Sharon Phipps

From: [redacted]@mowi.com>
Sent: 23 April 2019 14:55
To: Kirsty North; Liam Wright; Alex Turner
Cc: [redacted]
Subject: FW: Scalpay fish farm proposal - Revised ADD Deployment Guidance
Attachments: Appendix 5.5b_ADD Deployment Guidance_v2.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Good afternoon all,

Following on from our meeting last month we have been reviewing our ADD Deployment Guidance (attached). This revision is based on the recommended best practice by OTAQ. OTAQ recommend that Patrol Mode is used continuously to mitigate against potential seal attacks. The continuous use of the lower decibel range of Patrol Mode (125 dB to 170 dB) is suggested to be more effective than the intermittent use of other operational modes which utilise higher decibels. OTAQ are currently validating a model investigating the impact of SealFence operational modes on cetaceans and pinnipeds. The model output will provide evidence to determine if this is an effective method of seal deterrence and best practise. The results are planned to be presented by OTAQ to SNH in due course.

We look forward to hearing your comments on our revised ADD Deployment Guidance.

Kind regards,

[redacted]

[redacted]
Environmental Analyst

Mowi Scotland Limited

Mobile: [redacted]
DDI: [redacted]
[redacted] mowi.com

Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

MOWI

From: Kirsty North <Kirsty.North@nature.scot>
Sent: 06 March 2019 10:26
To: [redacted]@mowi.com>
Cc: Liam Wright <Liam.Wright@nature.scot>; [redacted]@mowi.com>; Alex Turner <Alex.Turner@nature.scot>
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Hi [redacted]

Yes, 14th March at 1pm suits us fine.

Please could we use the following dial in details for the teleconference, as all three of us from SNH will be joining from separate locations:

[redacted]

Thanks,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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From: [redacted]@mowi.com]
Sent: 04 March 2019 13:35
To: Alex Turner; Kirsty North
Cc: Liam Wright; [redacted]
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Good afternoon Alex,

Does Thursday 14th March 1pm suit?

External dial in: 01397 [redacted]

Thanks,

[redacted]

[redacted]

Mowi Scotland Limited

Mobile: [redacted]
DDI: [redacted]
[redacted] mowi.com

Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

From: Alex Turner <Alex.Turner@nature.scot>
Sent: 04 March 2019 09:28
To: [redacted]@mowi.com>; Kirsty North <Kirsty.North@nature.scot>
Cc: Liam Wright <Liam.Wright@nature.scot>; [redacted]@mowi.com>
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Thanks [redacted]

Shall we go for 14th? Please can MOWI suggest a time and provide TC phone in details?

Alex

Alex Turner | Operations Officer, Skye and Lochalsh
Scottish Natural Heritage | King's House | The Green | Portree | Isle of Skye | IV51 9BS | **t:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Taigh an Rìgh | An Grianan | Port Rìgh |An t-Eilean Sgitheanach | IV51 9BS
nature.scot – *Connecting People and Nature in Scotland* – *@nature_scot*

Please note - my telephone number has recently changed to **01463 701663** and my e-mail address has changed to **Alex.Turner@nature.scot**

From: [redacted]@mowi.com]
Sent: 01 March 2019 16:50
To: Kirsty North
Cc: Alex Turner; Liam Wright; [redacted]
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Hi Kirsty,

The following dates suit Stephen and I:

- Tuesday 12th March (pm)
- Thursday 14th March
- Wednesday 20th March

I will summarise the ADDs used at each of the sites ready to discuss in the meeting.

Thanks,

[redacted]

[redacted]
Mowi Scotland Limited
Mobile: [redacted]
DDI: +44 (0)1397 [redacted]
Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

From: Kirsty North <Kirsty.North@nature.scot>
Sent: 01 March 2019 11:13
To: [redacted]@mowi.com>
Cc: Alex Turner <Alex.Turner@nature.scot>; Liam Wright <Liam.Wright@nature.scot>
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Hi [redacted]

That would be great if we could set up a meeting to discuss this further. We'd be looking to discuss all five MOWI sites in South Skye (Scalpay, Sconser Quarry, Balmeanach Bay, Caraidh and Moll Ban) and it would be helpful to see a summary of the ADD devices being used at each site.

Would any of the following dates in March be suitable to hold a teleconference?

- Tuesday 5th March
- Thursday 7th March
- Monday 11th March
- Tuesday 12th March (pm)
- Thursday 14th March
- Wednesday 20th March
- Thursday 21st March

Thanks,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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From: [redacted]@mowi.com]
Sent: 25 February 2019 10:20
To: Kirsty North
Cc: [redacted] '[redacted]@highland.gov.uk)'; Alex Turner
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Hi Kirsty,

We are willing to set up an integrated ADD deployment plan for our sites in the Caol Mor group. Would it be worth setting up a meeting to discuss this?

Thanks,

[redacted]

[redacted]

Mowi Scotland Limited

Mobile: [redacted]
DDI: +44 (0)1397 [redacted]
Mail: [redacted]

Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

From: Kirsty North <Kirsty.North@nature.scot>
Sent: 25 February 2019 09:56
To: [redacted]@mowi.com>
Cc: [redacted]@mowi.com>; '[redacted]@highland.gov.uk)' <[redacted]@highland.gov.uk>; Alex Turner <Alex.Turner@nature.scot>
Subject: RE: Scalpay fish farm proposal - Revised ADD Deployment Guidance

Hi [redacted]

Given that there are a number of Mowi operated sites planned for/operating in the Inner Sound, we would appreciate the opportunity to discuss the potential for there to be integrated ADD Deployment Guidance to be used for all of these sites. This is because ADD use at each site will need to be considered in combination with the other fish farms operating in the area.

Is this something that would be possible?

Kind regards,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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From: [redacted]@mowi.com]
Sent: 19 February 2019 15:18
To: Kirsty North
Subject: RE: Scalpay fish farm proposal - LVIA report missing

Hi Kirsty,

Following our conversation this afternoon, I have submitted an amended Appendix 5.5b ADD Deployment Guidance_vF2 onto the ePlanning online portal as a post submission document (online reference 100147580-004). I have also attached it to the email so you can have access to it before it is uploaded onto the Highland Councils website.

Thanks for your help,

[redacted]

[redacted]
Mowi Scotland Limited
Mobile: [redacted]
DDI: +44 (0)1397 [redacted]
Mail: [redacted]@mowi.com
Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

From: Kirsty North <Kirsty.North@nature.scot>
Sent: 19 February 2019 14:27
To: [redacted]@mowi.com>
Subject: RE: Scalpay fish farm proposal - LVIA report missing

Hi [redacted]

Many thanks for the confirmation.

Our response to the Highland Council is based on the original ADD Deployment Plan submitted with the application, and therefore the use of Terecos units. If OTAQ SealFence ADDs are to be used instead then an updated ADD Deployment plan will need to be submitted, and our advice regarding potential impacts to cetaceans and seal haul-outs may change.

Kind regards,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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From: [redacted]@mowi.com]
Sent: 19 February 2019 08:58
To: Kirsty North
Subject: RE: Scalpay fish farm proposal - LVIA report missing

Hi Kirsty,

The information in the ES pages 88 to 93 contains information on the types of ADD we propose to use. Please find an extract from the ES below detailing the ADD units which are proposed to be used in the first instance.

> If needed, the company propose to install the OTAQ SealFence at the proposed site in the first instance should stock mortalities be attributed to seals. However, the company reserve the right to use an alternative device, which shares the same frequency & decibels specifications, if commercially available in the future. OTAQ has provided a deployment site plan for Scalpay Salmon Farm; this is a prediction and is subject to change depending on the nature of future seal activity at the farm (Figure 5.5.2p).

Figure 5.5.2p shows an initial plan of ADD deployment that is recommended by the supplier. However, as stated in the ES, this number and configuration could be subject to change depending on the nature of the seal activity.

Appendix 5.5b the statement “Terecos ADD (2 transducer units) to be used in the first instance” is a transcription error and should not be in the document – we can resubmit the document amended without that line.

Please let me know if you require any more information.

Many thanks,

[redacted]

[redacted]
Mowi Scotland Limited
Mobile: [redacted]
DDI: +44 (0)139 [redacted]
Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

From: Kirsty North <Kirsty.North@nature.scot>
Sent: 12 February 2019 14:59
To: [redacted]@mowi.com>
Subject: RE: Scalpay fish farm proposal - LVIA report missing

Hi [redacted]

Please could I also clarify something regarding the ADD units to be used as part of the proposal.

In the ES (5.5.2) it mentions that, if needed, OTAQ SealForce ADDs will be installed in the first instance. There is a diagram (5.5.2p) indicating that this would involve 20 different OTAQ units across the site. However, in the ADD Deployment Guidance (Appendix 5.5b), it states that two Terecos ADD units will be used in the first instance.

Please could you confirm which ADD units are proposed to be used, and how many, in the first instance should seal predation be an issue?

Kind regards,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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From: [redacted]@mowi.com]
Sent: 12 February 2019 10:54
To: Kirsty North
Subject: RE: Scalpay fish farm proposal - LVIA report missing

Hi Kirsty,

Please find attached Annex 5.7a Scalpay Fish Farm SVIA.

Thanks,

[redacted]

[redacted]

[redacted]

Mowi Scotland Limited

Mobile: [redacted]
DDI: +44 (0)1397 [redacted]
[redacted]

Office: Mowi
Farms Office
Glen Nevis Business Park
Fort William
PH33 6RX

MOWI

-------- Original message --------
From: Kirsty North <Kirsty.North@nature.scot>
Date: 12/02/2019 09:47 (GMT+00:00)
To: [redacted]@mowi.com>
Subject: Scalpay fish farm proposal - LVIA report missing

Hi [redacted]

I am in the process of commenting on the planning application for the proposed new fish farm to the east of Scalpay (18/05907/FUL). However, I am struggling to find some of the documents associated with landscape impacts.

The ES references Annex 5.7a as containing visualisations of the proposed development from the 3 identified viewpoints, and having a Section 2 describing the equipment considered. However the Annex 5.7a on the Highland Council planning portal only includes photos from two viewpoints, neither containing a visualisation of the proposed development, and there is no Section 2.

As far as I can see the LVIA report is also not present on the planning portal, would it be possible for this to be forwarded to me so that I can consider it in our response?

Kind regards,
Kirsty

Kirsty North | Operations Officer
Scottish Natural Heritage | Fodderty Way | Dingwall Business Park | Dingwall | IV15 9XB | **t:** 01463 701610 **dd:** 01463 [redacted]
Dualchas Nàdair na h-Alba | Slighe Fhodhraitidh | Pàirc Gnothachais Inbhir Pheofharain | Inbhir Pheofharain | IV15 9XB
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Tha am post-dealain seo agus fiosrachadh sam bith na chois dìomhair agus airson an neach no buidheann ainmichte a-mhàin. Mas e gun d’ fhuair sibh am post-dealain seo le mearachd, cuiribh fios dhan manaidsear-siostaim no neach-sgrìobhaidh.

Thoiribh an aire airson adhbharan gnothaich, ‘s dòcha gun tèid sùil a chumail air puist-dealain a’ tighinn a-steach agus a’ dol a-mach bho SNH.

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Tha am post-dealain seo agus fiosrachadh sam bith na chois dìomhair agus airson an neach no buidheann ainmichte a-mhàin. Mas e gun d’ fhuair sibh am post-dealain seo le mearachd, cuiribh fios dhan manaidsear-siostaim no neach-sgrìobhaidh.

Thoiribh an aire airson adhbharan gnothaich, ‘s dòcha gun tèid sùil a chumail air puist-dealain a’ tighinn a-steach agus a’ dol a-mach bho SNH.

****

SCALPAY SALMON FARM
ACOUSTIC DETERRENT DEVICE DEPLOYMENT GUIDANCE

Under the Regulation 39(2) of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean). Furthermore, the farm is located within the Inner Hebrides and Minches Special Area of Conservation (SAC) for the protection of harbour porpoise. Scottish Natural Heritage advise that the use of ADDs has the potential to lead to disturbance/habitat exclusion of harbour porpoise. The following deployment plan has been developed as a requirement of Scottish Natural Heritage to guide the efficient use of ADDs with due regard to the responsible management of fish welfare and protection given to seal species.

DECISION MAKING FLOW DIAGRAM

1 PREDATOR CONTROL MEASURES

Top Nets		Tension Nets
Seal Blinds		Daily Stock Mortality Retrieval

OTAQ SealFence ADD Patrol Mode 125 dB
Daily review of risk
Complete weekly review record

2 Increased risk to stock identified

Check initial control equipment & if appropriate carry out maintenance	Ensure daily mortalities are retrieved. Consider increasing frequency at which stock mortalities are retrieved	Review mortality data & cause of mortalities

Increased risk identified – review Patrol Mode decibel output and increase (up to 170 dB)
Notify Area Manager & in consultation consider additional control measure. Notify any relevant external party.

No further stock mortalities attributed to seals	Continued risk to stock

3 Further increase in stock mortalities attributed to seals

Increased risk identified – review other operational modes Protect Mode 189 dB
Notify Area Manager & in consultation consider additional control measure. Notify any relevant external party.

No further stock mortalities attributed to seals	Continued risk to stock

4 Consideration of alternative control measures

Review effectiveness of ADDs
If significant mortalities continue following two fortnightly reviews, SNH has advised ADDs are no longer effective and ask the company to implement alternative methods and to switch off ADDs. Clear justification of need and effectiveness must be logged and approval provided by the area manager for the continued use of ADDs
ADDs must be switched off if reasonable justification cannot be provided and if alternative controls are applied

Alternative mitigation measures to investigate site specific suitability:
- Alternative ADD models with different operational modes
- Secondary predator nets
- High density polyethylene seal nets

No further stock mortalities attributed to seals	Continued risk to stock

5 Implementation of a Seal Licence

ROLES & CONSIDERATIONS

Mowi Scotland Ltd and its site managers have a responsibility to maintain the welfare of its stock. The RSPCA welfare standard is based on 5 core freedoms covering the freedom from pain, injury, fear and distress. Sites are independently assessed by Freedom Foods and RSPA Officers prior certification to this standard

Key considerations:

Is there a licence condition or other mechanism which prevent the use of ADDs?

