayaks, pleasure boats and fishing vessels.

14.4.6 Roads

The A841 runs in a north-west to south-east direction between Sannox and Lochranza as shown on figure 1. This is the main road within the study area. A further small access road runs off the A841 providing access to North Sannox Burn Campsite. A total of fourteen viewpoints representative of the type of receptors likely to be affected by the Proposed Development are used in the SLVIA. The viewpoint locations are shown on Figure 8 and listed in Table 14.3 (below). Photographs and photomontages of the Proposed Development from each viewpoint are shown in Figures 10 to 51. The viewpoints are used to assist in the appraisal of effects on landscape and visual resources and are referenced in Section 14.6.5.

14.4.7 Viewpoints

The viewpoint locations have been agreed with Scottish Natural Heritage and are provided based on a representation of worst case scenarios from sensitive receptors. Viewpoint selection and micro-siting of each viewpoint location accord with advice of technical

[114] http://www.coastalway.co.uk/route/sannox-to-lochranza/

guidance[115] and therefore serve the purpose of allowing a competent technical SLVIA to be undertaken.

[115] Landscape Institute (2011) Advice Note 01/11 Photography and Photomontage in Landscape and Visual Impact Assessment, and Scottish Natural Heritage (2018) Visualisations for Aquaculture.

Table 14.3: Viewpoints used in the SLVIA

View Point Number	Name	Approximate Distance/Direction to the Proposed Development	Type of receptor & sensitivity
1	Core Path AR03	0.4 km, north	Recreational - Core Path - high
2	Core Path AR03	0.4 km, south-east	Recreational - Core Path - high
3	Laggan Cottage, junction of core paths AR02, AR03 and AR12	1.65 km, south-east	Recreational - Core Paths - high
4	Core Path AR04	1 km, north-west	Recreational - Core Path - high
5	Core Path AR12 (elevated)	2 km, south-east	Recreational - Core Path - high
6	Summit between Creag Ghlas Laggan and Fionn Bhealach	1.9 km, east	Recreational - high
7	Summit of Torr Meadhonach	4.0 km, south-east	Recreational - high
8	Sound of Bute	0.6 km, west	Boaters – high
9	Sound of Bute	1.5 km, south-west	Boaters – high
10	Sound of Bute	4.4 km, south-west	Boaters – high
11	Sound of Bute	1.2 km, south-east	Boaters – high
12	Sound of Bute	0.8 km, north-west	Boaters – high
13	Sound of Bute, Lochranza to East Loch Tarbert winter ferry	6.1 km, south-east	Ferry users, Boaters high to low
14	Sound of Bute	1 km, north-west	Boaters – high

14.5 Identification, Description and Assessment of Landscape Effects

14.5.1 Landscape Designations

Due to the reversible nature of aquaculture development it is assessed that there are no permanent changes to landscape and visual receptors as a result of such development. This judgement does not reduce the effects assessed below, it simply provides a clarification on the long term nature of effects for what is a unique type of development. Each element described within the baseline is assessed below based on the receptor's sensitivity to the Proposed Development, the magnitude of change experienced by the receptor during operation of the Proposed Development and the overall significance. All effects are considered adverse unless otherwise stated..

14.5.1.1 *North Arran NSA*

Due to its designation and special landscape qualities the NSA is particularly sensitive to development. It is therefore critical that development is proportionate to the capacity of the receiving landscape and appropriate in nature. The qualities of the NSA lie in its scenic qualities. The NSA does recognise the influence of human settlement as a contributing feature; however, this is in the context of the traditional settlements of dwellings and associated infrastructure. The sensitivity of this landscape designation is assessed as being **High.** The Proposed Development lies within the north-eastern edge of the NSA and would introduce man-made features within the NSA. The feed barge would be the most prominent feature although it will resemble a fishing vessel which is not uncharacteristic of the area. The geographical extent of the Proposed Development is negligible and would not directly affect the special qualities of the NSA although it will introduce man-made features to this part of the NSA. These will be long term but reversible. Within the NSA the Proposed Development will be most noticeable from a 3 km length (approximately) of coastline located between VP 12 and VP 2 where the Proposed Development will form a new feature along the coastline. However, the steeply rising land to the west prevents any further influence inland. The Proposed Development is set off shore and would have a limited influence on the shoreline, but it would increase the human influence on the water. Overall it is considered the Proposed Development would have a negligible change on the NSA scenic qualities over a small geographical extent. The extent over which the changes would be visible is small. Overall the magnitude of change is considered to be **negligible** and the significance is considered to be **moderate/minor** based on table 14.1 and professional judgement due to the introduction of man-made features into the seascape of the NSA.

14.5.1.2 *North Arran SLA*

The North Arran SLA is also particularly sensitive to development and encompasses the North Arran NSA as well as areas further south in central Arran. This area is assessed as having a **High** sensitivity. The Proposed Development would be located 0.2 km east of the SLA and would introduce man-made features adjacent to the SLA. The feed barge would be the most prominent feature although it will resemble a fishing vessel which is not uncharacteristic of the area. The geographical extent of the Proposed Development is negligible and would not directly affect the character of the SLA or NSA (see above). It will introduce man-made features to this part of the SLA although these will be long term but reversible. Within the SLA the Proposed Development will be most noticeable from a 3 km length (approximately) of coastline between VP 12 and VP 2 where the Proposed Development will form a new feature along the coastline but the steeply rising land to the west prevents any further influence inland. The Proposed Development is set off shore and would have a limited influence on the shoreline, but it would increase the human influence on the water. Overall it is considered the Proposed Development would have a negligible change on the SLA over a small geographical extent. The extent over which the

changes would be visible is small. Overall the magnitude of change is considered to be **negligible** and the significance is considered to be **moderate/minor** based on table 14.2 and professional judgement due to the introduction of man-made features into the seascape of the SLA.

14.5.2 Landscape Character

The landscape character areas and types are not designated landscapes; however they provide a more detailed assessment of the components of landscape character that form part of the wider designated Landscape of the NSA and SLA and also the Isolated Coast as defined within the Sound of Bute LCA included within the Seascape/Landscape Assessment of the Firth of Clyde (March 2013).

14.5.2.1 Seascape/Landscape Assessment of the Firth of Clyde, Sound of Bute LCA – Sannox to Lochranza

The Proposed Development would be located immediately to the north east an area of Isolated Coast defined in the Sound of Bute LCA and would lie approximately 0.2 km off the shoreline. The Proposed Development would introduce static man-made features in the water although the feed barge has been designed to resemble a fishing vessel which is not uncharacteristic of the seascape. There will be no anchorage or human activity on the shoreline of Arran but there will be activity associated with the operation of the pens and feed barge on the open water. The LCA is highly sensitive to any forms of development including fish farms with defining characteristics of this section of the LCA being '*Isolated Coast'* with its associated qualities of remoteness and limited man-made influence. The ZTV (Figure 08) shows the area over which the Isolated Coast may be influenced by the Proposed Development and shows the main area being the immediate coastline from North Sannox to the Cock of Arran. Following the site visit it is considered the stretch of coastline most affected would be from VP 4 to VP 3 with decreasing influence to the north and south of these viewpoints due to distance and the greater level of human influence and intervening features of landform and vegetation. The area of the LCA from North Sannox picnic area to VP4 at Fallen Rocks is influenced to a greater extent by human activity with man-made features such as navigational beacons, timber telegraph poles, a surfaced path and recently felled plantation. Man-made features along the coastline north of VP 3 include the ruins at the Salt Pans, and Laggan which follow the coastline to the edge of the Proposed Development. The section of coast between VP 3 and VP 4 has fewer man-made features although the telegraph poles are present with other features confined to the water such as fishing buoys and the activity of fishing boats and pleasure boats on the Sound and along the coastline. It is considered that the Proposed Development will introduce man-made features to this stretch of coast but these would be water based with no anchorage points or infrastructure on the land. The study area is popular with recreational boats and also fishing vessels[116] and as such it is considered this reduces the feeling of remoteness and isolation and consequently reduces the sensitivity of the study area to water-based development only. Overall it is considered that the magnitude of change is **moderate** due to the geographical extent of the Proposed Development in relation to the LCA area and Isolated Coast although reversible and as such will result in a **major/moderate** significance of effect.