Are any external notifications required before or after use?

If yes, notification sent to, or permission sought from, relevant external party. If in doubt, please consult the Marine Harvest Environmental Team

The **Site Manager** is responsible for:-

- maintaining a record of the deployment date, make & model of device, dates of use, settings used, the position of the transducers
- a daily review as to whether an increased risk is still present and whether the ADDs can be switched back to Patrol Mode 125 dB or if additional measures are required. Any changes to ADD use should be recorded, and
- a fortnightly review in conjunction with **Area Manager** as to whether the risk is still present and whether the ADDs can be switched back to Patrol Mode 125 dB or if additional measures are required; actions and justification to be recorded in a log by the **Site Manager**.
- **Site and Area Manager** to review ADD use at the end of each cycle.

Marine (Scotland) Act - From the 31st January 2011, any fish farm in Scotland that requires to manage seals, at any time of year, will need an annual Seal Management Licence. Predator control at the salmon farm should be managed in a manner which is compliant with the conditions of its licence.

Prior to taking further steps, the Site Manager must ensure that the following documents have been completed and approval formally issued by the Seawater Production Manager:-

Authorisation to dispatch seal
Contractor's guidelines – seal dispatch

Please refer to the Seal Protocol for further details or seek guidance from your Area Manager.

The Scottish Salmon Company

ADD Deployment and Usage Plan

Ardyne, Sound of Rothesay

Date	**April 2019**
Revision No.	**A1**
Author	[redacted]
Approved by	

CONTENT

1. Introduction

As a farm operator, it is important that Scottish Salmon Company (SSC) is able to protect the fish held on site from any predator threat and has developed a site specific Predator Control Plan for the Ardyne site, which details the measures that will be used to deter avian and mammalian predators. The use of Acoustic Deterrent Devices (ADDs) forms part of this plan.

2. Purpose of ADD Deployment and Usage Plan

This plan has been prepared, and provided to Argyll and Bute Council, as supporting information to a planning application for an extension to the Ardyne marine fish farm, Sound of Rothesay. The plan has been prepared to meet the requirements of Scottish Natural Heritage (SNH), as detailed in their response to the Scoping request for this development (Reference 19/00335/SCRSCO).

The Ardyne site is not located in the vicinity of any designated areas for harbour porpoise. There have been occasional sightings of harbour porpoise recorded at the existing site, therefore there is the potential for interaction between the use of ADDs as part of the predator control measures at the replacement site and harbour porpoise that may be in the vicinity of the site.

Various measures will be employed at the Ardyne site prior to ADDs being considered necessary, and these measures are detailed in the Predator Control Plan.

3. ADD Deployment and Usage

3.1 Equipment Specification – OTAQ SealFENCE

The proposed ADD for the Ardyne site is the **OTAQ SealFENCE Seal Deterrent System**. This system uses a bespoke ultrasonic transmission to create an acoustic fence around the cages, intended to deter seals. Technical details of the system are as follows:

Frequency	8 – 12kHz (single waveform centred around 10kHz)
Source level	198dB re 1µPa/@1m
Duty Cycle	Variable depending on demand
Standard operation	2 second pulse every 8 – 12 seconds (random (can be increased or decreased from central control)

OTAQ will provide installation, staff training, and maintenance of the whole system. OTAQ will also provide any necessary software updates.

A SealFENCE deployment system has been designed specifically by OTAQ for the Ardyne site. Each transmitter provides around 45m (90m diameter range) of deterrence to seals and a total of 24 projectors will be located around the perimeter of the cage groups. The proposed layout of units is shown below in Figure 1 (diagram provided by OTAQ). This will ensure that, when activated, there is an effective perimeter protection with sufficient overlap between each projector.

The SealFENCE system can be controlled centrally from the barge. This provides the farm manager with a visual representation of how the system is operating and allows the activation or deactivation of the system.

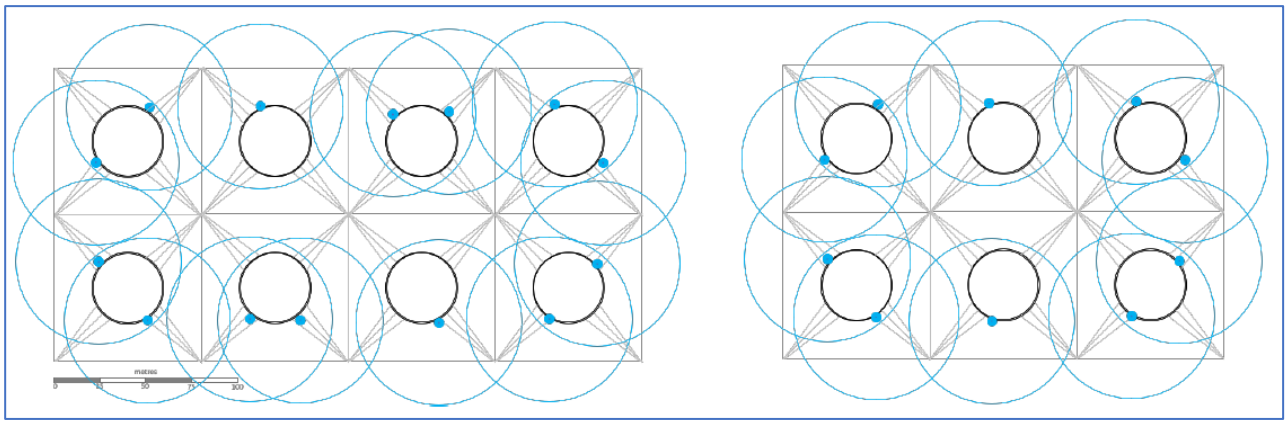

Figure 1 - Proposed SealFENCE design and coverage at existing Ardyne site. Blue dots show location of each Sealfence system

3.2 Triggers for Activation

It is proposed that the system is normally switched off and may be activated by the site manager.

Sightings of seals, in close proximity to the site, will be recorded by site staff regularly in the Seal Log. Seal activity within the site boundary will result in appropriate action being taken in line with the Predator Control Plan.

The decision to activate and deactivate the SealFENCE will be made by the site manager, in accordance with the attached ADD deployment decision flow diagram (Figure 2). The ADD deployment plan and decision flow will be followed if mortalities which are directly attributable to seal kills are recorded. It is imperative that SSC protect their stock, therefore the ADD will remain operational for as long as seal mortalities are being recorded, within a maximum 2-week period. The effectiveness of the system, and the requirement for the continued activation of the system, will be reviewed daily within this period. If zero seal mortalities are recorded for 5 consecutive days, ADDs will be switched off. Continued use of the SealFENCE will be reviewed at the end of the initial 2-week period.

Details on SealFENCE activation/de-activation and performance are recorded electronically by the system. Further details on activation 'triggers' are provided in the flow diagram.

3.3 Data Logging

3.3.1 Use of ADDs

Detailed records will be kept by SSC on the duty cycle of the ADD, which will detail deployment cues, operational dates, sound frequency and duration. In addition, the SealFENCE system contains a monitoring component, which continuously monitors and records the output from each projector. As well as allowing operators to verify that their system is working correctly in real-time, this also means that it can provide data verifying exactly how a system has been working during a period of time. This will allow for a full record of dates and times that the device is sounding, and the duration. A report analysing this information will be presented to Argyll and Bute Council (ABC) prior to the review meeting.

3.3.2 Predation

Seal activity in the proximity of the site will be recorded in the Seal Log and site diary, and seal mortalities will be recorded on the FishTalk system. Cetacean sightings will also be recorded in the site-specific Wildlife Log. As noted above, records will be kept by SSC, which will detail deployment cues, operational dates, sound frequency, and duration. This information will be reviewed collectively by the site manager and regional

manager at the end of each production cycle and will inform future decisions on predator control measures at the site.

4. Responsible Persons

- Site Manager and Senior Marine Operative.

5. Review Process

SSC commits to meet with Argyll and Bute Council (and Scottish Natural Heritage (SNH), if requested), at least annually, unless otherwise agreed in writing with ABC, to review the ADD Deployment Plan, and information gathered from the Seal Log, Wildlife Log and ADD performance records. The robustness of the ADD deployment plan will be reviewed at these meetings and SSC commits to adopt any changes to the plan deemed necessary by ABC.

6. Associated Documents

- Ardyne Wildlife Log;
- Ardyne Seal Log;
- Ardyne Predator Control Plan;
- Ardyne ADD Deployment Plan; and
- Ardyne ADD records.

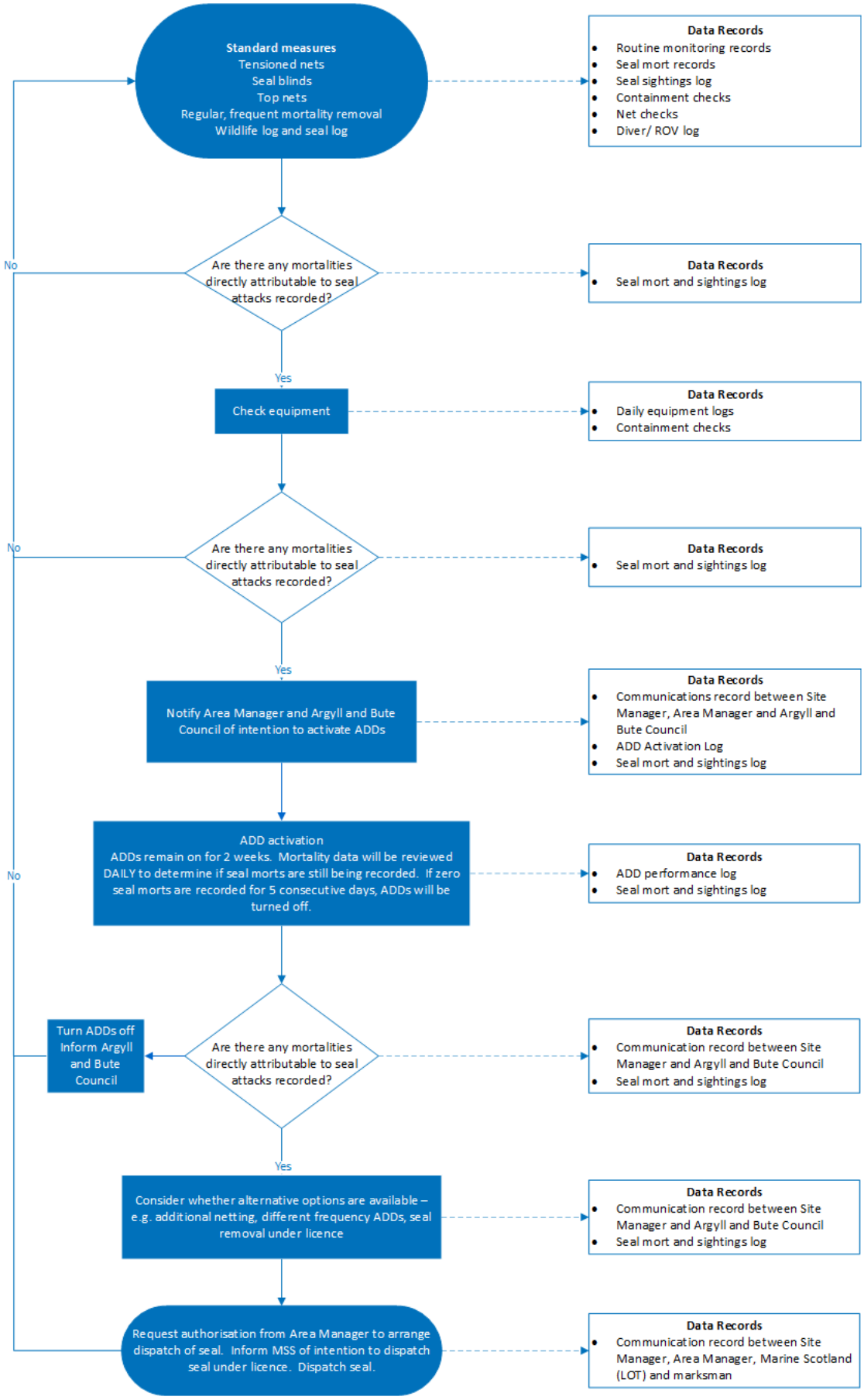

Figure 2 - ADD decision flow diagram

The Scottish Salmon Company

ADD Deployment and Usage Plan

Geasgill, Loch na Keal

Date	**April 2019**
Revision No.	**A1**
Author	[redacted]
Reviewed	
Approved by	

CONTENTS

1. INTRODUCTION

As a farm operator, it is important that Scottish Salmon Company (SSC) is able to protect the fish held on site from any predator threat and has developed a site specific Predator Control Plan for the Geasgill site, which details the measures that will be used to deter avian and mammalian predators. The use of Acoustic Deterrent Devices (ADDs) forms part of this plan.

2. PURPOSE OF ADD DEPLOYMENT AND USAGE PLAN

This plan has been prepared, and provided to Argyll and Bute Council, as supporting information to a planning application for an extension to the Geasgill marine fish farm, Loch na Keal. The plan has been prepared to meet the requirements of Scottish Natural Heritage (SNH), as detailed in their response to the Scoping request for this development (Reference 19/00136/SCRSCO).