14.5.2.2 Coastal Headlands LCT 62

The Proposed Development would be located 0.2 km east of the LCT and would introduce man made features adjacent to the LCT. The feed barge would be the most prominent feature although it will resemble a fishing vessel which is not uncharacteristic of the area.

[116] North Arran Fish Farm
Baseline Marine Activity Assessment - Anatec Ltd 2019

The geographical extent of the Proposed Development is negligible and would not directly affect the character of the LCT. It will introduce man-made features. Although these will be long term, they will be reversible. The principal stretch of coastline the Proposed Development will be most noticeable from within the LCT is approximately a 3 km length between VP12 and VP2 where the Proposed Development will form a new feature along the coastline; however, the steeply rising land to the west prevents any further influence inland. The Proposed Development is set off shore and would have a limited influence on the shoreline, but it would increase the human influence on the water. Overall it is considered the Proposed Development would have a negligible change on the LCT over a small geographical extent. The extent over which the changes would be visible is small. Overall the magnitude of change is considered to be negligible and the significance is considered to be **moderate/minor**. The effects are considered to be adverse as the Proposed Development introduces man-made features into the LCT.

14.6 Identification, Description and Assessment of Visual Effects

14.6.1 Core Paths and land based recreational points of interest

There are 4 Core Paths and points of interest which have been assessed as likely to be affected by the Proposed Development, the following viewpoints are representative of these paths and features:

- VP 1,2 & 4 - AR03 Laggan to Fallen Rocks;
- VP3 - AR12 Lochranza to Laggan;
- VP 4 - AR04 Fallen Rocks to Picnic Site;
- VP 3 - AR02 Newton Point to Laggan;
- VP 6 - Summit between Creag Ghlas Laggan and Fionn Bhealach; and
- VP 7 - Summit of Tor Meadhonach.

All receptors are considered to be of **high** sensitivity to change due to the popularity of the area with walkers and their principal reason for being there being for recreation purposes to experience the relative isolation and natural beauty of the coastline.

Of these receptors those using AR03 Core Path are considered to have the most significant effects and Viewpoint 1 illustrates the Proposed Development with close distance full views available of the pens and feed barge. At this location receptors are predicted to experience a magnitude of visual change as **substantia**l due to the large change in view with the introduction of the Proposed Development at close distance and of long-term duration, although reversible. Overall the visual effects from this Core path at viewpoint 1 are considered to be of **major** significance due to the introduction of man-made elements which will form a principle feature in this view, reducing the sense of isolation along this section of the Core Path.

Of those Major effects identified they are represented across an area of only 1.5 km. From a distance of approximately 1km to the south of VP 1 at VP 4 on Core Path AR04, receptors travelling north towards the Proposed Development would experience **major/moderate** effects increasing to **major** the nearer the receptor travels towards the Proposed Development (and upon reaching VP1 – Core Path AR03). From VP3 receptors travelling south on Core Path AR03 towards the Proposed Development experience Moderate/Minor effects at VP3 increasing proportionally to Major at VP2 as the whole of the Proposed Development is seen. The effects for receptors travelling south are less significant proportionally with distance as only a limited part of the Proposed Development is visible until the receptor reaches VP2. Beyond VP3 and VP4 the effects are not significant as either views are not possible seen sequentially from a distance where the Proposed Development occupies only a small section of available views.

14.6.2 Elevated Viewpoints

Elevated viewpoints include viewpoints 5, 6 & 7.

- VP 5 - AR12 Core Path;
- VP 6 - Summit between Creag Ghlas Laggan and Fionn Bhealach; and
- VP 7 - Summit of Tor Meadhonach.

Of these receptors, at Viewpoints 5 and 6 the magnitude of change is considered to be **negligible** to **slight** and are considered to have the visual effects of a **minor** significance. The effects are considered to be adverse as the Proposed Development will introduce man-made features although this will be set within the context of the large- scale seascape. There are no views available from the summit of Tor Meadhonach.

14.6.3 Water Users

The water-based receptors assessed as likely to be affected by the Proposed Development are boat and ferry users on the Sound of Bute and along the coastline of Arran. These receptors are illustrated by the following viewpoints:

- VP 8 - Recreational and Fishing Boat Users;
- VP 9 - Recreational and Fishing Boat Users;
- VP 11 - Recreational and Fishing Boat Users;
- VP 12 - Recreational and Fishing Boat Users;
- VP 13 - Ferry Users; and
- VP 14 - Recreational and Fishing Boat Users.

The most sensitive are those with close distance views of the Proposed Development such as VP 8, 11, 12 and 14 and represent sea kayak users as well as fishing and pleasure boats.

Of these receptors Viewpoint 8 is considered to experience the most significant effects. The magnitude of visual change is considered to be **substantial** due to the close distance views and a clearly noticeable change in views which are of long term duration, although reversible. Overall the visual effects from this viewpoint are considered to be of **major/moderate** significance due to the introduction of man-made elements which will form a prominent feature in this view.

For other water-based receptors effects are reduced due to distance and the backdrop of the coastline and water. The pens have limited visibility when viewed from the water due to the low profile of the design and dark colour. The feed barge would be the most visible element due to the light colour scheme. However, this has been designed to resemble a fishing boat which is not uncharacteristic of the seascape.

The effects of views from the water are generally less than land based effects as receptors view the Proposed Development against the foreshore where the Proposed Development benefits to a greater degree from embedded mitigation through the back clothing effect of the rugged and dark coastline adjacent to the Proposed Development. The closest water based receptor at Viewpoint 8 is predicted to experience adverse effects of a **major/moderate** significance.

14.6.4 Roads

There are no effects on the local road (A841) as the Proposed Development cannot be seen as illustrated on Figure 8 (ZTV).

14.6.5 Viewpoints

Each viewpoint has been assessed for its sensitivity, magnitude and significance of effect. For further details of the assessments refer to Annex 1 - Assessment of Potential Landscape and Visual Effects.

14.6.5.1 *Viewpoint 1*

This viewpoint represents recreational users of the Core Path AR03/ Arran Coastal Route opposite the Proposed Development. The viewpoint is taken from the Laggantuin SAM just above the footpath which can be seen as a worn grass track in the foreground. The Proposed Development will be clearly visible with close distance views (less than 500 m) of the majority of the pens and feed barge. Figure 12 shows the potential appearance of the feed barge and pens as a photomontage. The Proposed Development will form a large change in the view and introduce man-made although maritime features into the seascape. Although views out towards the sea are expansive and open the views inland are contained by the steeply rising land with the views along this stretch of Core Path being the coastline, ridgeline, sea and Proposed Development. Underwater lighting would be occasionally utilised; however such lighting would be at a depth of 6 m and appear as a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. The magnitude of visual change is considered to be **substantial** due to the large change in view at close distance and of long-term duration, although reversible. Overall the visual effects from this viewpoint are considered to be of **major** significance due to the introduction of man-made elements which will form the principal feature in this view.

14.6.5.2 *Viewpoint 2*

This viewpoint represents recreational users of the Core Path AR03/Arran Coastal Route north of the Proposed Development. The Proposed Development will be clearly visible with close distance views (less than 500 m) of the majority of the pens and feed barge. Figure 15 shows the potential appearance of the feed barge and pens as a photomontage. The Proposed Development will form a large change in the view and introduce man-made although maritime features into the seascape. Views out towards the sea are expansive and open. Views inland are contained by the steeply rising land with the views along this stretch of Core Path being the coastline, ridgeline, sea and Proposed Development. The magnitude of visual change is considered to be **substantial** due to the large change in view at close distance and of long-term duration, although reversible. Underwater lighting would be occasionally utilised; however such lighting would be at a depth of 6m and appear as a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. Overall the visual effects from this viewpoint are considered to be of **major** significance due to the introduction of man-made elements which will form the principal feature in this view.