The Geasgill site is located c.500m within the boundary of the 'Inner Hebrides and the Minches' candidate Special Area of Conservation (cSAC) for harbour porpoise. The Conservation Objectives for the Inner Hebrides and the Minches cSAC are;

1. *To ensure that the Inner Hebrides and the Minches SAC continues to make an appropriate contribution to harbour porpoise remaining at favourable conservation status;*
2. *To ensure for harbour porpoise within the context of environmental changes, that the integrity of the Inner Hebrides and the Minches SAC is maintained through 2a, 2b and 2c:*

2a. Harbour porpoise within the Inner Hebrides and the Minches are not at significant risk from injury or death;

2b. Distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance; and

2c. The condition of supporting habitats and the availability of prey for harbour porpoise are maintained.

In order to ensure that SSC operations at the Geasgill site meet Objective 2, careful consideration has been given to the methods of seal deterrence which may be used, in particular Acoustic Deterrent Devices (ADDs). This is due to the potential for interaction with cetaceans in the vicinity of the site. Various measures will be employed at the Geasgill site prior to ADDs being considered necessary, and these measures are detailed in the Predator Control Plans.

3. ADD DEPLOYMENT AND USAGE

3.1 Equipment Specification – OTAQ SealFENCE

The proposed ADD for the Geasgill site is the **OTAQ SealFENCE Seal Deterrent System**. This system uses a bespoke ultrasonic transmission to create an acoustic fence around the cages, intended to deter seals. Technical details of the system are as follows:

Frequency	8 – 12kHz (single waveform centred around 10kHz)
Source level	198dB re 1µPa/@1m
Duty Cycle	Variable depending on demand
Standard operation	2 second pulse every 8 – 12 seconds (random (can be increased or decreased from central control)

OTAQ will provide installation, staff training, and maintenance of the whole system. OTAQ will also provide any necessary software updates.

A SealFENCE deployment system has been designed specifically by OTAQ for the Geasgill site. Each transmitter provides around 45m (90m diameter range) of deterrence to seals and a total of 16 projectors will be located around the perimeter of the cage groups. The proposed layout of units is shown below in Figure 1 (diagram provided by OTAQ). This will ensure that, when activated, there is an effective perimeter protection with sufficient overlap between each projector.

The SealFENCE system can be controlled centrally from the barge. This provides the farm manager with a visual representation of how the system is operating and allows the activation or deactivation of the system.

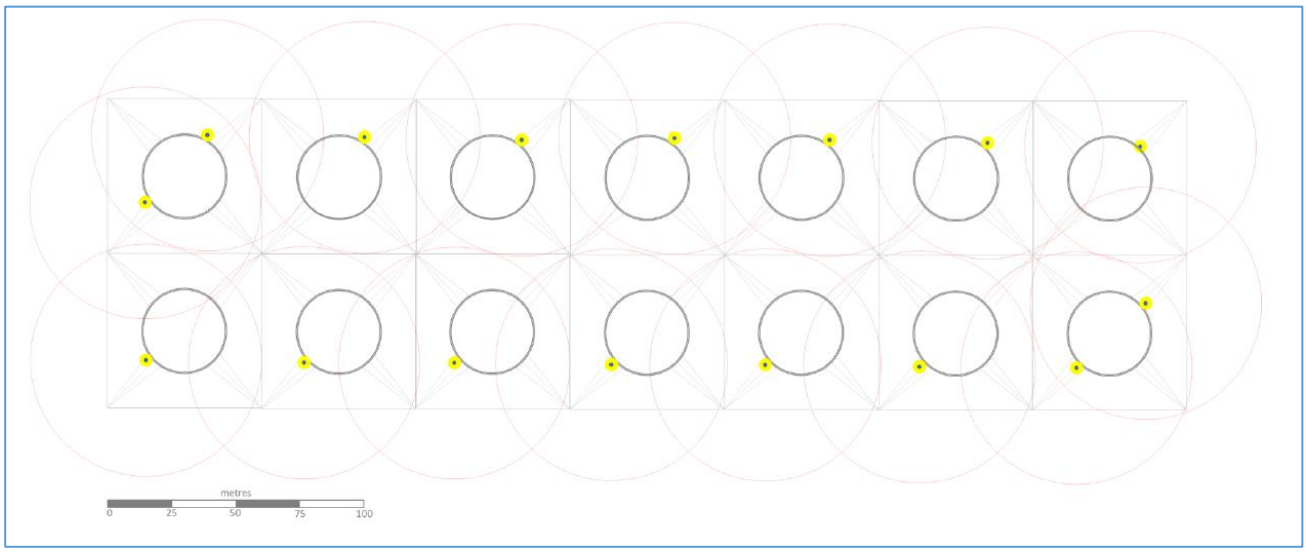

Figure 1 - Proposed SealFENCE design and coverage at existing Geasgill site. Yellow dots show location of each Sealfence system

3.2 Triggers for Activation

It is proposed that the system is normally switched off and may be activated by the site manager.

Sightings of seals, in close proximity to the site, will be recorded by site staff regularly in the Seal Log. Seal activity within the site boundary will result in appropriate action being taken in line with the Predator Control Plan.

The decision to activate and deactivate the SealFENCE will be made by the site manager, in accordance with the attached ADD deployment decision flow diagram (Figure 2). The ADD deployment plan and decision flow will be followed if mortalities which are directly attributable to seal kills are recorded. It is imperative that SSC protect their stock, therefore the ADD will remain operational for as long as seal mortalities are being recorded, within a maximum 2-week period. The effectiveness of the system, and the requirement for the continued activation of the system, will be reviewed daily within this period. If zero seal mortalities are recorded for 5 consecutive days, ADDs will be switched off. Continued use of the SealFENCE will be reviewed at the end of the initial 2-week period.

Details on SealFENCE activation/de-activation and performance are recorded electronically by the system. Further details on activation 'triggers' are provided in the flow diagram.

3.3 Data Logging

3.3.1 Use of ADDs

Detailed records will be kept by SSC on the duty cycle of the ADD, which will detail deployment cues, operational dates, sound frequency and duration. In addition, the SealFENCE system contains a monitoring component, which continuously monitors and records the output from each projector. As well as allowing operators to verify that their system is working correctly in real-time, this also means that it can provide data verifying exactly how a system has been working during a period of time. This will allow for a full record of dates and times that the device is sounding, and the duration. A report analysing this information will be presented to Argyll and Bute Council (ABC) prior to the review meeting.

3.3.2 Predation

Seal activity in the proximity of the site will be recorded in the Seal Log and site diary, and seal mortalities will be recorded on the FishTalk system. Cetacean sightings will also be recorded in the site-specific Wildlife Log. As noted above, records will be kept by SSC, which will detail deployment cues, operational dates, sound frequency, and duration. This information will be reviewed collectively by the site manager and regional manager at the end of each production cycle and will inform future decisions on predator control measures at the site.

4. RESPONSIBLE PERSONS

- Site Manager and Senior Marine Operative.

5. REVIEW PROCESS

SSC commits to meet with Argyll and Bute Council (and Scottish Natural Heritage (SNH), if requested), at least annually, unless otherwise agreed in writing with ABC, to review the ADD Deployment Plan, and information gathered from the Seal Log, Wildlife Log and ADD performance records. The robustness of the ADD deployment plan will be reviewed at these meetings and SSC commits to adopt any changes to the plan deemed necessary by ABC to meet the the cSAC Conservation Objectives.

6. ASSOCIATED DOCUMENTS

- Geasgill Wildlife Log;
- Geasgill Seal Log;
- Geasgill Predator Control Plan;
- Geasgill ADD Deployment Plan; and
- Geasgill ADD records.

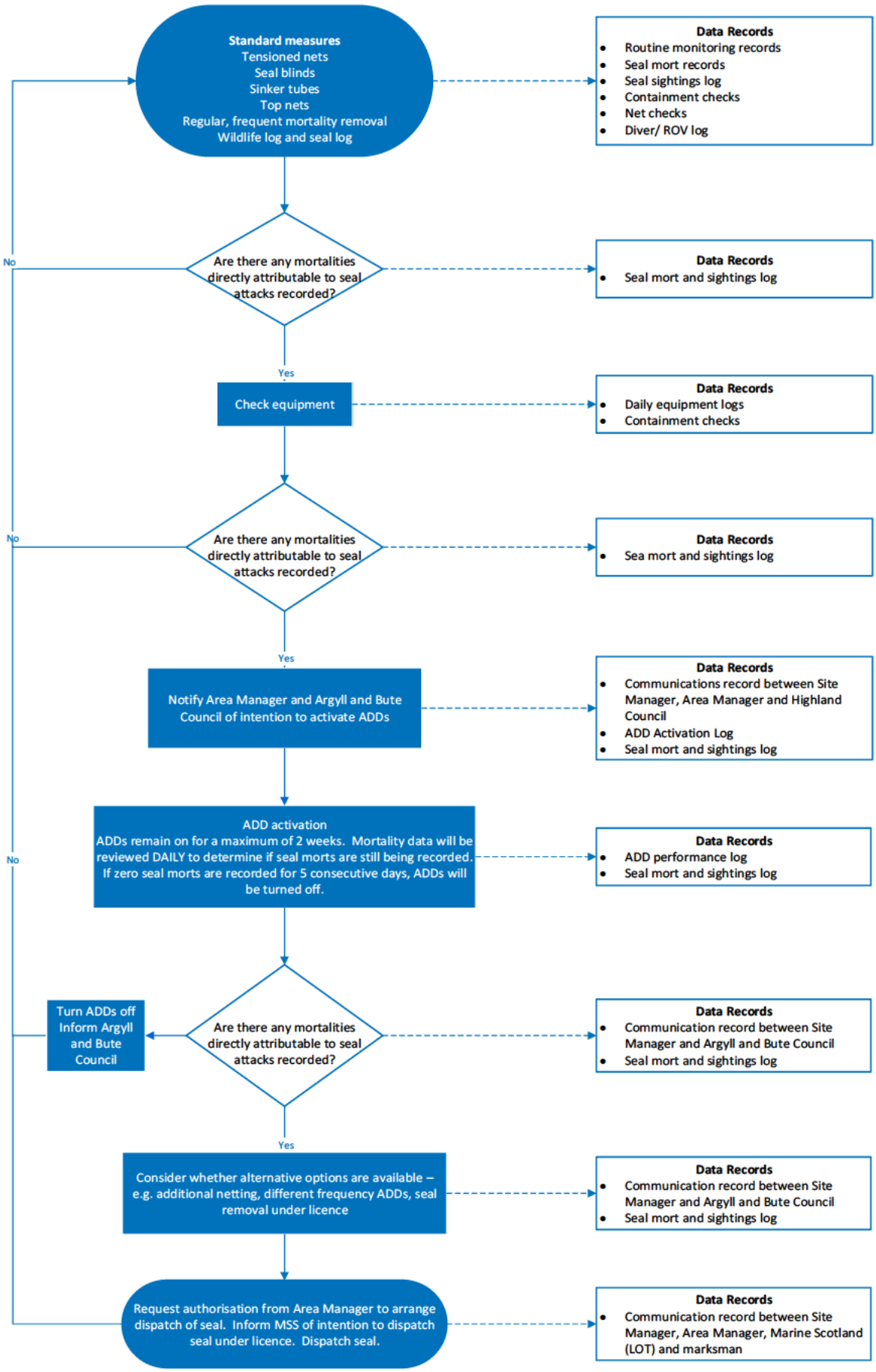

Figure 2 - ADD decision flow diagram

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

[redacted]
Highland Council
Planning and Development
By email

14h May 2019

Your ref: 19/01413/FUL
Our ref: CDM152069

Dear [redacted]

19/01413/FUL - Marine Fish Farm - Atlantic salmon: new site consisting of 4 x 100m circumference circular cages. North Aird Ardheslaig, Loch Shieldaig

Thank you for your planning application consultation on the proposed development.

Summary
The proposal is adjacent to the Inner Hebrides and the Minches Special Area of Conservation (SAC) for harbour porpoise and is within 35 km of the River Kerry SAC for freshwater pearl mussel. There are natural heritage interests of international importance on the site, but in our view, these will not be adversely affected by the proposal.
It is also within the Wester Ross National Scenic Area (NSA). The proposal will not have an adverse effect on the integrity of the NSA or the objectives of the designation.
While there is potential for interaction with Priority Marine Features (PMFs), in our view, the proposal will not result in significant impact on the national status of these PMFs.

Inner Hebrides and the Minches SAC
In our view, this proposal is likely to have a significant effect on the qualifying interest of the Inner Hebrides and the Minches SAC due to the potential impact of the use of Acoustic Deterrent Devices (ADDs) on harbour porpoise. Given the relatively low sensitivity of this site in relation to the SAC and the distance to the boundary we are content that the proposal has an adequate ADD deployment plan.
However, there do appear to be discrepancies in terms of the assessment carried out by the applicant which we wish to highlight:

- They state they propose to use the US3 as it is targeted at frequencies that are designed to only target seals. This is true when the US3 is used in conjunction with the low frequency transducer (RT1) which emits sound in the 1-2KHz frequency. However, it isn't clear from the information submitted that this is their intention. The standard US3 emits sound in the 10-20KHz frequency range which is within the sensitive hearing range for harbour porpoise (i.e. not target specifically at seals).

- They identify that the SAC is approx. 500m away from the proposed development and then go on to state that through noise modelling it was predicted that harbour porpoise's deterrence range of between 0.2 and 1.2 km is out with the range of harbour porpoise using the SAC. We don't think that the ER shows evidence to suggest that sound emitted by the ADDs will not travel in to the SAC boundary.

Therefore, in our view, this proposal is likely to have a significant effect on the qualifying interest of site. Consequently, the Highland Council, as competent authority, is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests.
To help you do this we advise that, in our view, based on the information provided and our appraisal carried out to date, the proposal will not adversely affect the integrity of the site provided they adhere to their ADD deployment plan, as submitted. The appraisal we carried out is based on the assumption that the intention is to use the US3 used in conjunction with the low frequency transducer (RT1) that emits sound in the1-2KHz frequency. You may wish to confirm with the applicant that this is their intention. To ensure deployment, monitoring and review of ADD use at the site is adhered to, the Highland Council may wish to secure the ADD deployment plan as a condition to any planning permission given.

River Kerry SAC
In our view, this proposal is likely to have a significant effect on the freshwater pearl mussel qualifying interest of the River Kerry SAC due to the potential impact of escaped farmed salmon from the proposal on the host species. Consequently, the Highland Council, as competent authority, is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest.
To help you do this we advise that, in our view, based on the information provided and our appraisal carried out to date, the proposal will not adversely affect the integrity of the site. The appraisal we carried out considered the impact of the proposals on the following factors:

- We previously advised in our scoping response of 14th September 2018 that there is unlikely to be connectivity between sea lice that may emanate from the proposed site and the main host species of the River Kerry SAC. However, we highlighted that there remained the potential impact of escapes on the River Kerry SAC and that the ER should consider this risk and describe measures which could mitigate this risk.

- The applicant has supplied an adequate 'Escapes contingency plan'; therefore we can conclude that this is sufficient so that as long as they adhere to the plan, there will be no adverse effect on site integrity of the River Kerry SAC. The Highland Council may wish to secure this as a condition to any planning permission given.

Wester Ross NSA
We advised at scoping that there was a potential for the addition of six new cages alongside the existing farm to affect views from within the NSA and we recommended that a LVIA should be carried out to assess any impacts. We are pleased that they have taken on board many of our landscape comments by reducing the number of cages to four and have

undertaken a thorough assessment of effects. We agree with the conclusions of effects, especially for the NSA & Wild Land Areas as the extension of effects is limited, given the existence of the current fish farm cages already, hence the focus on additionally is appropriate. Therefore we can conclude that the proposal will not have an adverse effect on the integrity of the NSA or the objectives of the designation.

Priority Marine Features (PMFs)
According to the visual survey carried out, two PMF species are present: Northern Feather Star and Northern Sea Fan. We have not seen the visual survey footage and cannot therefore discount that the presence of Northern Sea Fan may also indicate the presence of the PMF habitat, Northern Sea Fan and Sponge Communities, although it is acknowledged that the survey did not report any of the other component species as being present. Given the relative low abundances of the PMF species present, as reported in the survey report, we can confirm that any impacts on these PMF species or habitat would not result in any significant impacts upon their national status.

Kind regards,
Tamara

Tamara Lawton
Operations Officer
South Highland

Sharon Phipps

From: [redacted]@scottishsalmon.com>
Sent: 11 June 2019 09:57
To: Rachel Cartwright
Cc: [redacted]
Subject: RE: 19/00180/FFPAES - New Fish Farm - Further information request
Attachments: SSC_Ushenish_ADD Plan_A1.pdf

Hi Rachel,

As discussed on our call the other week, please find attached a copy of the proposed ADD plan for the Ushenish site, for your reference. If you would like any further information, please let us know.

Patrick mentioned on the call that SNH might be able to send us further information on the reasoning behind the 3 km indicative disturbance distance for the Inner Hebrides and Minches SAC, can you confirm if this is possible?

Kind regards,
[redacted]

[redacted]

Ardkinglas Estate, Cairndow
Argyll PA26 8BH
Tel: +44 (0)131 718 8500
DD: [redacted]
[redacted]
www.scottishsalmon.com

From: Rachel Cartwright [mailto:Rachel.Cartwright@nature.scot]
Sent: 20 May 2019 14:27
To: [redacted]
Subject: 19/00180/FFPAES - New Fish Farm - Further information request

[External Email]

H[redacted]

As discussed;

In order for SNH to issue our advice, could you please request further information from The Scottish Salmon Company (SCC).

1. Our benthic advisor would like to view the footage from the benthic survey, due to the identification of *Swiftia*. Could this please be sent to Liam Wright. Scottish Natural Heritage, 1 Kilmory Industrial Estate, Lochgilphead, PA31 8RR.
2. The proposed site is within 3km of the Inner Hebrides and the Minches SAC designated for harbour porpoise. An ADD deployment plan would be required for this proposed site; This would need to include the requirement to consider best net technology prior to ADD use. Could SCC please contact myself to discuss the requirements of the ADD deployment plan further.

Many thanks,
Rach

Rach Cartwright | Operations Officer
Scottish Natural Heritage | Stilligarry | South Uist | HS8 5RS | **t:** 01870 [redacted]
Dualchas Nàdair na h-Alba | Stadhlaigearraidh | Uibhist a Deas | HS8 5RS
nature.scot – Connecting People and Nature in Scotland – @nature_scot

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The Scottish Salmon Company

ADD Deployment and Usage Plan

Ushenish, Isle of South Uist

Date	**May 2019**
Revision No.	**A1**
Author	[redacted]
Approved by	

CONTENTS

1. INTRODUCTION

As a farm operator, it is important that Scottish Salmon Company (SSC) is able to protect the fish held on site from any predator threat. SSC has developed a site specific Predator Control Plan for the Ushenish site, which details the measures that will be used to deter avian and mammalian predators. The use of Acoustic Deterrent Devices (ADDs) forms part of the Predator Control Plan.

2. PURPOSE OF ADD DEPLOYMENT AND USAGE PLAN

This plan has been prepared, and provided to Comhairle nan Eilean Siar, as supporting information to a planning application for a new fish farm at Ushenish, Isle of South Uist. The plan has been prepared to meet the requirements of Scottish Natural Heritage (SNH), as detailed in their response to the planning application for this development (Reference 19/00180/FFPAES).

The Ushenish site is located c. 1 km outside the boundary of the 'Inner Hebrides and the Minches' candidate Special Area of Conservation (cSAC) for harbour porpoise. The Conservation Objectives for the Inner Hebrides and the Minches cSAC are;

1. *To ensure that the Inner Hebrides and the Minches SAC continues to make an appropriate contribution to harbour porpoise remaining at favourable conservation status;*
2. *To ensure for harbour porpoise within the context of environmental changes, that the integrity of the Inner Hebrides and the Minches SAC is maintained through 2a, 2b and 2c:*

2a. Harbour porpoise within the Inner Hebrides and the Minches are not at significant risk from injury or death;

2b. Distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance; and

2c. The condition of supporting habitats and the availability of prey for harbour porpoise are maintained.

In order to ensure that SSC operations at the Ushenish site meet Objective 2, careful consideration has been given to the methods of seal deterrence which may be used, in particular Acoustic Deterrent Devices (ADDs). This is due to the potential for interaction with cetaceans in the vicinity of the site. Various measures will be employed at the Ushenish site prior to ADDs being considered necessary, and these measures are detailed in the Predator Control Plan submitted with the planning application.

3. ADD DEPLOYMENT AND USAGE

3.1 Equipment Specification – OTAQ SealFENCE

The proposed ADD for the Ushenish site is the **OTAQ SealFENCE Seal Deterrent System**. This system uses a bespoke ultrasonic transmission to create an acoustic fence around the cages, intended to deter seals. Technical details of the system are as follows:

Frequency	8 – 12kHz (single waveform centred around 10kHz)
Source level	198dB re 1µPa/@1m
Duty Cycle	Variable depending on demand
Standard operation	2 second pulse every 8 – 12 seconds (random (can be increased or decreased from central control)

OTAQ will provide installation, staff training, and maintenance of the whole system, and will also provide any necessary software updates.

A SealFENCE deployment system has been designed specifically by OTAQ for the Ushenish site. Each transmitter provides around 45m (90m diameter range) of deterrence to seals and a total of 16 projectors will be located around the perimeter of the cage groups. The proposed layout of units is shown below in Figure 1 (diagram provided by OTAQ). This will ensure that, when activated, there is an effective perimeter protection with sufficient overlap between each projector.

The SealFENCE system can be controlled centrally from the barge. This provides the farm manager with a visual representation of how the system is operating and allows the activation or deactivation of the system.

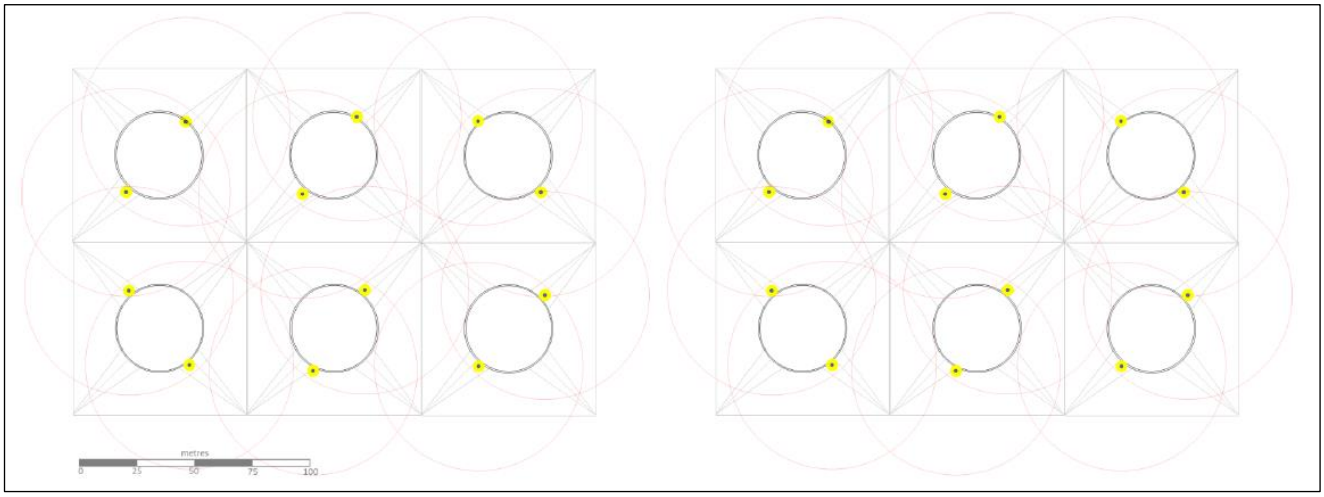

Figure 1 - Proposed SealFENCE design and coverage at existing Ushenish site. Yellow dots show location of each Sealfence system

3.2 Triggers for Activation

It is proposed that the system is normally switched off and may be activated by the site manager.

Sightings of seals, in close proximity to the site, will be recorded by site staff regularly in the Seal Log. Seal activity within the site boundary will result in appropriate action being taken in line with the Predator Control Plan.

The decision to activate and deactivate the SealFENCE will be made by the site manager, in accordance with the attached ADD deployment decision flow diagram (Figure 2). The ADD deployment plan and decision flow will be followed if mortalities which are directly attributable to seal kills are recorded. It is imperative that SSC protect their stock, therefore the ADD will remain operational for as long as seal mortalities are being recorded, within a maximum 2-week period. The effectiveness of the system, and the requirement for the continued activation of the system, will be reviewed daily within this period. If zero seal mortalities are recorded for 5 consecutive days, ADDs will be switched off. Continued use of the SealFENCE will be reviewed at the end of the initial 2-week period.

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Detailed records will be kept by SSC on the duty cycle of the ADD, which will detail deployment cues, operational dates, sound frequency and duration. In addition, the SealFENCE system contains a monitoring component, which continuously monitors and records the output from each projector. As well as allowing operators to verify that their system is working correctly in real-time, this also means that it can provide data verifying exactly how a system has been working during a period of time. This will allow for a full record of dates and times that the device is sounding, and the duration. A report analysing this information will be presented to Comhairle nan Eilean Siar (ABC) prior to the review meeting.

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Seal activity in the proximity of the site will be recorded in the Seal Log and site diary, and seal mortalities will be recorded on the FishTalk system. Cetacean sightings will also be recorded in the site-specific Wildlife Log. As noted above, records will be kept by SSC, which will detail deployment cues, operational dates, sound frequency, and duration. This information will be reviewed collectively by the site manager and regional manager at the end of each production cycle and will inform future decisions on predator control measures at the site.

4. RESPONSIBLE PERSONS

- Site Manager and Senior Marine Operative.

5. REVIEW PROCESS

SSC commits to meet with Comhairle nan Eilean Siar (and Scottish Natural Heritage (SNH), if requested), at least annually, unless otherwise agreed in writing with CnES, to review the ADD Deployment Plan, and information gathered from the Seal Log, Wildlife Log and ADD performance records. The robustness of the ADD deployment plan will be reviewed at these meetings and SSC commits to adopt any changes to the plan deemed necessary by CnES to meet the the cSAC Conservation Objectives.

6. ASSOCIATED DOCUMENTS

- Ushenish Wildlife Log;
- Ushenish Seal Log;
- Ushenish Predator Control Plan;
- Ushenish ADD Deployment Plan; and
- Ushenish ADD records.