14.6.5.3 *Viewpoint 3*

This viewpoint represents recreational users of Core Paths AR03/AR12/AR2 and Arran Coastal Route at Laggan Cottage north of the Proposed Development. The Proposed Development would be partially visible (Figure 18) with the southern portion of the pens and the lower portions of the feed barge obscured by the local topography and the dark colour of the pens and irregular coastline reduce the visibility of the Proposed Development. Millstone Point juts out into the coastline forming a visual barrier and preventing full views of the Proposed Development. The Proposed Development will partially alter the available view and will cause a small but perceptible change due to the addition of the man-made features into the seascape. The magnitude of visual change is considered to be slight to negligible due to the distance (over 1 km) of the Proposed Development from this viewpoint and the extent over which the changes would be visible is small within the landscape. Overall the proposals would cause a perceptible change in view but are considered **slight** to **negligible** as the views are partial and at distance and do not form the most prominent feature of the view. Overall the visual effects from this viewpoint are considered to be of **moderate/minor** significance due to the nature of the receptor (recreational users of the Core Path) and the introduction of man-made elements which will form a new feature in

this view. Although this is not immediately discernible as a man-made feature due to embedded design principles of the location against the coastal edge.

14.6.5.4 Viewpoint 4

This viewpoint represents recreational users of the Core Path AR04 and Arran Coastal Route south of the Proposed Development. The pens and feed barge associated with the Proposed Development would be clearly visible (Figure 21) in distant views northwards over a medium extent area and in comparison with available views across the Sound of Bute; albeit in relatively close proximity to the shoreline. The proposals will cause a clearly visible change in view and set within the context of increased human activity and man-made landscape features. Overall the proposals would cause a clearly visible change in view and are considered **major/moderate** as the views are at distance and do not form the most prominent feature of the view. Overall the visual effects from this viewpoint are considered to be of **major/moderate** significance due to the nature of the receptor (recreational users of the Core Path with high sensitivity) and the introduction of man-made elements which will form a new feature in this view although the receiving landscape is considered to be less sensitive here due to the present human activity and backdrop of the forestry practices resulting in a coastline which feels and appears less isolated than that to the north.

14.6.5.5 Viewpoint 5

This viewpoint represents recreational users of the Core Path AR12 north west of the Proposed Development. Even though the viewpoint is elevated there are limited views of the Proposed Development. The photomontage (Figure 24) indicates that views are restricted to the northern portion of the pen layout. The feed barge and southern pen layout are unlikely to be visible from this viewpoint. The proposals will cause a perceptible change in views due to distance and the small scale of the Proposed Development set within the open and expansive seascape along a dynamic route. The extent over which the changes would be visible would be perceptible from a small section of the core path. Overall the magnitude of change is considered to be **negligible** and the significance is considered to be **minor** as the Proposed Development neither contributes to nor detracts from the seascape and visual resource.

14.6.5.6 Viewpoint 6

This viewpoint represents recreational users on the summit between Creag Ghlas Laggan and Fionn Bhealach west of the Proposed Development. There are elevated views of the Proposed Development although it will form a small portion of the overall scene and panoramic views across the Sound of Bute and inland Arran which are the principal focus of views for receptors. The photomontage (Figure 27) indicates that views will be available of the full extent of the Proposed Development. The proposals will cause a perceptible change in the view although these will be limited by distance and the small scale of the Proposed Development in comparison with the open and expansive seascape. Overall the magnitude of change is considered to be **slight** and the significance is considered to be **minor** as the Proposed Development will introduce man-made features although this will be set within the context of the large-scale seascape.

14.6.5.7 Viewpoint 7

This viewpoint represents recreational users on the summit of Tor Meadhonach west of the Proposed Development. The Proposed Development is not visible from this location due to intervening topography (Figure 29)

14.6.5.8 *Viewpoint 8*

This viewpoint represents boat users on the Sound of Bute. The pens and feed barge of the Proposed Development will be seen against the backdrop of open water and the shoreline. The feed barge would be the most prominent element in the view due to its contrasting colour against the water and foreground. The pens would not be as prominent due to their dark colour and low lying nature in the water. The Proposed Development will be clearly visible with close distance views (less than 500 m) of the majority of the pens and feed barge. Figure 32 shows the potential appearance of the feed barge and pens as a photomontage. The Proposed Development will form a clearly noticeable change in the view and introduce man-made although maritime features into the seascape. Underwater lighting would be occasionally utilised; however such lighting would be at a depth of 6m and appear as a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface to a limited number of receptors. The magnitude of visual change is considered to be **substantial** due to the close distance views and a clearly noticeable change in views which are of long term duration, although reversible. Overall the visual effects from this viewpoint are considered to be of **major/moderate** significance due to the introduction of man-made elements which will form a prominent feature in this view.

14.6.5.9 *Viewpoint 9*

This viewpoint represents boat users on the Sound of Bute. The pens would be barely discernible at this distance due to the low profile of the design and colour against the backdrop of water. The feed barge would be visible due to the light colour scheme and would resemble a fishing boat. The Proposed Development would cause a barely perceptible change in view due to distance and the scale of the Proposed Development in relation to the extent of views available of the surrounding area. Therefore, the magnitude of change is considered to be **negligible**. Overall the visual effects are considered to be of **minor** significance and the effects are considered to be **neutral**. Even though the feed barge can be seen (Figure 35) it will be viewed in the context of other maritime features using the area such as fishing vessels and in the main from transitory receptors.

14.6.5.10 *Viewpoint 10*

This viewpoint represents boat users on the Sound of Bute. The proposed pens are unlikely to be visible at this distance and the feed barge would appear as a speck between the water and land. The Proposed Development would be barely perceptible due to distance and the scale of the Proposed Development in relation to the extent of views available of the surrounding area. Therefore, the magnitude of change is considered to be **negligible** (feed barge) to no change (pens). Overall the visual effects are considered to be of **minor** significance (feed barge) to **no effect** (pens) and the effects are considered to be **neutral** (Figure 38).

14.6.5.11 *Viewpoint 11*

This viewpoint represents boat users on the Sound of Bute and along the coastline of Arran. The pens and feed barge of the Proposed Development will be seen against the backdrop of open water and the shoreline of Arran and would cause a perceptible change in view through the addition of the feed barge more so than the pens. The feed barge would be the most prominent element in the view due to its contrasting colour against the water and foreground. The pens would not be as prominent due to their colour and low-lying nature in the water. Figure 41 shows the potential appearance of the feed barge and pens as a photomontage. The feed barge will form a noticeable change in the view and introduce man-made although maritime features into the seascape. Underwater lighting would be occasionally utilised; however such lighting would be at a depth of 6 m and appear as a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. The magnitude of visual change is considered to be **slight** due to distance and

are of long-term duration, although reversible. Overall the visual effects from this viewpoint are considered to be of **moderate/minor** significance due to the introduction of man-made elements, in particular the feed barge, which will form a new feature in this view although not uncharacteristic of the maritime seascape.

14.6.5.12 *Viewpoint 12*

This viewpoint represents boat users on the Sound of Bute and along the coastline of Arran. The pens and feed barge of the Proposed Development will be seen against the backdrop of open water and the distant coastline of the mainland to the north west which limits the visibility of the Proposed Development. The barge would be the most prominent element in the view due to its contrasting colour against the water and darker background of the land. The pens would not be as prominent due to their colour and low-lying nature in the water. Figure 44 shows the potential appearance of the feed barge and pens as a photomontage. The feed barge will form a noticeable change in the view and introduce man-made although maritime features into the seascape. Underwater lighting would be occasionally utilised; however, such lighting would be at a depth of 6 m and appear as a slight underwater illumination, seen as a green glow, with minimal visibility from the surface. The magnitude of visual change is considered to be **slight** for the pens due to the distance and backdrop limiting visibility. The magnitude of change for the feed barge is considered to be **slight** as it will cause a perceptible change to the view but these are limited by distance and although long term are reversible. Overall the visual effects from this viewpoint are considered to be of **moderate/minor** significance due to the introduction of man-made elements, in particular the feed barge, which will form a new feature in this view.

14.6.5.13 *Viewpoint 13*

This viewpoint represents ferry users. The Proposed Development is unlikely to be seen or appreciated at this distance and would appear at most a speck on the horizon. The proposals would **not cause a change to the existing view** and any effects are considered to be **neutral** and **not significant** (Figure 47).

14.6.5.14 *Viewpoint 14*

This viewpoint represents boat users on the Sound of Bute and along the coastline of Arran. The pens and feed barge of the Proposed Development will be seen against the backdrop of the coastline of Arran which limits the visibility of the pens. The barge would be the most prominent element in the view due to its contrasting colour against the water and darker background of the shorelinealthough its appearance would resemble a fishing vessel moored off the coast. The pens would not be as prominent due to their colour and low-lying nature in the water. Figure 50 shows the potential appearance of the feed barge and pens as a photomontage. The feed barge will form a noticeable change in the view and introduce a man-made although maritime feature into the seascape. Underwater lighting would be occasionally utilised; however, such lighting would be at a depth of 6 m and appear as a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. The magnitude of visual change is considered to be slight for the pens due to the distance and backdrop limiting visibility. The magnitude of change for the feed barge is considered to be **substantial** as it will cause a clearly noticeable change to the view at middle distance views, although long term such effects are reversible. Overall the visual effects from this viewpoint are considered to be of **major/moderate** significance due to the introduction of man-made elements, in particular the feed barge, which will form a new feature in this view.

14.7 Embedded Mitigation

The embedded mitigation is based on the following design principles:

- The Proposed Development is limited to 20 finfish pens to ensure that it is proportionate to the receiving landscape;
- The feed barge has been designed to emulate a fishing vessel to help assimilate the structure into the seascape;
- The Proposed Development is set out as a uniform grid;
- The Proposed Development is orientated along the coastline in a compact and regular form;
- The pens and feed pipes are low in profile, circular and will be coloured dark grey or black to blend into the water and against the backdrop of the coastline;
- The associated infrastructure of feed augers and buoys has a very minimal visual impact due to their size and location within the water; and
- The Proposed Development would be serviced from the existing shore base at Lamlash, or potentially from Brodick, without need for expansion of shore based infrastructure or land based infrastructure near the pens and feed barge.

14.8 Conclusion

Based on an assessment undertaken of the Landscape and Visual receptors that were identified as likely to be affected by the Proposed Development following a desk based assessment and site visit it is assessed that the impact upon the Landscape and Visual resources within a 10 km study area would be most significant from land based receptors using the Arran Coastal Path along a 3 km section between Viewpoint 4 and Viewpoint 3.

In terms of effects on the NSA and SLA, the geographical extent of the Proposed Development is negligible and would not directly affect the character of the SLA or NSA although it will introduce man-made features of a long term but reversible nature. The Proposed Development will be most noticeable from within the NSA and SLA along a 3 km length of coastline between VP2 and VP4 where the Proposed Development will form a new feature along the coastline; however the steeply rising land to the west prevents any further influence inland. The Proposed Development is located 0.2 km off shore and would have a limited influence on the shoreline, but it would increase the human influence on the water. Overall it is considered the Proposed Development would have a negligible change on the NSA/SLA over a small geographical extent. The extent over which the changes would be visible is small. Overall the magnitude of change is considered to be **negligible** and the significance is considered to be **moderate/minor** as the Proposed Development introduces man-made features into the NSA/SLA.

In terms of the isolated coasts and Sound of Bute LCA the Proposed Development would introduce man-made features into the water although the feed barge has been designed to resemble a fishing vessel which is not uncharacteristic of the seascape. There will be no anchorage or human activity on the shoreline of Arran but there will be activity associated with the operation of the pens and feed barge on the open water. The LCA is highly sensitive to any forms of development and is defined as '*Isolated Coast*' with its associated qualities of remoteness and limited man-made influence. The ZTV shows the area over which the LCA may be influenced by the Proposed Development and shows the main area being the immediate coastline from North Sannox to the Cock of Arran. Following the site visit it is considered the stretch of coastline most affected would be from VP 4 to VP 2 with decreasing influence to the north and south due to distance and the greater level of human influence to the south of VP 4. The section of coast between VP 2 and VP 4 has fewer man-made features although telegraph poles are present along the coastline to the south west of the Proposed Development, with other features confined to the water such as fishing buoys and the activity of fishing boats and pleasure boats on the Sound of Bute and along the coastline. It is considered that the Proposed Development

will introduce man-made features to this stretch of coast but these would be water based with no anchorage points or infrastructure on the land. The study area is popular with recreational boats and also fishing vessels[117] and as such it is considered that this reduces the feeling of remoteness and isolation and consequently the sensitivity of the Site to water based development only. Overall it is considered that the magnitude of change is **moderate** due to the geographical extent of the Proposed Development in relation to the LCA area although reversible and as such will result in a **major/moderate** significance.

Of those visual effects identified, Viewpoints 1 and 2 from Core Path AR03 are predicted to experience effects of a **major** significance. This is due to the sensitivity of the receptors and the proximity of the receptors to the Proposed Development and the direct and close nature of views available. As receptors travel beyond the extent of the Proposed Development the effect for those travelling away from the Proposed Development (north or south) reduces significantly as views become either oblique and then successive where the receptor has to turn their head to see the Proposed Development. This is due to the limited scale and low nature of the Proposed Development and the receiving landscape. Of those Major effects identified they are represented across an area of only 1.5 km. From a distance of approximately 1km to the south of VP 1 at VP 4 on Core Path AR04, receptors travelling north towards the Proposed Development would experience **major/moderate** effects increasing to **major** the nearer the receptor travels towards the Proposed Development (and upon reaching VP1 – Core Path AR03). From VP3 receptors travelling south on Core Path AR03 towards the Proposed Development experience Moderate/Minor effects at VP3 increasing proportionally to Major at VP2 as the whole of the Proposed Development is seen. The effects for receptors travelling south are less significant proportionally with distance as only a limited part of the Proposed Development is visible until the receptor reaches VP2. Beyond VP3 and VP4 the effects are not significant as either views are not possible seen sequentially from a distance where the Proposed Development occupies only a small section of available views.

The effects of views from the water are generally less than land based effects as receptors view the Proposed Development against the foreshore where the Proposed Development benefits to a greater degree from embedded mitigation through the back clothing effect of the rugged and dark coastline adjacent to the Proposed Development. The closest water based receptor at Viewpoint 8 is predicted to experience adverse effects of a **major/moderate** significance.

In considering the significance of effects the following has been considered:

- The context of the existing seascape;
- The scale of the Proposed Development;
- Embedded design mitigation as identified in Section 14.7 above;
- The large scale of the receiving landscapes including designated landscape and LCT's; and
- The proximity and nature of the landscape and visual receptors.

It is assessed that in reference to the above there will be significant effects of a substantial adverse nature for land based receptors using the Arran Coastal Way but from a limited geographical extent, in particular Viewpoint 1 and 2, and to a lesser degree Viewpoint 4; together with water based receptors with close distance views such as Viewpoint 8; however such effects occur across a relatively small section of between 1-3 km, of the coastline for land based receptors and up to 1 km for water based receptors. Beyond 1 km (the extent of the Proposed Development) all effects are limited by direction of travel where views become successive and decrease quickly with the effects of distance from the

[117] North Arran Fish Farm
Baseline Marine Activity Assessment - Anatec Ltd 2019

Proposed Development. It is assessed that, whilst such effects occur, the nature of the Proposed Development is characteristic of a coastal location and the receiving landscape is of such a scale that it has the capacity to absorb a development of this nature.

15 SOCIAL AND ECONOMIC ASSESSMENT

Imani Enterprise Ltd (Imani) were commissioned to carry out an assessment of the anticipated social and economic impacts of the Proposed Development. This analysis is based on the Sustainable Livelihoods Approach (SLA) to identify impacts across the Scottish supply chain as well as effects local to Arran. A summary of the findings is presented here, with detail on methodology and fuller discussion on impacts within Imani's final report[118] included as Appendix P to this EIAR.

15.1 Baseline Characteristics

There are five types of capital or livelihoods assets to consider within the SLA methodology and the assessment is based around this structure:

- Human i.e. employment / skills / education / health;
- Social i.e. family / community life;
- Financial i.e. income / earnings for business;
- Environmental i.e. land / water / wildlife / biodiversity; and
- Physical i.e. infrastructure / shelter / water / energy / communication.

The Isle of Arran lies within the Firth of Clyde and is home to around 4,500 permanent residents – comprising under 5% of the total population of North Ayrshire. Its natural aesthetics, coupled with its proximity to Glasgow and Road Equivalent Tariff (RET) ferry service, has made Arran an extremely popular destination for tourists regionally and from abroad. Tourism is now the dominant driver of Arran's economy, making use of Arran's natural land and sea assets.