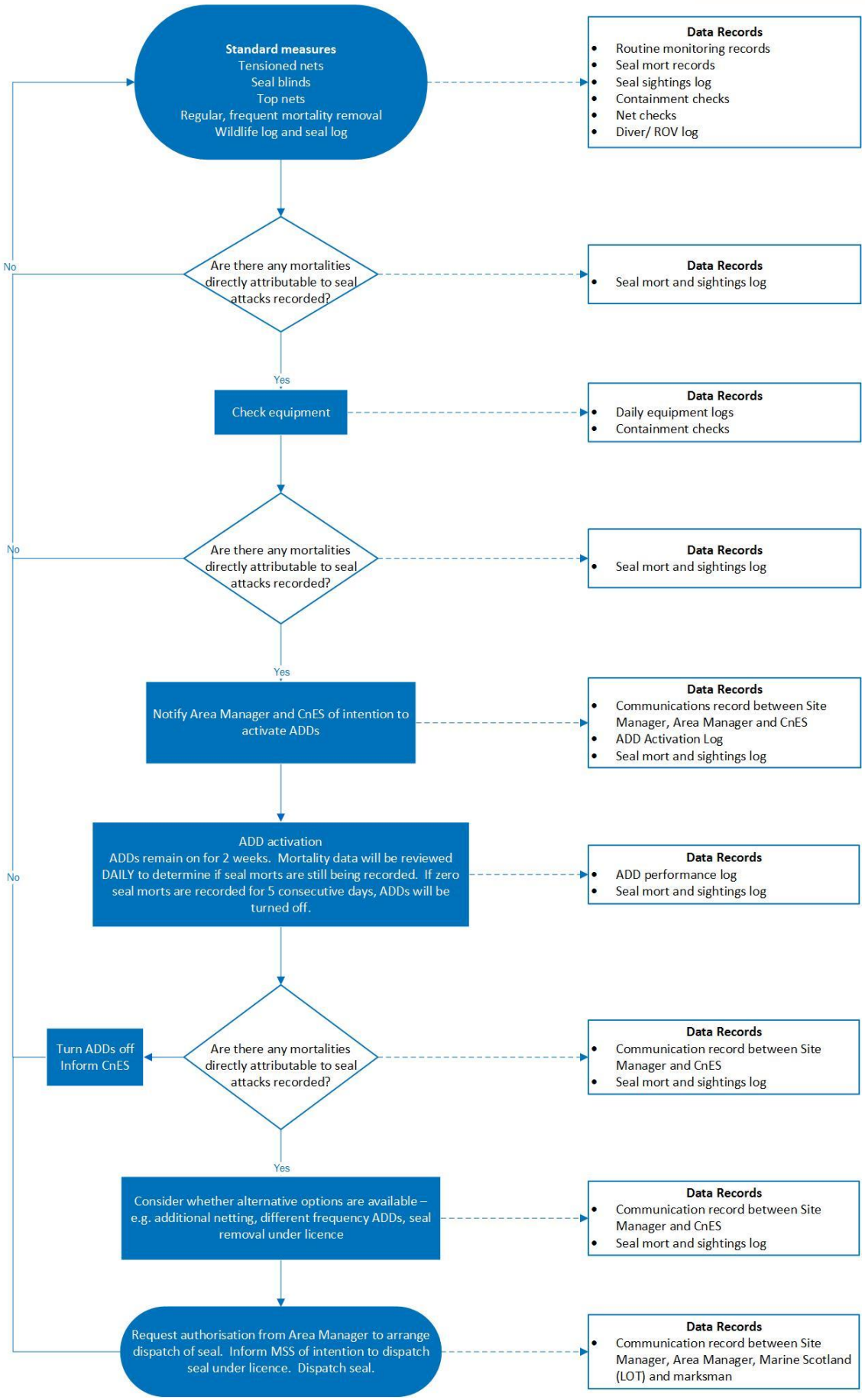

Figure 2 - ADD decision flow diagram

6 STATUTORY CONSULTEE RESPONSE

6.1. Organisation: SNH

Contact name:	Debbie Skinner
Directorate/Division/Agency:	SNH
Telephone number:	01463 [redacted]
Email:	debbie.skinner@nature.scot

We have considered this proposed development in terms of formal EIA Screening and Scoping, and have completed our assessment of the significance of potential environmental impacts.

Check or complete the following fields as required.

We obtained supplementary information from the developer during our consideration ☐

We consulted with other Statutory Consultees during our consideration ☐

Our advice as to your Screening opinion is summarised as:
An EIA is required.

Our advice as to your Scoping opinion/advice, relating to environmental information that should be included in an Environmental Statement, is summarised as:

An Environmental Management Plan should be produced.

Our advice on additional information that should submitted in support of any future planning application for the proposed development is summarised as:

An Environmental Management Plan should be produced.

[redacted]

Electronic signature:
Date: 20/06/19

Project Name: Modification of existing marine finfish farm Foindle West
Location: Foindle Bay, Loch Laxford, Sutherland, Highland
Other identifier: Loch Duart Ltd

Screening & Scoping Checklist

For each of the numbered potential impacts in the left hand column, consideration should be given to the following points:

A. Will the impact have an effect on any of the receptors or issues identified in sections 4.1 to 4.4 Have all the receptors/issues/effects been identified. Explain.
B. Is the impact covered by other regulation? State your reasons for wishing to discuss it further in this document.
C. Is there potential for cumulative or indirect impact on an identified receptor. Explain.
D. SCREENING ADVICE. Is the impact on receptor(s) likely to have a significant effect. Explain.
E. SCOPING ADVICE. If so, what details of additional information required and methodology

Provide concise information, and refer it specifically to elements A to E where appropriate.

IMPACT TYPE	INSERT YOUR COMMENTS IN THE APPROPRIATE ROW
1. Benthic Impacts	
DEVELOPER	Fin fish rearing has the potential to impact upon subtidal habitats and associated species. Benthic impacts are monitored and controlled by SEPA under the Controlled Activities (Scotland) Regulations (CAR); a CAR License is currently held for the Foindle West site (CAR/L/1003893) and an application with supporting modelling has been submitted to SEPA for the modified pen layout and biomass. This modelling indicates that the proposed layout can sustainably support a maximum standing biomass of 590T (see Attachment 2) whilst maintaining benthic conditions within SEPA's Environmental Quality Standards (EQS) which ensure that benthic impacts are both localised and temporary. Experience of operations at the existing Foindle West farm indicate that benthic impacts are sustainable and model predictions are reliable for the site; a visual survey has also been undertaken which, while identifying burrowed mud habitat in the vicinity, shows no significant impact on the benthos from farm operations. While it is understood that there will be some additional benthic impact resulting from the reconfiguration and biomass increase, given current performance of the site this is not anticipated to have an adverse effect relative to the controlled EQS and model predictions. The most recent benthic classification is provided in Attachment 4 and the visual survey report in Attachment 12. In operation of the farm, the following measures will be taken at the site to minimise the potential for negative benthic impacts: <u>Feeding</u> • Appetite monitoring carried out by trained husbandry staff to prevent feed waste • Feed monitoring utilising underwater cameras as part of the feed barge system • Optimal feeding regime & pellet size used to suit needs of the fish throughout the cycle • High quality feed with high digestibility, minimising waste discharge to the benthos • Ongoing monitoring of FCR is identified as a Key Performance Indicator by Loch Duart <u>Stocking & Fallowing</u> (see also Attachment 1 for further details) • Low stocking – maximum density of 8.5kg/m^3 across the site, meeting and indeed below RSPCA Assured requirements • Maximum standing biomass controlled by SEPA under CAR Licence CAR/L/1003893 • Extended fallow of a minimum five months after each production cycle achieved by rotational use of sites Furthermore, the proposed modification is part of a revised stocking strategy for the area which would see farm activity in Loch Laxford consolidated to two pen groups (Laxford Sites Foindle West & Eilean Ard) rather than the current three. Eilean Ard is subject to a similar proposal to Foindle West, with revised pen configuration and biomass, under a separate application (refs 19/01818/SCRE & 19/01819/SCOP). Upon successful modification of these sites it is the applicant's intention that the adjacent Laxford Site 1, totalling 480 tonnes biomass consent, be inactivated for salmon production. As such this proposal does not seek to increase production activity or total standing biomass in the area, rather to achieve modernisation and optimisation of farming operations in Loch Laxford.
STATUTORY	Please see comments under section 5.

CONSULTEE	
2. Water Column Impacts	
DEVELOPER	The location of the Foindle West site is currently categorised as Locational Guideline Area Category 3. Cumulative impacts of discharges to the surrounding water body from farms in the area do have the potential to impact upon subtidal habitats and associated species and as such need to be taken into consideration. As above, the modified configuration of the Foindle West site has been modelled and is under application with SEPA (CAR/L/1003893), controlling biomass, medicine and disinfectant use at the site within a defined Environmental Quality Standard. Furthermore, the modification is part of a proposal that will see active discharges within the area reduce, as the adjacent Laxford 1 Site is proposed to be inactivated for salmon production on successful development of Foindle West and Eilean Ard, resulting in reduced cumulative impact. Nutrient Enhancement Calculations have been completed for the proposal, taking into account all currently consented sites and the proposed 'final' modification to both Eilean Ard, Foindle West (Attachment 3), and calculations suggest that even without the planned inactivation of Laxford Site 1, the proposed modification of Foindle West and Eilean Ard would not negatively impact upon the waterbody's classification status. Loch Duart do not use antifoulants on nets, removing the risk of associated discharges, and net hygiene is instead maintained using the air-drying swim-through method or net washing at the Foindle West site. Through rotational use of the Foindle West site with other Loch Duart operated sites in the Eddrachillis Bay area, the site will also be subject to an extended fallow further reducing potential water column impacts.
STATUTORY CONSULTEE	
3. Interaction with Predators	
DEVELOPER	Interactions with wildlife will continue to be managed further to the conditions experienced at the site and in accordance with Loch Duart's ISO14001 accredited Environmental Management System (Attachment 5) and relevant codes of practice (Attachment 6). Preventative measures are used to minimise potential for interaction, including: • Tensioned top nets • Tensioning system for pen nets specific to site conditions • Regular removal of any moribund fish or mortalities • Use of predator nets and ADDs where appropriate Full details of measures to manage predator interactions at the modified Laxford site (both Foindle West & Eilean Ard) are provided within the site-specific Wildlife Interaction Plan Attachment 5 and are in compliance with the Scottish Seal Management Code of Practice and the Marine (Scotland) Bill 2010 under permission of Marine Scotland Seal Licensing. As no increase in production or change from current practices is proposed, no negative impact in terms of increased predator interactions are anticipated.
STATUTORY CONSULTEE	We welcome the mitigation measures outlined within the predator defence and mitigation policy and are satisfied that the proposed measures are appropriate.
4. Interaction with Wild Salmonids	
DEVELOPER	Wild salmonids (Sea Trout and Atlantic salmon) may frequent the area of the site. Potential interaction between wild and farmed salmonids will be mitigated through appropriate management and cooperation with other interests in the area. The developer will continue to manage fish health and sea lice within the terms of a Farm Management Statement, Code of Good Practice (CoGP) guidelines and Marine Scotland Fish Health Inspectorate Authorisation and Sea Lice Enforcement Policy (2017). The site lies within Farm Management Area (FMA) M-3 (Loch Laxford) and is stocked in conjunction with other sites in the area with a single yearclass. An extended fallow policy is applied to all sites in the area, and where treatment is necessary this will be carried out synchronously. Full details of Loch Duart's sea lice control strategy for the site are provided in Attachment 7; sea lice control is currently very good with numbers remaining well below CoGP Treatment Trigger and Marine Scotland Fish Health Inspectorate Reporting/Enforcement levels for the entirety of the current cycle (presently at harvest stage), and while historic cycles have shown potential for sea lice challenge, the cycle previous to current illustrated that such challenges can be effectively managed back to below CoGP Treatment Trigger and Marine Scotland thresholds using the intervention measures outlined in Attachment 7. The company shares fish health information and lice data with the operators of neighbouring FMAs through the Scottish Salmon Producers Organisation and regular meetings are maintained allowing

	for any treatment strategies to be coordinated where appropriate. Loch Duart are committed through the Code of Good Practice for Scottish Finfish Aquaculture and the SSPO to unified strategic fish health management practices, and this will continue at the Foindle West site. Furthermore, Loch Duart also shares production and fish health information, including sea lice data, with the West Sutherland Fisheries Trust and local fishing interests through the Loch Laxford Area Management Agreement; this ensures that local wild fish interests are fully up to date with activities at the site. Potential escapes will be safeguarded against through use of high-quality nets, pens and mooring equipment, staff training, regular equipment inspections and management of seal interactions to prevent net damage. There have been no escapes from the existing Laxford sites in recent cycles. Attachments 5 & 8 set out containment measures for the site in detail, including: • Routine pen equipment inspections and 10-year refurbishment/replacement policy • Full out-of-water mooring checks every second year • Pen net inspections every 5 weeks, annual net strength testing and replacement after second cycle Proposed pen equipment for the site consists of 24m x 24m square steel pens which are suitable for conditions at the site (attestation provided in Attachment 10). Should an escape occur an Escape Contingency Plan would be implemented as per Attachment 8. In addition to the above mitigation measures, the proposed development is part of a plan to reduce overall consented production in terms of active sites within the area; as such the potential for interactions with wild salmonids will be further reduced.
STATUTORY CONSULTEE	Please see comments under section 5.
5. Impacts upon species or habitats of conservation importance, including Sensitive Sites	
DEVELOPER	The Foindle West site is located in Loch Laxford Special SAC, adjacent to the Loch Stack & River Laxford SSSI, Foinaven SAC/SSSI/SPA and Handa SSSI/SPA. Potential impact of the proposal on habitats and species associated with these sites plus others likely to be present in the area are as identified below (excluding wild fish as covered under section 4 above and also Freshwater Pearl Mussel): <u>Reefs, Inlets & Bays</u> Loch Laxford SAC in which the site lies is designated for reef, shallow inlet and bay features; it is a complex fjard with numerous small islands and side branches that include two subsidiary lochs. The outermost part of the site is exposed, but the many reefs and islands near to the narrow entrance result in sheltered conditions over most of the loch. The variety of habitats, which include a sheltered littoral inlet at the head of the loch, soft mud sediments such as within the inner subsidiary loch Loch a'Chadh-Fi and coarser sediments in the outer part of the site, support a wide variety of species and communities. This includes beds of maerl *Phymatolithon calcareum* and associated communities in various channels of the loch. The modification proposes the expansion and local relocation of the existing Foindle West farm; while this will result in some new areas of seabed being impacted in the immediate vicinity of the pen group, this is not anticipated to adversely affect site features. A visual survey of the proposed modified farm footprint has been undertaken with guidance from SEPA and SNH (Attachment 12), and while some soft-sediment features including burrowed mud with sea pens have been identified, no maerl beds have been found to be present in the area. Offsetting the potential localised impact of the proposed development at Foindle West, soft-sediment seabed previously impacted by the existing site will be vacated and Laxford Site 1 immediately adjacent to Foindle West will be inactivated for salmon production. <u>Freshwater Pearl Mussel *Margaritifera margaritifera*</u> Freshwater pearl mussels are one of the qualifying features of the Foinaven SAC and Loch Stack & River Laxford SSSI adjacent to the site. Marine fish farming has the potential to indirectly impact upon the mussels through interaction with wild salmonids which act as hosts for the larval stage of the mussel. As per section 4 above, potential interactions with wild salmonids are mitigated through good fish health management and farm equipment specification/maintenance to minimise the risk of escapes.