Key baseline characteristics identified are outlined below:

- Arran has a strong tourism and eco-tourism economy
- The natural capital of Arran comprises the Island's primary asset and underpins key sectors of tourism, hospitality, forestry, food agriculture and aquaculture;
- Good transport infrastructure alongside improving 4G and Fibre connectivity
- Arrans population is ageing and falling. Residents over the age of 65 comprised around a third (1 in 3) of Arran's total population, with this figure expected to rise to half (1 in 2) in 2026[119]. Communities are losing services due to a dropping numbers of permanent residents
- Key worker posts remain unfulfilled and there are limited good quality, full-time, diversified, year-round employment opportunities

The SLA has identified key economic and social drivers on Arran and across the Scottish supply chain. In summary:

- **Tourism:** The sector is seen as a boon for the economy that should be protected at all costs, but it has also introduced negative social and economic drivers that require mitigation and diversification for a sustainable island economy on Arran
- **Housing:** House prices are going up, and population is going down. There is clear aspiration to attract people and businesses to Arran, however, the housing supply and current utilisation are inappropriate to achieve this.
- **Job Creation:** Consultation set out reasons why job creation is not a priority in Arran – in fact it is the availability of workers that is the problem, as the tourism sector is creating many jobs that remain unfilled. However, job quality, seasonality and pay are likely to be relevant factors: the tourism sector is largely seasonal, part-time and low paid – with many people taking on two to three jobs. It is difficult to both work in the

[118] Imani Enterprise Ltd (June 2019) Evaluating the Social and Economic Impacts of the SSC North Arran Aquaculture Development (Appendix Q to North Arran Marine Fish Farm EIAR).

[119] North Ayrshire Community Planning Partnership, September 2017, Locality Profile: Arran, accessed at: http://d1xcj1909sd1jp.cloudfront.net/wp-content/uploads/sites/60/2018/02/Locality-Profile_Arran_Final_Version_Sept2017.pdf

tourism sector and afford to live on Arran permanently. There is an apparent scarcity in jobs where people can easily afford to live on the island and raise a family – jobs (direct and indirect) in the aquaculture sector through the site should support these objectives.

- **Social impact of housing:** Tourism has greatly affected the housing market with around 1 in 4 houses on Arran owned as second homes (some of which owned by residents, some of which owned by non-residents). Tourism is viewed positively in Arran but the pressures it places on the economy require strong mitigation measures.
- **Key workers and demographics:** All of these factors are working against young, working people and their families and preventing other working people from moving to Arran, including key workers. This in turn means that fewer people are available for full-time work on Arran: already teaching, nursing, etc. posts are cited as vacant.
- **Primacy of natural capital:** Natural capital provides the foundation for almost all economic activity in Arran in some way – whether directly or indirectly. The more a population and economy is geared towards retirement and tourism, the less important high-quality and full-time opportunities (i.e. those needed by younger working families) become.
- **Travel to Work:** All of these factors push the economy towards a Travel-to-Work model, where employment opportunities are flexible, part-time and seasonal. Financial capital enters Arran via tourists and people moving to Arran for retirement, whilst salaries and human capital investments create economic value outside of Arran.
- **Social change:** Arran runs the risk of perpetuating a growth path which is difficult to change, with cyclical depreciating effects on social, human, physical and financial capital. The Arran Economic Group (AEG) are clearly setting out to mitigate negative social effects. It is unclear whether or not protecting and growing Arran's natural capital is an appropriate trade-off for Arran and its people, but from an SLA perspective, this will greatly distort the islands asset base

15.2 Assessment of Effects

15.2.1 Arran's Economy

It is currently unknown how many of the direct farm jobs will be taken up by Arran workers: given the current housing and related labour constraints, it is possible that those jobs can be filled by people from other areas by accessing the site by sea. Based on the assessment of Arran and wider area Clyde region linkages, it may be advantageous if it offers positive employment opportunities for other areas with more demand for jobs, for example Ardrossan or the Loch Fyne area where SSC has a cluster of operations. Key worker jobs (in particular health and social care workers and teachers) are unable to find affordable housing in Arran, necessitating many to commute from the mainland, or those jobs remain vacant. This is detailed in numerous AEG and other reports. Nevertheless, the jobs are considered positive in providing competitive, year-round salaries that would help diversify the Arran economy.

As part of the development plans, SSC is looking to recruit an additional ten full-time equivalent members of staff in the area which would support 51 supply chain jobs and ten wider economy jobs across Scotland with a total Gross Value Added (GVA) for the Scottish Economy of over £8.6 million per year.

15.2.2 North Ayrshire and Scottish Supply Chain

The wider socio-economic impact of the proposed development has been considered, including that of additional jobs in the North Ayrshire Council region, and across Scotland. One example of the wider job creation would be W&J Knox in Kilbirnie (within the North Ayrshire region) has been one of the biggest private employers in the town, with a current complement of 77/78 employees and a turnover of around £11m. Should Knox be

successful in obtaining the contract for supplying nets and maintenance to the North Arran site, it would amount to around £500,000 in initial purchasing (CAPEX) and around £500,000 in maintenance contracts over 5 years. This would equate to around 1-2 extra jobs (or Full Time Equivalents) or £120,000 per year (turnover) in Kilbirnie. However, overall around 95% of the Knox business relates to the aquaculture sector, meaning that over 70 jobs there are reliant on the sector.

Construction of the barge and pen system by Gael Force Group would take place in Corpach, Fort William (for the barge), with pen work likely in or between the Oban area (Barcaldine) and Inverness. The SeaQure Farm system is seeking to be the best-in-class model to minimise negative impacts cited in recent reports (primarily the 2018 Parliamentary Inquiry2) and which were reflected as a concern amongst many Arran residents, driving some negative perceptions of the sector which in turn has affected views about this site.

15.2.3 Wider Supply Chain Impacts for Scotland

SSC have highlighted their work with Arran Workboats (Kiscadale Engineering), based in Whiting Bay. While it is unclear whether the firm will secure a contract to produce workboats directly relating to the proposed site (though it is likely to be the case), it is important to consider their links with the rest of the sector. Arran Workboats have won contracts to supply SSC with workboats being delivered to Lewis and across the Highlands, and supplying the sector is now their core business.

While these income and employment streams to Arran Workboats are not relating directly to the proposed site, they are an illustration that economic impacts work both ways – there are indirect benefits to Arran from the aquaculture sector throughout Scotland, and equally there will be indirect impacts in areas elsewhere in Scotland throughout the supply chain from the production emanating from the proposed site. These are likely to include supporting and/or creating jobs and GVA in:

- Fort William, Inverness and Kilbirnie (equipment supply – Gael Force and Knox);
- Larkhall (distribution – DFDS);
- Grangemouth / Bathgate (feed – Biomar, EWOS);
- Arran (transport and engineering – Kiscadale, Arran Haulage, Paddy McHale); and
- Cairndow (processing – within SSC processing operations).

15.2.4 Conclusion

The key findings of the SLA are outlined below and discussed in detail in Appendix P.

- **Positive economic and social impact:** The site will have a significant positive, inclusive impact across Scotland's aquaculture supply chain in Arran, Argyll and Bute, North Ayrshire and the Central Belt. The GVA contribution to Scotland is calculated to be at least £8.61m per year;
- **Employment:** In total it is projected to support a total of 61 jobs (FTE): 51 in the sector, and a further 10 in wider economic stimulus. Most of these jobs would be year-round and well paid (including engineering, farm management, manufacturing, and services);
- **Arran's economic resilience:** A lack of economic diversity and resilience threatens sustainable community development in Arran, and without support this will continue to exclude young working people. Tourism risks creating low-security employment and driving out activities that could improve year-round use of social and physical assets (schools, medical care, accommodation). The 2011 census saw a 16% decline in working age population during a period of economic growth;
- **Benefit to Arran:** The degree of social and economic benefit to Arran depends largely on the affordability of physical housing stock on the island, its effect on available labour,

and the effectiveness of stakeholders in addressing constraints (including positive support from SSC as an option);
- **Natural capital:** As long as environmental compliance is achieved through the EIA and the site is managed in accordance with best practice, optimal husbandry / welfare standards, and emerging regulatory frameworks, there appear to be no significant impacts on the natural capital of Arran, and a positive case can be made for the site's positive contribution to low carbon animal protein production;