	No escape incidents have occurred during recent cycles at the existing site, and sea lice control has been good with numbers remaining below CoGP Treatment Trigger and Marine Scotland Fish Health Inspectorate Reporting/Enforcement levels for the entirety of the current cycle (presently at harvest stage). While historic cycles have shown potential for sea lice challenge, the cycle previous to the current one illustrated that such challenges can be effectively managed back to below CoGP Treatment Trigger and Marine Scotland thresholds using the intervention measures outlined in Attachment 7. Attachments 5, 8 & 10 also provide details of the containment measures employed at the Laxford farms and attestation of the proposed equipment's suitability for the Foindle West site. Furthermore, the modification to both Foindle West and Eilean Ard does not propose an overall increase in active consented biomass or production in the Laxford area, and as such no negative impact on sea lice management or increased risk of interaction between the farm and wild fish is anticipated. The proposed 24m x 24m pen equipment is successfully operated by Loch Duart on neighbouring sites in the area, and is proven to be compatible with the use of cleanerfish for biological sea lice control. The proposal is also suggested to have a positive impact on other aspects of fish health, with fewer pen units across the Laxford site facilitating more efficient interventions such as low salinity baths for the management of gill health. <u>Birds</u> Breeding Red Throated and Black Throated Divers are a feature of the Loch Stack & River Laxford SSSI adjacent to the site. Avoiding disturbance of these Divers, particularly during breeding season April – September is important. Other seabird species are also likely to frequent the area around the site, with the most frequently sighted being gulls and skuas; potential interactions between seabirds and aquaculture installations include entrapment in farm infrastructure and scavenging behaviour. Any potential disturbance of Red Throated and Black Throated divers will be avoided through timing and location of activity associated with the proposal. Existing equipment will be removed from site by sea, for decommissioning/repurposing off site and with no shore-based activity taking place within the Loch Laxford area. Similarly, no new equipment will be constructed on site, with pens being constructed at Kinlochbervie Harbour and towed to site by vessel once ready for installation. Existing feed barges will be retained on site. The only on-site activity associated with the proposal will be the lifting and laying of moorings, as is current practice for routine mooring checks and maintenance. Pending permission, installation activity is planned to take place in March-April 2020. Potential interaction of birds with feed, stock and site equipment is mitigated through suitable storage of feed and waste to prevent scavenging and tensioning of top nets, used to prevent predator access to pens, to safeguard against entrapment. The proposed modification supports such measures; the feed barge will continue to provide secure feed storage and the proposed in-pen top net supports and feed spreading system will ensure that scavenging at point of feed delivery into the pens is mitigated and good net tensioning maintained to avoid the risk of entrapment. <u>European Otter *Lutra lutra*</u> Otters are known to frequent the area around the existing Laxford farms. Fish farming has the potential to impact upon otters through disturbance, effects on shoreline habitat or direct interaction with the farm. The proposed modification does not include any changes to or increase in shore-based activities which might lead to disturbance. Similarly, no increase in boat activity is proposed, with the overall plan of reducing to two active pen groups in the Laxford area allowing for boat traffic to service the farms to be reduced. The site lies approximately 135m from the adjacent shore in water of an average ~30m depth and as such disturbance of otter foraging habitat is not anticipated. Through experience of ongoing operations at the existing site no interaction has been noted between the farm and otters. The site will continue to operate as per Loch Duart's Wildlife Interaction Plan (Attachment 5). <u>Cetaceans</u> Several cetacean species are likely to frequent the wider area around the site, with species sighted in the North Minch area including Harbour Porpoise *Phocoena phocoena* and Common Minke whale *Balenoptera acutorostrata*. Attachment 5 outlines the measures in place to safeguard against potential disturbance or harm to cetaceans in the vicinity of any Loch Duart farm sites. The proposed modification is not anticipated to increase the risk of interaction between farm activities and cetaceans passing through the area; use of Acoustic Deterrent Devices (ADDs) to prevent seal predation will remain unchanged from current practices, indeed with a smaller number of ADD units facilitated by the change from three active pen groups to two. The proposal will also result in reduced boat traffic in the area.
STATUTORY	The proposal lies within Loch Laxford Special Area of Conservation (SAC), designated

CONSULTEE	for its reefs and shallow inlets and bays, and could affect Foinaven SAC, designated for a range of habitats and plant communities, otter and freshwater pearl mussel. The sites' status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 2017 as amended (the "Habitats Regulations") or for reserved matters, The Conservation of Habitats and Species Regulations 2017. Consequently, The Highland Council is required to consider the effect of the proposal on these sites before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements: https://www.nature.scot/sites/default/files/2017-06/A423286%20-%20Legislative%20requirements%20for%20European%20Sites.pdf **Loch Laxford SAC** The benthic survey shows that mixed sediments are present in the shallower areas with a transition in to burrowed mud habitats in the deeper areas. This represents a component of the Loch Laxford SAC shallow inlets and bays feature. In our view, this proposal is likely to have a significant effect on the benthic component of the SAC's feature. Consequently, The Highland Council is required to carry out an appropriate assessment in view of the sites' conservation objectives for their qualifying interests. This assessment should include an appraisal of the following: 1. The extent of habitat likely to be affected by this development alone and in combination with the planned changes to Laxford 1 and Laxford 2, relative to the total extent of the habitat within the SAC. 2. The extent and nature of benthic habitat affected by the three fish farms at their present locations that is likely to recover following the planned changes. 3. To assess the net increase in impact on the SAC we would advise that the applicant provides an calculation of the relative net increase in AZE footprint in the SAC (i.e. combined area of the AZE footprints of both proposed new / modified sites minus the combined area of the AZE footprint of the exiting sites that will be relinquished/removed. We have already received a copy of the visual survey footage and survey report and can confirm this information is sufficient to assess the benthic impacts of proposed Foindle West site. We can provide information on the extent of habitats within Loch Laxford SAC. To complete the appropriate assessment, the Highland Council will require benthic information relating to the existing farm sites (existing information from previous surveys will be adequate). Once these are available we will be able to advise further. We would be happy to discuss this further with the Highland Council and / or the applicant. **Foinaven SAC** In our view, this proposal is likely to have a significant effect on the fresh water pearl mussel feature of the site. Consequently, the Highland Council, is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest. To help you do this, we propose to carry out an appraisal to inform your appropriate assessment. To enable us to carry out this appraisal, further information is required through the production of an Environmental Management Plan. The EMP would contain a commitment to undertake monitoring of the resident salmonid populations in the River Laxford and the Uidh nam Ballach (the rivers that support pearl mussels), of sea trout in Loch Laxford to assess lice loads within the wider Loch Laxford, and for lice numbers within the farm to be collected and made available alongside the other monitoring information. The EMP should also contain information about the sea lice

	control measures that will be deployed at the sites and also details about under what conditions they will be implemented (e.g. trigger levels, or in response to the findings of monitoring etc).
6. Navigation, Anchorage, Commercial Fisheries, other non-recreational maritime uses (MOD)	
DEVELOPER	One inshore fishing boat currently operates out of Fanagmore Bay adjacent to the Foindle West site, with activity in the Laxford area consisting of creel fishing for lobster, crab, prawns and wrasse. Historically there have been no known conflicts of interest between these fishing operations and activity at the site. Initial discussions have taken place with local fishing interests to fully understand their activity in the immediate area, and potential implications of the proposed modification. Overall the proposal for consolidation to two pen groups within Loch Laxford is suggested to be of benefit to fishing interests, with less area occupied by farm equipment and improved near-shore access. There are no anchorages in the immediate vicinity of the Foindle West site; there is however an anchorage to the south-west of the site in Foindle Bay which is rarely used by recreational yachts. No increase in farm-related vessel traffic is proposed as a result of the modification, and as such no impact on the access to this anchorage, or others in the wider Loch Laxford area is anticipated. An amended Marine License will be sought for the modified site layout and the equipment clearly marked and lit; as such the proposed modification is not anticipated to cause any hazard to navigation of fishing vessels or others passing through the area.
STATUTORY CONSULTEE	
7. Landscape and Visual Impacts	
DEVELOPER	Visual aspects of the proposed modification have been considered within the context of SNH's Marine Aquaculture and the Landscape guidance in terms of location, layout and detail design. The existing Foindle West site is located within the North-West Sutherland National Scenic Area, adjacent to the island of Eilean a' Mhadaidh in the central portion of Loch Laxford. The immediate area is characterised by a rock and heather landscape, with a complex coastline of numerous islands, reefs and bays. Distinctive mountain peaks and cnocan landscape are the backdrop further inland. The site is relatively remote and is only overlooked by a short section of the single-track public road at Foindle. A Zone of Theoretical Visibility (ZTV) assessment for the site is provided in Attachment 11. Readily accessible views of the site from land are restricted and are limited to fairly close proximity; it is visible from the single-track Foindle-Fanagmore road, the end of the road leading to the dwellings at Foindle, and the associated properties. The site will also be visible from the sea. As such, Loch Duart aim to minimise visual impact through appropriate equipment layout and design. The modified site layout is, as the existing site, orientated in alignment to the dominant coastal edge of Eilean a' Mhadaidh. Although an increase in surface area is proposed, the number of pen units is to be reduced (14 to 12) and positioning of the feed barge in close proximity to the pen group helps minimise the visual scale of the site, particularly in relation to the point where the site is visible from shore at Foindle. Furthermore, upon successful modification of Foindle West and Eilean Ard, the adjacent Laxford 1 site will be inactivated, thereby reducing the visual scale of aquaculture equipment in Foindle Bay. The feed barge is relatively compact in nature, being of a raft-type design which appears as an extension of the pen group. Both the feed barge and pen infrastructure are grey in colour to minimise visibility against the rocky coastline of the immediate area. Seasonal use is made of underwater lighting at the site, between January and May every second year, and to minimise visual impact an energy-efficient targeted LED system is utilised which results in very localised lighting effect not visually intrusive at distance. A diagram of the site infrastructure is provided in section 3 and visualisation in Attachment 11. The site will continue to be serviced from existing shorebase facilities at Fanagmore Bay and Badcall, with personnel access also from the existing shore base at Fanagmore. No change or increase in shore-based activities is proposed, and the modification will in fact result in reduced boat traffic in the Loch Laxford area as activity is consolidated to two operational farms rather than the existing three. As such, the proposed modification is not thought likely to cause any significant change to visual

	amenity in the area.
STATUTORY CONSULTEE	We are not able to comment on the landscape and visual impacts of this proposal. This does not mean that we have taken a view on the landscape and visual impacts of the proposal. We are currently providing landscape and visual advice in only the highest priority circumstances, where development: 1. Is likely to have significant adverse effects on the integrity and objectives of designation of a National Scenic Area 2. Is likely to have significant adverse effects on Special Landscape Qualities of a National Park 3. Is likely to have significant adverse effects on the qualities of a Wild Land Area 4. Raises landscape issues of national interest in the wider countryside 5. Contributes to selected place-based priorities
8. Noise	
DEVELOPER	The Foindle West site is located to the east-north-east of the nearest dwelling, which is within Foindle Bay. The current farm configuration is approximately 680m from the dwelling to its nearest point, and the modification sees this increase to approximately 725m as the reconfiguration proposes a shift to the east-north-east. No change to existing farm routines are proposed as part of the modification; normal hours of operation are 0800 – 1700 during which activity on site in terms of boat movement, feeding and routine husbandry takes place. Only on infrequent occasions such smolt input or wellboat grading may activity occur outside these hours. Feeding activity occurs during daylight hours only and any noise generated by the feed barge power system will be minimised through appropriate sound insulation. The power generation system for the barge is fitted with an exhaust silencer and acoustic enclosure, and as such operating noise is minimal. No issues with noise have arisen from existing farm activities at the site; with no increase or change in activity, the feed barge power system remaining the same as that currently in operation and indeed a marginal increase in distance from the nearest dwelling and inactivation of the adjacent Laxford Site 1, no noise issues are anticipated.
STATUTORY CONSULTEE	
9. Marine Cultural Heritage	
DEVELOPER	There are no known aspects of marine cultural heritage which would be affected by the proposed site modification. The remains of a disused harbour, Foindle Harbour (Canmore ID 159071 grid ref NC 19310 48721) lie south-west of the site, within Foindle Bay, and the proposed modification will see the farm site move further east-north-east from this location. A wreck, classified as an unknown craft, is located to the north-west of the site adjacent to Ardmore Point (Canmore ID 357560, grid ref NC 18250 51330); this is well outwith the benthic Allowable Zone of Effect for both the existing and modified site.
STATUTORY CONSULTEE	
10. Waste Management (non-fish)	
DEVELOPER	Waste from the current site is primarily in the form of feed packaging. Loch Duart aims to minimise waste through bulk packaging or delivery of feed, and the proposal includes a suitably-size feed barge allows for bulk delivery of feed in support of this. A policy of 'good housekeeping' will continue to be employed on site to minimise the potential for marine litter.
STATUTORY CONSULTEE	
11. Socioeconomic, Access and Recreation	
DEVELOPER	The proposed modification is not anticipated to displace any aspect of socio-economic activity. As per section 5.6 creel fishing activity occurs within the area; historically there have been no conflicts of interest between ongoing fishing and aquaculture activities in the area, and a meeting with the local creel fishermen has been held to discuss the proposed modification and optimal mooring design to

	allow access to seabed around the site. Recreation is important to the local area with tourism and leisure activities providing a significant source of income. An outdoor centre is located to the north-east of the site at Ardmore, with kayaking in the area an established activity, and the North Coast 500 is a popular tourist driving route passing by the area via the A894. As per 5.6 there also anchorages in the Loch Laxford area, which are occasionally used by yachts. However, given the location of the site and the nature of the modification, with no increase in overall farm activity in the area or farm-related traffic, no negative impact on tourism or leisure activities is identified. In addition, the proposed modification will support the ongoing activity of Loch Duart Ltd with 72 full time staff directly employed by farm operations in the Sutherland area, as well as use of local services including fuel, haulage, accommodation and other suppliers.
STATUTORY CONSULTEE	
12. Traffic and Transport	
DEVELOPER	Transport for servicing of the site will continue to be from Loch Duart's existing facilities at Fanagmore (Laxford shorebase) and Badcall. As the modification does not propose to increase production in the area it will not cause an increase in traffic at sea or by road; the proposed consolidation to two operational pen groups rather than the current three will in fact provide the opportunity for reduced by-sea traffic around site as efficiency of servicing and husbandry visits will be improved.
STATUTORY CONSULTEE	
13. Any other issue	
DEVELOPER	None identified.
STATUTORY CONSULTEE	None identified.

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

[redacted]
Planning Officer
Planning Department
Comhairle nan Eilean Siar
Balivanich
Isle of Benbecula
HS7 5LA

Our Ref: CNS/DC/WI/U&B/CDM155280
Your Ref: 19/00180/FFAES

Date: 24 June 2019

Dear [redacted],

TYPE OF APPLICATION:	**Fish Farm Planning Application (with ES)**
PROPOSED DEVELOPMENT:	**New Fish Farm**
LOCATION:	**Ushenish Fish Farm, Lochskipport, South Uist**
GRID REF:	**NF 86050 36487**

Thank you for consulting us on the above application. As requested, the applicant has additionally submitted an Acoustic Deterrent Device (ADD) deployment plan, which allows us to conclude our advice on this application.

Summary

The proposed development lies outside of Inner Hebrides and the Minches Special Area of Conservation (SAC). This proposal could be progressed with appropriate changes. However, because it could affect internationally important natural heritage interests, **we object to this proposal unless it is made subject to conditions so that the works are done strictly in accordance with the changes detailed in our appraisal below.**

Appraisal of the Likely Impacts of the Proposal on Natural Heritage Interests:

Inner Hebrides and the Minches SAC

The proposal lies approximately 1.3km from the Inner Hebrides and the Minches SAC designated to protect Harbour porpoise. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply. The SNH website has a summary of the legislative requirements. https://www.nature.scot/sites/default/files/2017-06/A423286%20-%20Legislative%20requirements%20for%20European%20Sites.pdf

Harbour porpoise

The applicant has included the use of ADDs as part of their Predator Mitigation Plan. The typical frequencies of ADDs are within the hearing range of harbour porpoise. A significant

body of evidence exists to suggest that in some instances ADDs can result in the disturbance and displacement of harbour porpoise. The evidence of impacts on cetaceans from ADDs currently in use is varied and is dependent on many variables (e.g. noise characteristics of device, how the device is used, the topography, animal behaviour and importance of the area/habitat where the ADD is being used).

We advise that a 3km indicative disturbance distance is used when assessing applications. This distance is based on evidence in scientific literature and on our internal modelling exercise, and should be used to assess the indicative spatial extent of disturbance. The proposed site lies 1.3km from the boundary of the SAC.

In our view, this proposal is likely to have a significant effect on harbour porpoise designated within the above SAC. Consequently, Comhairle nan Eilean Siar is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interests. Provided the ADD deployment plan is adhered to and the following conditions are applied, then we can conclude there will be no adverse effect on site integrity.

Conditions to ensure that there will be no adverse effect on site integrity:

- Any ADDs that are deployed at this site will be done so in accordance with the agreed ADD deployment plan (provided by the applicant on 11 June 2019 and attached to the accompanying email). Any future changes to the plan must be agreed with the Planning Authority.

- As highlighted in the ADD deployment plan the operator must undertake reporting on ADD usage at the site including:
  - The exact dates when the device was operated, how often it was operated on that date, for what duration, and what was the cue for its activation.
  - Details of any predation events by seals and any anti-predation measures (including ADD deployment) in use at the time should be logged.
  - Details of the person (or persons) responsible for maintaining the logs.
  - An undertaking that all logs will be maintained for review by the Planning Authority and/or SNH, if deemed necessary by the Planning Authority.

- The Planning Authority should maintain the ability to require future changes to the ADD deployment plan should it, upon review of the logs, consider it necessary.

If the planning authority intends to grant planning permission against this advice without the suggested changes, you must notify Scottish Ministers.

Additional Advice

Benthic impacts and Priority Marine Features (PMFs)
The proposal will impact Priority Marine Features (PMFs). Comhairle nan Eilean Siar should consider the effect of the proposal on the PMF(s) before consenting. We advise that the proposal does not raise any issues of national interest regarding PMF habitats or species. Our appraisal below provides further information.

From analysis of the visual benthic survey provided by the applicant, we can confirm that burrowed mud habitat is widespread across much of the site; However, there were no notable component features present such as sea pens or fireworks anemones. As such we have no significant concerns about the potential impacts on the PMF habitat burrowed mud.

The PMF habitat northern sea fan and sponge communities are also present in some locations across the site. Northern sea fan (*Swiftia pallida)* is also a PMF species in its own right. The areas of northern sea fan and sponge communities habitat that are present are very limited in extent, being found on only a few rocky outcrops which are sparsely distributed across the site. Given the limited extent of the habitat that is present we would not consider any potential impacts as a result of the fish farm as likely to result in any significant impacts on the national status of the northern sea fan and sponge communities PMF habitat.

Protected Species

White tailed eagle are listed on Schedule 1A under the Wildlife and Countryside Act 1981. It is an offence to recklessly or intentionally harass a Schedule 1A bird.

There are records of White-tailed eagle breeding between 500m and1000m of the proposed site. It is likely that white-tailed eagles will habituate to the presence and operation of a fish farm at this distance, however the installation of the fish farm may cause disturbance if carried out during the breeding season. We advise that the installation is carried out, outside the white-tailed eagle breeding season (1 February – 1 August). If the fish farm is installed during the breeding season, the developer should undertake a survey (carried out by a suitably qualified and licensed bird surveyor) prior to installation to check known nest sites and other suitable habitat within 1km of the fish farm site for breeding white-tailed eagles. If a breeding attempt is located within this distance, installation should be delayed until the end of the breeding season. We advise that this is a condition of any consent given.

Any use of helicopters associated with fish farm operations may also cause disturbance to breeding eagles and we would advise that SNH guidance (The use of helicopters and aircraft in relation to disturbance risks to Schedule 1 & 1A raptors and wider Schedule 1 species June 2015) is followed.

Please contact me if you need any further information.

[redacted]

Rach Cartwright
Operations Officer
Argyll & Outer Hebrides

GEASGILL FISH FARM EXTENSION

HABITATS REGULATIONS APPRAISAL REPORT

JUNE 2019

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TABLE OF CONTENTS

1 INTRODUCTION

This Habitats Regulations Appraisal Report ('the Report') has been prepared by Arcus Consultancy Services (Arcus) on behalf of The Scottish Salmon Company (SSC) ('the Applicant'). SSC are proposing to submit an application under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, for an extension to the existing Geasgill marine fish farm in outer Loch na Keal ('the Existing Site'). The proposed extension comprises of an additional 2 x 100 m circumference fish cages ('the Extension').

1.1 Development Description

The Existing Site is located in the outer reaches of Loch na Keal, on the west coast of the Isle of Mull. Loch na Keal is south-west facing, and extends approximately 10 km from Gruline before opening out into the wider coastal waters off Mull. Approximately 3km north of the Existing Site, Loch na Keal connects with Loch Tuath via the Sound of Ulva, a narrow passage, 2 km in length. A number of smaller uninhabited islands are located in Loch Tuath and Loch na Keal. Loch na Keal has a complex bathymetry, with many shallow areas and skerries. The depth at the Existing Site ranges s between 20 and 50 m.The Extension is located immediately east of the Existing Site, to the south of the Island of Ulva.

1.2 Habitats Regulation Appraisal

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 Extension is not associated with the management of the SAC, and therefore must at least undergo the first stage of the HRA process; screening. HRA screening aims to identify international sites in and around the plan or 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. Should a significant effect be determined, the Extension will be statutorily required to be subject to an Appropriate Assessment (AA) by a relevant competent authority (such as a Local Planning Authority).

In an Appropriate Assessment, a 'competent 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 proposal 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 the third stage.

In this third and final stage 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.

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 the character and ecology of QFs, as well as the nature of the potential impacts of the plan or project. For example, for Natura 2000 Sites where

the QF are floral, sessile/low mobility species or habitats, the potential effects are likely to be limited to those on, directly adjacent, or with direct connectivity to the plan or project. As a result, the ZoI is likely to be notable smaller that it would be for a mobile species.

The maximum likely ZoIs for each QF type are defined in Table 1, below, with the rationale and justification for each definition also provided.

Table 1: Maximum extend of the potential Zone of Influence of the Extension

Qualify Feature Type	Maximum ZoI	Rationale
Habitats/Benthos	3 km	Autodepomod modelling predicted the exported mass of waste to affect an area up to 2.3km^2 (see Appendix I: Modelling Report). As a precaution the ZoI for benthic impacts was extended to 3km.
Bird Species	15 km	SNH guidelines state that in most cases the core range should be used to determine whether there is connectivity between a proposal and the SPA. The maximum extent of core ranges with connectively to the Extension is 15 km, the core range of Barnacle goose.
Cetacean Species	3 km	Scottish Natural Heritage (SNH) has accepted potential ZoI for aquaculture developments[1]
Seal Species	50 km/30 km	Core foraging range of grey seal is considered to be 50 km.[2] Core foraging range of harbour seal is considered to be 30 km.[3]
Freshwater pearl mussel hosts	35 km	Related to the maximum extent that a measurable effect on individual host salmonid fish may be detected. Established via consultation with Scottish Natural Heritage (SNH)
Terrestrial species/Habitats	Scoped Out	Extension with be constructed and operated solely in the marine environment.

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. A habitat QF is considered unlikely to be present if no suitable habitats exist within the ZoI. A species QF is considered unlikely to be present if no suitable habitats exist within the ZoI that can support that species. In the case that suitable habitats are present, the extent and quality of those habitats, can be used to inform the magnitude of any perceptible effect.

3 NATURA 2000 SITES

Table 2, below, presents all Natura 2000 Sites present within the potential ZoI of the Extension.

[1] Established via consultation.

[2] 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,

[3] 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

Table 2: Natura 2000 Sites within the Potential Zone of Influence

Natura 2000 Site	Designation	Qualifying Feauture	Proximity to Extension
Inner Hebrides and Minches	SAC	Harbour porpoise (*Phocoena phocoena*)	Within site area (c500m inside eastern boundary)
Cnuic agus Cladach Mhuile	SPA	Golden eagle	2km east
Treshnish Isles	SAC	Grey seal (*Halichoerus grypus*)	14km west
Treshnish Isles	SPA	European storm petrel (*Hydrobates pelagicus*) Greenland barnacle goose (*Branta leucopsis*)	14km west
Mingarry Burn	SAC	Fresh water pearl mussel (*Margaritifera margaritifera)*	35km

All of the Natura 2000 Sites within Table 2, and their associated QF will be further assessed within the HRA screening process in Section 4, below.

Reef, a QF of the Treshnish SAC, has been scoped out of further assessment, as it lies outwith the ZoI for habitats/benthos. As a result, the assessment of the SAC will be limited to the potential impacts on grey seal.

The following species, designated as QFs of Natura Sites within the ZoI have been recorded within the wildlife logs of the Existing Site;

- Harbour porpoise (Inner Hebrides and Minches SAC);
- Grey seal (Treshnish Isles SAC); and
- Goose species (Treshnish Isles SPA).

Eileanan agus Sgeiran Lios Mor SAC is located approximately 35km east (over 75km by sea) of the Extension and is designated for harbour seal. Although this species has also been recorded at the Existing Site, based on the core foraging range of harbour seal (30km, see Table 1), these individuals are unlikely to be part of the SAC population, and the SAC is considered outwith the ZoI of the Extension. Therefore, impacts on the *Eileanan agus Sgeiran Lios Mor* SAC are scoped out of further assessment.

4 HABITATS REGULATIONS APPRAISAL SCREENING

4.1 Inner Hebrides and Minches SAC

The Extension is located within the Inner Hebrides and Minches SAC, approximately 500m inside the eastern boundary. This SAC is designated for harbour porpoise and supports important numbers of the UK population. Impacts that may affect the integrity of the SAC are defined as those which may undermine the conservation objectives of the designation. The focus of the draft Conservation Objectives for harbour porpoise sites is to ensure that human activities do not result in;

- Significant killing, injury or disturbance that negatively affect the site on a long term basis;
- Incidental or reckless killing or injury of significant numbers of harbour porpoise (directly or indirectly) that may have a negative impact of the species Favourable Conservations Status;

- Prevention of utilization by harbour porpoise of significant parts of the SAC by disturbance or displacement;
- Significantly damage relevant habitats; or
- Significantly reduce the ecological function of relevant habitats such as the reduction of prey availability on a long-term basis.