15.3 Mitigation Measures

There are a number of ways which have been identified in which SSC can improve and mitigate current challenges on Arran, for example through upgrading coastal path infrastructure, supporting housing development, and supporting the business case for better ferry services through increased commercial traffic. These are explored further below:

- Financial impacts (increased income, any detriment to other income sources, access to finance) - SSC can be relatively neutral about how the direct farm jobs are filled – the jobs may benefit other communities by as much if not more, through increased income, than if the employees were based 100% in Arran. SSC could use their access to finance to support the financing of Arran housing initiatives.
- Physical capital infrastructure (housing, ferry use, roads, communications) - SSC should where possible support Arran's efforts to improve access to housing for workers, and could support improving the physical infrastructure of the local site area, e.g. information boards, path maintenance, boat tours etc. as part of an integrated good neighbour approach.
- Natural capital (effects on, and, of the natural resource in relation to the development) - Beyond complying with regulatory requirements, SSC should consider (as they are) how to demonstrate a Best-in-Class approach to local Arran stakeholders. This is not just for the planning process but for ongoing social licence to operate.
- Social capital (social impacts of the development, including population, social amenities, income) - SSC should where possible support housing and jobs on Arran (even for those not directly employed but may be crucial for Arran, such as key workers), but also consider the potential social impacts across the Highlands and Central Belt.
- Human capital (possible impacts of training, skills, career, and location) - Site employment will entail training and up-skilling, and rural, year-round career options. However, it will also play a role in developing manufacturing jobs in the Highlands (and likely directly in Arran).

15.4 Statement of Significance

There are benefits and costs to sustainable livelihood 'capitals' associated with the development. The magnitude of the benefits will comfortably outweigh the magnitude of the costs.

Without implementing any mitigation measures or recommendations: the overall impact of the site on Sustainable Livelihoods is net positive, taking into account concerns of residents and mildly negative impacts; and despite the uncertainty around where farm employees are based as a result of housing issues.

With mitigation measures: the overall impact of the site on Sustainable Livelihoods may be strongly positive by mitigating negative impacts and existing economic blockers, and enabling Arran and other Scottish regions to meet their strategic objectives.

The Proposed Development is anticipated to be a positive step towards:

- **Economic Diversification**: building demand and GVA created by non-tourism sectors

- **Resilience:** to exogenous shocks (e.g. currency fluctuation associated with Brexit) to tourism industry
- **Year-round jobs:** Creation of employment and career opportunities that are non-seasonal and full-time.
- **Support island capacity:** Increase drivers to support new permanent dwellings, and associated services and consumption

It is important to acknowledge that the unlocking of this value is due to Arran's and North Ayrshire's willingness to utilise the site – for Arran and North Ayrshire's direct interests and to recognise their strategic importance for Scotland. Understanding the total value of Arran's knock-on contribution to the Scottish economy, and their integration with it, would make a clearer case for investment in ferry services which involve public service obligations (PSO) and other local priorities. This would in turn improve utilisation of limited housing stock – if it is to be used for tourism, it should be as fully used, year-round, as possible. Such virtuous circles could be possible with continued engagement in the relationship between fish farming and communities.

16 OTHER ISSUES

This chapter of the EIAR addresses any remaining topics that are within the scope of the EIA, due to potential for significant effects from the Proposed Development. these topics include:

- Farm Management; and
- Noise.

16.1 Farm Management

The Proposed Development will be managed in accordance with the principles of Integrated Pest Management and the National Treatment Strategy.

The Scottish Salmon Producers Organisation (SSPO) Code of Good Practice (CoGP)[120] requires that all marine sites have a Farm Management Statement (FMS) in place. The FMS will be finalised after fish are stocked onto site, once the health status of the stock has been confirmed.

The husbandry practices of salmon farmers are strictly regulated by SEPA, through the Water Environment (Controlled Activities) (Scotland) Regulations (2011) as amended, and Marine Scotland, through the Aquaculture and Fisheries (Scotland) Act 2013.

Regarding comments raised by MSS in relation to the potential overlap of DMAs, a dynamic risk assessment has been undertaken by SSC to determine how existing DMAs may or may not overlap in relation to the Proposed Development. The risk assessment is provided in Appendix H and takes a building block approach to cumulative DMA risk assessment, incrementally assessing various scenarios as described below:

Baseline - **Scenario 1:** Current area(s) with consented, operational sites and/or non-operational but authorised sites (SEPA/MS consent). This includes current DMA's: 19a (Loch Fyne - SSC), 19b (Loch Striven - SSC), 19c (Carradale - MOWI) & 20 (Arran - SSC) in current format with appropriate separation distances.

Proposed Developments - The following scenarios represent those plans, projects or proposals with no consent in place and which have yet to secure planning permission (i.e. the Proposed Development and the DFF sites). These scenarios can be split into a further 4 tiers:

- **Scenario 2:** Currently authorised sites in place (scenario 1), plus addition of the Proposed Development (DMA 19d in risk assessment).
- **Scenario 3:** Currently authorised sites and the Proposed Development in place (scenario 2), plus addition of DFF Loch Long site (DMA 19e in risk assessment).
- **Scenario 4:** Currently authorised sites, the Proposed Development & DFF Loch Long in place (scenario 3), plus addition of DFF East & West Cumbrae sites.
- **Scenario 5**: Currently authorised sites, the Proposed Development, DFF Loch Long, West & East Cumbrae (scenario 4), plus DFF Bute site.

The cumulative risk assessment up to Scenario 3 would have a low risk in relation to potentially overlapping DMAs. The current use of the Clyde area, plus the addition of the Proposed Development (Scenario 2) is assessed to pose no additional risk to disease spread with embedded mitigation in the form of design and management measures in place. The Proposed Development will be a stand-alone DMA and would be operated as any other separate DMA. The current baseline (scenario 1) plus the Proposed Development and DFF Loch Long site (Scenario 3) would not change the current risk assessment for disease spread between areas.

[120] Scottish Salmon Producers Organisation (2015) Code of Good Practice for Scottish Finfish Aquaculture. Available at: http://scottishsalmon.co.uk/cogp/

The addition of the DFF East and West Cumbrae and Bute sites are assessed as posing a high risk to existing sites in Loch Striven (19b) for spread of disease and sea lice management as the loch system would back fill and DMA 19b would be extended. This is irrespective of any consent for the Proposed Development.

Taking a 'building block' approach to cumulative risk assessment it can be clearly demonstrated that the base case (Scenario 1) and addition of the Proposed Development (Scenario 2) poses little risk to overlapping DMA. Even with the addition of the DFF site in Loch Long (Scenario 3) the risk of DMA overlap is negligible due to the distances between DMA. However, the addition of the other proposed developments by DFF in Scenarios 4 & 5 will cause a high risk of potential DMA overlap due to the relatively close proximity of the DFF sites to each other, to shore and to the Proposed Development. Using the tiered approach in the risk assessment it is evident that the Proposed Development does not cause a risk to either the extent or management of existing DMAs, rather such a risk is created when the proposed DFF sites (Scenario 4 & 5) are also considered.

16.2 Noise

This section presents a consideration of the impacts of noise associated with the operation of the Proposed Development.

16.3 Development Overview

The Proposed Development is located off the north-east coast of the Isle of Arran in an expanse of open water in the Firth of Clyde. A full description of the Proposed Development is Chapter 3.

Daily working hours will be typically between the hours of 8am – 5pm, with no night-time working other than in an emergency.

16.3.1 Noise Sources

The key noise sources associated with the Proposed Development would be the feed blowers / selectors on board a single static barge located centrally between two groups of 10 fish pens. Feeding takes place daily, between the hours specified above.

In addition, the Proposed Development will be serviced by a workboat and a rigid-hulled inflatable (RIB) type boat for staff access and routine operations. The boat will operate from the existing shore base at Lamlash; no shore base is proposed as part of the Proposed Development. These boats will typically make one return journey from the shore base to the Proposed Development each day. Given the temporary nature of this noise source, coupled with the fact that a number of vessels already operate in the area between Lamash and the Proposed Development, there is considered to be no potential for a significant impact associated with these vessels.

Other occasional noise sources include a wellboat during harvesting and feed deliveries. The wellboat will be required to visit the Proposed Development over a 6-month harvesting period in the second year of each 24-month cycle. During this time, the wellboat will make up to 10 trips to the Proposed Development per month, with no visits at any other time. Feed for the Proposed Development will be delivered directly to the barge by boat from the manufacturers' plant and will be stored on board the barge. The number of feed deliveries is anticipated to total 78 over the entire 2-year cycle. Given the infrequent and temporary nature of these visits, along with the limited period over which harvesting in particular takes place, any noise impacts associated with these activities are considered to be negligible.

16.4 Assessment

16.4.1 Potential Receptors

The closest residential dwellings are located approximately 4 km to the southeast of the Proposed Development; no impacts are therefore anticipated at residential dwellings, and have therefore not been considered further. Notwithstanding this, it is noted that in their Scoping Response, EAC requested information on the potential noise level on the coastline, along with an associated consideration of the impact of this noise level upon recreational users of the area and protected wildlife. A coastal path runs past the Proposed Development at a distance of approximately 275 m at its closest point, no other potential receptors for formal recreation were identified.

16.4.2 Estimated Noise Levels

Discussion with SSC has revealed that the specification of the primary noise sources (i.e. the feed blowers / selectors on the feed barge) is the same as that previously assessed by Arcus for a similar Proposed Development, for which measurements were undertaken, and a sound power level of 99 dB, L_{WA} was determined for each blower. It is understood that the feed barge will accommodate four such items, resulting an overall sound power level of 105 dB, L_{WA}.

The feed barge is located approximately 240 m from the coastline at its closest point. Therefore, using a standard hemispherical propagation equation, an estimate of the noise level at the coastline can be made.

The standard hemispherical propagation equation is:

- $L_p = L_w - [20 \times \log10 (r)] - 8$

Where:

- L_p is the sound pressure level (i.e. the predicted noise level due to the Proposed Development)
- L_w is the sound power level of the source; and
- r is the distance from source to receiver in metres.

The feed barge will be orientated such that the blowers / selectors are fully screened from the coast by the vessel's superstructure. It is generally accepted that a reduction in noise level of 10 dB is achieved where the line of sight between source and receiver is fully obscured. The equation can therefore be modified to the following:

- $L_p = L_w - [20 \times \log10 (r)] – 18$

Substitution of the above values into this equation provides the following result:

- $L_p = 105 - [20 \times \log10 (240)] – 18 = 39$ dB(A)

As shown above, the noise level due to the Proposed Development at the coastline is anticipated to be approximately 39 dB(A). With regard to the coastal path, substitution

of the 275 m separation distance into the above equation results in a predicted noise level of approximately 38 dB(A) at the closest point. Such a levels are considered to be relatively low, and given the noise generated by the waves at the coastline, are likely to be similar to the existing background noise level.

16.5 Potential Impact

Based upon the above, whilst the Proposed Development has the potential to be audible under calm conditions at the closest points on the coastline and the coastal path, noise is unlikely to result in a significant impact. It also should be noted that noise levels at all other points on the coastline and on the coastal path will be lower than presented. By the nature of the activity, walkers are transient receptors; any noise due to the Proposed Development will therefore quickly become inaudible as the walkers pass by.

In conclusion, given the limited working hours of the Proposed Development (including no night-time working), the lack of residential receptors in the vicinity, and the modest levels of noise generated by the Proposed Development, it is considered that there is no reasonable prospect of a significant noise impact and as such, a detailed consideration of noise has been scoped out.

17 SUMMARY OF MITIGATION

This section of the Environmental Impact Assessment Report (EIA Report) provides a summary of mitigation measures that have been proposed with the EIA Report to prevent, reduce or offset the effects associated with the North Arran Marine Fish Farm (the Proposed Development).

Mitigation measures have been integral to the design evolution of the Proposed Development as outlined in **Chapter 3 Description of the Proposed Development**. The overall aim of the design strategy was to create a fish farm with a cohesive design that relates to the surrounding landscape whilst taking account of the environmental characteristics of the area in which the Proposed Development is located (the Site).

Table 17.1 presents a schedule of mitigation measures for the Proposed Development listed according to the relevant environmental topic, which would be applied during the construction and operation of the Proposed Development.

Table 17.1: Schedule of Mitigation

Environmental Subject Area	Mitigation Proposed	Timing
Chapter 3 – Description of the Proposed Development	**Mitigation by design** The layout design of the Development is a vital part of the EIA process and is the stage where the biggest contribution can be made to mitigate potential landscape and visual effects, creating a design which is appropriate for the existing landscape character and visual features of an area. *Orientation of pen groups* The scale of the Proposed Development is governed by the equipment necessary to facilitate the functions of an Atlantic salmon fish farm at the Site. Any equipment on the barge will be at a height less than a single storey, ensuring that they are not overly disruptive to the landscape of the area, with the majority of the infrastructure lying below the surface. The pens will be at 1.4 m above sea level. The pen groups have been orientated parallel to the coastline in order to offer protection and to minimise landscape and visual impacts. The barge has been positioned in a specific location for operational reasons in order to allow it to effectively feed all pens within the Site. This siting distance is due to the barge requiring a significant amount of power to blow feed along the maximum length of the pipe. As such, it needs to be located within the middle of the two groups of pens in order to operate effectively and to be within optimum distance of all pens. Its location at the centre will also: Protect the vessel from the often harsh weather elements; Reduce any potential interactions with nearby marine traffic; and Reduce any potential Landscape and Visual impacts	Design
Chapter 7 – Benthic Habitats	**SeaQure Farm** A key aspect of the SeaQure Farm concept is focused use of freshwater bath treatments (see Section 7.4.1.2) to reduce the potential environmental impact of chemical treatment of farm stock. Freshwater will be contained within a controlled environment which will ensure that any water used in the treatment is captured, and sea lice are removed and destroyed before releasing water to the environment, reducing the potential for detrimental impacts.	Design

Environmental Subject Area	Mitigation Proposed	Timing
	Environmental Management Plan An Environmental Management Plan (EMP) will be implemented at the Proposed Development. A key aspect of the EMP is to ensure compliance with a quality assured integrated sea lice management plan (ISLM), which will focus on the use of non-chemical control (see Chapter 10 mitigation), and thus reduce the requirement for medicinal treatment. Chapter 10 mitigation. Routine monitoring of the seabed, stipulated in the SEPA CAR discharge licence, will be carried out to ensure environmental standards are adhered to. This involves a site specific program where seabed samples are collected and analysed for indicators of nutrient enrichment. As a result of this sampling regime, a site can be assessed for its assimilative capacity and biomass tonnages can be adjusted accordingly to keep within the consented limit. As there is cross over between potential impacts on benthos and the water column, and the associated mitigation for both, further information of embedded mitigation related to waste and chemical release is presented in the line below (Chapter 8 – Water Column Impacts mitigation).	Pre-deployment, during deployment, and operation
Chapter 8 – Water Column Impacts	Although the nutrient input of the Proposed Development will be low, considerable effort will be made by SSC to reduce nutrient waste and potential for nutrient enrichment, primarily through the reduction of feed waste. Feed wastage is minimised by effective feed control and site management, and the following mitigation is proposed to achieve this: Routine monitoring of the seabed, stipulated in the SEPA CAR discharge licence, will be carried out to ensure environmental standards are adhered to. This involves a site specific program where seabed samples are collected and analysed for indicators of nutrient enrichment. As a result of this sampling regime, a site can be assessed for its assimilative capacity and biomass tonnages can be adjusted accordingly to keep within the consented limit; Fish feed used at marine farms has been developed to mimic the natural diet of salmon, and is highly digestible, reducing the potential for nutrient release into the water column. SSC has a specific Feed and Nutrition Team, whose role focusses on ensuring an optimal diet is produced and provided to SSC fish, with efficient nutrient conversion, which ensures that the amount of soluble nutrients released into the marine environment is minimised; The operational staff will be trained in feed usage and methods to reduce waste feed; and Feeding will be in accordance to established guides, and staff will be able to adapt feeding regimes as necessary e.g. if weather conditions are temporarily affecting feeding behaviour. The proposed SeaQure Farm feeding mechanism is fully automated with an inbuilt pellet detection system and associated feedback loop to ensure minimal waste.	Operation

Environmental Subject Area	Mitigation Proposed	Timing
Chapter 9 – Interactions with Predators	**Predator Control Plan** All measures would be managed via the PCP presented as an annex of the EMP (Appendix C), which would include the following measures: Appropriate husbandry practices which aim to reduce stock mortality that may inadvertently attract predators; Selection of the most appropriate net designs and tensions, including the installation of Seal Blind (false bottom) and Seal Pro nets; Responsible maintenance of tensioned nets, to prevent bird attacks and reduce risk of entanglements; and, Maintenance of a Wildlife Log – to help assess and monitor changes in wildlife occurrence and distribution in marine habitats surrounding the Proposed Development over time. The PCP prioritises the use of non-lethal management measures which have proved successful and low impact at the other SSC sites, therefore it is anticipated that the PCP will be successful at the Proposed Development.	Pre-construction, during construction, and during operation
Chapter 10 – Interaction with Salmonids	**SeaQure Farm** The SeaQure Farm is a newly developed innovation which aims to ensure robust fish health and welfare and environmental sustainability, and will form an integral part of the design and management of the Proposed Development. A key aspect of the SeaQure Farm concept is focused use of freshwater bath sea lice treatments (see Section 7.4.1.2) to reduce the potential environmental impact associated with chemical treatment of stock.	Design
	Integrated Lice Management Plan (ISLM) An Environmental Management Plan (EMP) will be implemented at the Proposed Development. A key aspect of the EMP is to ensure compliance with a quality assured ISLM. Although regulated medical treatment will form a part of the sea lice management at the Proposed Development, the ISLM plan will aim to focus on the use of non-chemical control such as biological control and systems which physically remove sea lice, which will be utilised where appropriate and necessary. The following controls will be implemented: Biological control – cleaner fish; Cleaner fish represent an effective biological method for the removal of sea lice and offer an alternative to chemical treatments for sea lice control. Physical Removal Systems; As presented within the ILSM, systems which physically remove sea lice, such as the Hydrolicer and Thermolicer will be utilised where appropriate and necessary	Operation

Environmental Subject Area	Mitigation Proposed	Timing
	Fallowing; Following the completion of each production cycle, the Proposed Development will be left fallow for a minimum of 2 months. This will reduce the potential for sea lice accumulation and, should sea lice be present, allow the levels to return to natural background levels.	
Chapter 11 – Impacts on species or habitats of conservation importance	**Environmental Management Plan** Embedded mitigation implemented via the PCP included within the EMP, including the use of net tensioning methods and bespoke Acoustic Deterrent Device (ADD) deployment plan ADDs would only be used temporarily, and only when required (i.e. when seal predation becomes a problem, and passive measures have been demonstrated to be ineffective). ADDs deployed will be set to emit noise within the low frequency range of between 8 - 12 kHz, outwith the optimal hearing frequency range of high and medium frequency cetaceans.	Operation
Chapter 13 – Navigation, Commercial Fisheries, and Recreational Maritime Uses	Beyond the maintenance of the required navigational markings and lighting no monitoring or mitigation is proposed. Exclusion of commercial fishing activities will be mitigated by maintaining minimum appropriate length of mooring lines. The location of the Proposed Development adjacent to and parallel with the shore minimises any interactions with commercial fisheries. Following installation, the majority of the area taken up by mooring lines will still be accessible for static gear fishing with full exclusion only required during maintenance of mooring lines or boat operations on site. No ongoing monitoring is proposed.	Operation
Chapter 14 – Seascape, Landscape and Visual Assessment	The embedded mitigation is based on the following design principles: The Proposed Development is limited to 20 finfish pens to ensure that it is proportionate to the receiving landscape; The feed barge has been designed to emulate a fishing vessel to help assimilate the structure into the seascape; The Proposed Development is set out as a uniform grid; The Proposed Development is orientated along the coastline in a compact and regular form; The pens and feed pipes are low in profile, circular and will be coloured dark grey or black, to blend into the water and against the backdrop of the coastline; The associated infrastructure of feed augers and buoys has a very minimal visual impact due to their size and location within the water; and The Proposed Development would be serviced from the existing shore base without need for expansion of shore based infrastructure or land based infrastructure near the pens and feed barge.	Design

Environmental Subject Area	Mitigation Proposed	Timing
Chapter 15 – Social and Economic Assessment	There are a number of ways which have been identified in which SSC can improve and mitigate current challenges on Arran, for example through upgrading coastal path infrastructure, supporting housing development, and supporting the business case for better ferry services through increased commercial traffic. These are explored further below: Financial impacts (increased income, any detriment to other income sources, access to finance) - SSC can be relatively neutral about how the direct farm jobs are filled – the jobs may benefit other communities by as much if not more, through increased income, than if the employees were based 100% in Arran. SSC could use their access to finance to support the financing of Arran housing initiatives. Physical capital infrastructure (housing, ferry use, roads, communications) - SSC should where possible support Arran's efforts to improve access to housing for workers, and could support improving the physical infrastructure of the local site area, e.g. information boards, path maintenance, boat tours etc. as part of an integrated good neighbour approach. Natural capital (effects on, and, of the natural resource in relation to the development) - Beyond complying with regulatory requirements, SSC should consider (as they are) how to demonstrate a Best-in-Class approach to local Arran stakeholders. This is not just for the planning process but for ongoing social licence to operate. Social capital (social impacts of the development, including population, social amenities, income) - SSC should where possible support housing and jobs on Arran (even for those not directly employed but may be crucial for Arran, such as key workers), but also consider the potential social impacts across the Highlands and Central Belt. Human capital (possible impacts of training, skills, career, and location) - Site employment will entail training and up-skilling, and rural, year-round career options. However, it will also play a role in developing manufacturing jobs in the Highlands (and likely directly in Arran).	Operation

18 CONCLUSION

There is regional and national support through the Firth of Clyde Marine Spatial Plan, the National Marine Plan, Scottish Planning Policy and other material considerations. The Proposed Development would result in economic benefits including new employment, opportunities for local and regional contractors and support for existing aquaculture operations in the region.

The EIAR and associated Appendices provide a full and detailed description of the proposed equipment and practices to be used at the Proposed Development. The Proposed Development has been designed in such a way to ensure that environmental effects have been minimised through the use of innovative technology and enhanced, best practice management measures implemented.

Where a potential risk to the surrounding environment has been identified, appropriate mitigation has been proposed (e.g. the layout of the pens following the coastline and design of the feed barge to resemble a fishing vessel).

Whilst there is the potential for significant adverse landscape, seascape and visual effects for receptors using the Arran Coastal Way, these occur over a limited geographical extent, and decrease quickly as one moves past the Proposed Development. It is assessed that whilst such effects occur, the nature of the Proposed Development is characteristic of a coastal location and the receiving landscape is of such a scale that it has the capacity to absorb a Proposed Development of this nature.

The design and assessment process adopted by the Applicant has represented a good practice approach to the reasonable development of marine aquaculture. All potential areas of significant interaction between the Proposed Development and the environment have been addressed, resulting in a well-designed development incorporating appropriate mitigation measures, at a suitable site.

The Proposed Development complies with, and is supported by, the aims and objectives of both national policy and the Development Plan, and would make a valuable contribution towards the ambitious growth targets set for the aquaculture industry.

It is considered that the Proposed Development complies with the Development Plan and is acceptable in all other respects and there are no material considerations that would outweigh these conclusions.

APPENDIX A FIGURES

APPENDIX B1 – EQUIPMENT ATTESTATIONS

APPENDIX B2- EQUIPMENT SPECIFICATIONS

APPENDIX C – ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX D – EXAMPLE PRODUCTION SPREADSHEET

APPENDIX E – SEA LICE EFFICACY STATEMENT

APPENDIX F – FISH MORTALITY PLAN

APPENDIX G– ADD DEPLOYMENT AND USAGE PLAN

APPENDIX H – FARM MANAGEMENT: DYNAMIC RISK ASSESSMENT

APPENDIX I – SEABED VIDEO REPORT

APPENDIX J – ADDITIONAL SEABED VIDEO REPORT

APPENDIX K –MODELLING REPORTS

APPENDIX L – HYDROGRAPHIC REPORT

APPENDIX M – ECE REPORT

APPENDIX N – BASELINE MARINE ACTIVITY ASSESSMENT

APPENDIX O – SLVIA: ANNEXES 1-3

APPENDIX P - SOCIAL AND ECONOMIC IMPACTS REPORT