Multiple stakeholder advice[4] considers the use of Acoustic Deterrent Devices (ADDs) in finfish aquaculture to be the primary activity likely to affect harbour porpoise, however the perceptible impacts that may affect the integrity of the SAC are considered to be:

- Net entanglement;
- Contaminants (i.e. pollution resulting in effects in water quality and bioaccumulation which may then affect the survival and productivity of harbour porpoise);
- Underwater noise (i.e. the use of ADDs); and,
- Death or injury by collision (predominantly with fast moving vessels).

Sections 4.1.1-4.1.5 consider the potential for impact to harbour porpoise, and thus the likely effects on the integrity of the designation from the Extension, taking location, species ecology, proposed management, good practise procedures and embedded mitigation into account.

4.1.1 Entanglement Risk

The risk of entanglement for harbour porpoise (and other cetaceans) with aquaculture infrastructure (moorings, nets and pens) is generally considered low. There is little current scientific information regarding cetacean entanglements, however there is at least one documented case of a humpback whale (*Megaptera novaeangaliae*) entanglement in a salmon aquaculture sea pen in Scotland.[5] Therefore, although it is likely that this risk exists, the likelihood is very low.

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 marine mammals (as well as other species such as basking sharks and birds) is significantly reduced[6]. Harbour porpoise are recorded in relatively close proximity to the existing Site, and yet no net entanglement has been recorded to date, therefore the risk is considered likely to be very low.

Effective management measures presented within the Predator Control Plan (PCP) included within the Environmental Management Plan (EMP) (Appendix D), would be adopted at the Extension, to minimise the potential risk of accidental net entanglement. As a result, the risk of harbour porpoise entanglement is considered to be negligible, and likely effects on the integrity of the SAC are considered to be not significant.

4.1.2 Contaminants

Harbour porpoise 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)[10]. With regards to pollution from aquaculture developments,

[4] Inner Hebrides and Minches: Advice to Support Management. Available at: https://www.nature.scot/sites/default/files/2017-10/Consultation%20-%20Harbour%20Porpoise%20 %20Inner%20Hebrides%20and%20the%20Minches%20pSAC%20-%20Combined%20Reg%2033%20%20MOP%20-%20A1918723.pdf

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

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

waste may contribute a mix of organic and inorganic compounds to waters, potentially leading to small scale eutrophication and oxygen depletion.

Additionally, the coastal process of the Extension will likely prevent eutrophication of the local environs. The local area is characterised by moderate to strong current velocities (Appendix I (Modelling Report)), and therefore a large spatial footprint around the site is expected. This is due to the moderately high tidal energy with low shear (similarity of current velocity and direction at all depths) and local water depths providing a moderately flushed site, resulting in the dispersal and dilution of waste deposits in the vicinity of the Extension. Therefore, it is likely that any impact on the environment from pollutants will be of a localised nature.

The Extension 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 D) and the Farm Management Statement (Appendix G). 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 likely effects on the integrity SAC are considered to be not significant.

4.1.3 Underwater Noise

Multiple stakeholder advice[4] in relation to general impacts of aquaculture considers that the use of ADDs is the main interaction between aquaculture development and cetaceans. It is recognised that active ADDs may result in potential disturbance and habitat exclusion of cetacean, and in particular harbour porpoise, in the area of ADD use and where cetaceans are present within the detectable range.

Not all delphinids (marine dolphins and porpoises) are similarly affected by ADDs largely due to variation in hearing ranges. 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.

A recent evaluation of mid-frequency ADDs and harbour porpoise noise criteria found avoidance was recorded at ranges of between 1 and 7.5 km[7]; however other trials using different types of ADD found weak or minimal responses[8]. It is therefore acknowledged that potential impacts to harbour porpoise from underwater noise are dependent on a number of factors including; noise characteristics of the ADD deployed; how the device 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)[9], as well as having poorer overall sensitivity than porpoises. Therefore, in order to target predatory seals, and minimise impacts on high frequency cetaceans, ADDs at the Extension (OTAQ devices), will emit noise within the low frequency range of between 8 - 12 kHz[9].

Should ADDs be employed at the Extension, due to the uncertainly in ADD trials, impacts on harbour porpoise using habitats within close proximity to the Extension cannot be ruled out, however to understand the magnitude of that effect, it is important to considered the habitat use of the species within the potential ADD range.

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

[7] 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.

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

[9] 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.

important in porpoise distribution, with consistent preference for inshore areas with water depths between 50 and 150 m and highly sloped regions[10]. These depths are largely a reflection of the habitat suitably for their prey species.

Bathymetry data shows the water depth beneath the pen group is between 20 m to 40 m, with relatively flat benthic topography. These conditions do not represent the habitat preferences for harbour porpoise.

An assessment of seabed data[11] in the local area shows that benthic habitats are present below the extension and in the wider local area comprise largely sandy mud with areas of rock and gravel, which become dominated by sandy habitats approximately 35 km west of the Extension. 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 waters[10]. Sandeels have a close association with sandy substrates between approximately 30–150 m depth[10], conditions not found in proximity to the Extension. 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 Extension (at depths of 30 -100 m).

From the above it can be concluded that habitats in proximity to the Extension do not represent habitats of high value to harbour porpoise. As the Extension lies at the very edge of the SAC, and extensive suitable habitats are found in the wider area of the SAC, the value of this area to the SAC population, and its utilisation by the SAC population, is likely to be low.

Despite the relatively low value of habitats, harbour porpoise has been recorded in proximity to Existing Site, despite ADD occasionally being used when triggered by the presence of seal predation. Furthermore, as harbour porpoise in this area are exposed to ADDs from a range of established fish farm sites throughout their home range (over fifty marine fin fish sites with the SAC, with ten on the coast of Mull alone[11]) it is likely that animals are not naïve to these signals. Studies suggest that although full habituation may not occur, a notable degree of reduced sensitivity is likely to result from this long-term exposure[10].

As the Extension will be constructed on land i.e. not on site, and the existing site is active, no perceptible additional noise impacts from construction are predicted.

In summary, as ADD use would be occasional and closely managed, noise emitted by the ADD will be outwith the key hearing range for harbour porpoise and, if heard, a notable degree of reduced sensitivity to ADD use is likely. Furthermore, as the marine habitats in close proximity to the Development are considered to be of low value to cetaceans, although effects of individual porpoise cannot be ruled out, the magnitude on the impact on the SAC population will be very low. As a result, no likely significant impact on integrity of the SAC from underwater noise is predicted.

4.1.4 Disturbance and Collision Risk from Marine Vessel Usage

There is a potential risk of disturbance, injury and mortality to harbour porpoise from marine vessel activity associated with the Extension. Although cetaceans may potentially be at risk from collision when foraging offshore, there is little evidence to suggest that harbour porpoise or other marine mammals are at risk from collision from fish farm vessels[4]. Harbour porpoise are naturally shy of boats, generally engaging in avoidance behaviour when vessels approach or are heard[10].

[10] 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.

[11] Marine Scotland Maps NMPI. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/

Vessel activity would primarily comprise access to the feed barge, which is permanently moored alongside the pens at the Existing Site, and a slow-moving vessel used over short distances. Both 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). SAC advice[4] suggests that no additional management is required for vessel activity providing best practice is followed. Although vessel activity could result in temporary avoidance behaviour in foraging marine mammals, the effect would be temporary and of very low magnitude. In light of this, no likely significant impacts on integrity of the SAC from disturbance and collision risk from marine vessel usage are predicted.

4.1.5 Cumulative Effects

As detailed above, over fifty marine fin fish farming sites lie within the boundary of the SAC, with a further nine on the coast of Mull alone. Furthermore, the Extension is not a new Site, but an extension of an existing site from twelve to fourteen cages, which represents a relatively small-scale increase. Additionally, successful management measures in place at Existing Site will be adopted at the Extension to ensure high standards of management practice is maintained. This will be implemented via the site specific EMP (Appendix D), the ADD Plan (Appendix L) and the Farm Management Statement (Appendix G).

As the Extension does not present any significant impact to the integrity of the SAC, the scale of the Extension in the context of the Existing Site is relatively small, and in the context of fin fish development across the SAC is very minor, and management practices successfully implemented at the Exiting Site will be adopted at the Extension, no significant cumulative effects are predicted.

4.2 Cnuic agus Cladach Mhuile SPA

The Extension lies approximately 2.5 km west of the *Cnuic agus Cladadh Mhuile* SPA, which is designated for golden eagle, and contains one of the highest density populations in Britain. Due to the proximity of the SAC and the nature of the extension, impacts on habitats are not considered feasible. As a result, the only perceptible risk that the Extension may pose to golden eagles in the designated area is through risk of net entanglement or collision with helicopters associated with the Extension.

4.2.1 Helicopter related collision.

Helicopters are occasionally used to transfer smolt to fish farm sites, as a result there is a risk of bird strikes associated with this activity. However, SSC do not use helicopters to transfer fish, and all fish transfers associated with the Extension will be by boat. In light of this, no significant impacts on the SAC, both in the context of the Extension and cumulatively, are predicted.

4.2.2 Net entanglement

Golden eagle are terrestrial predators, largely feeding on mammal species, and are not known to be predators of fish farms. Direct interactions between golden eagles and the Extension are likely to be negligible. The Predator Control Plan (provided in Appendix D) details measures to be taken to reduce the potential risk of entanglement of bird and other potential predators. As a result, the risk to golden eagles from net entanglement is negligible, and no likely significant impacts on the SAC, both in the context of the Extension and cumulatively, are predicted.

4.3 Treshnish Isles SAC

Grey seals will forage up to 50 km from a haul out area, which puts the Extension within the foraging range the Treshnish Isles SAC population, as it lies 14 km to the west. Although the extension lies outwith close proximity to the SAC, two seal haul out sites are located within 3 km of the Extension, both of which may be used by seals associated with the SAC.

As grey seal are common predators to marine fish farms, they are at risk from impacts of direct predator control measures. These measures include the effects of underwater noise, via the implementation of ADDs, and should these 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. Management methods currently implemented across SSC sites would be implemented at the Extension. These measures have been very successful across SCC 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 appendix of the EMP (Appendix D), 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, with installation of Seal Blind (false bottom) nets;
- Tensioned top nets with supports to prevent bird attacks; and,
- Maintenance of a Wildlife Log – to help assess and monitor changes in wildlife occurrence and distribution in marine habitats surrounding the 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. As outlined above, the impacts of direct predator control measures have the potential to effect seals associated with Treshnish Isles SAC population, and thus the integrity of the SAC.

4.3.1 Underwater Noise

The most widely used direct predator control measure is the use of ADDs. The primary potential impact of ADD use is the disturbance or displacement of seals from important feeding or breeding areas within range. ADDs at the extension (OTAQ devices), will emit noise within the low frequency range of between 8 - 12 kHz, and have a predicted detection range of 45 m[12]. As detailed with 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), as detailed in the PCP (Appendix D: EMP). Furthermore, the use of feedback loops would ensure that ADD noise is minimised as much as possible.

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[13]. 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 Extension for commuting and foraging. As the use of ADD will be occasional and triggered, and is only detectable at a close range (and not within breeding areas such as the SAC), impacts will be limited to the temporally disturbance of small numbers of individual seal predators in close proximity to the

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

[13] 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

Development. Due the temporary and localised nature of impacts, the effects on the SAC population will be of low magnitude, and therefore are likely to be not significant.

4.3.2 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. Effective management and ADD use, as successfully implemented at the Existing Site, would mean that the need for rogue dispatch would remain very low.

In light of the above, the effects of legal dispatch is likely only to impact, if at all, very small numbers of individual rogue seals. Therefore, the magnitude of this impact on the SAC populations will be very low to negligible, and therefore, impacts on the integrity of the SAC are considered likely to be not significant.

4.3.3 Cumulative

As detailed in Section 4.1, there are a further nine fish farms on the coast of Mull alone, and the Extension represents a relatively small-scale increase in size from the Existing Site. As the Extension does not present any significant impact to the integrity of the SAC, and the scale of the Extension, both in the context of the Existing Site, and in the context of fin fish development in the wider local area is relatively small, and management practices successfully implemented at the Exiting Site will be adopted at the Extension, no likely significant cumulative effects are predicted.

4.4 Treshnish Isles SPA

The Treshnish Isles SAC is located 14 km west of the Extension, and is designated for storm petrel and Greenland barnacle goose. Neither species are known to be predators of marine fish farms. The typical prey of storm petrel consists of surface organisms such as small fish, squid, crustaceans and jellyfish[14]. Furthermore, the species is a pelagic feeder, with individuals recorded foraging over highly pelagic waters over and beyond continental slopes between 400 to 830 km from colonies. Barnacle goose fly at height, roost inland and forage on terrestrial vegetation such as the leaves and stems of grasses, roots and seeds within arable habitats, such as barley stubble fields[15].

As there is not perceptible means by which the Extension could impact either species, no likely significant impacts on the SAC, both in the context of the Extension and cumulatively, are predicted.

4.5 Mingarry Burn SAC

In the Scoping/Screening response[16], SNH highlighted the potential for impacts on the Mingarry Burn SAC, designated for Freshwater pearl mussel (FWPM) (*Margaritifera margaritifera*). Although this species will not be directly impacted by marine aquaculture development, their life cycle is dependent on salmonid fish (as larval hosts)[17], which have the potential to be impacted by marine fish farming via impacts such as sea lice infestation

[14] https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/storm-petrel/

[15] https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/barnacle-goose/#rPme3xxyrGTpDHWx.99.

[16] Via email to Argyll and Bute Council dated 14th February 2019

[17] Ann Skinner, Mark Young and Lee Hastie (2003) Ecology of the Freshwater Pearl Mussel Margaritifera margaritifera Conserving Natura 2000 Rivers Ecology Series No. 2

and dilution of wild gene pools by aquaculture escapees. Therefore, impacts on salmonids can have indirect consequences on FWPM.

Mingarry Burn SAC is distant from the Extension, located approximately 35 km north (by sea). In SNH's response[16] they advised that the Extension is in the periphery of where a measurable effect upon individual host species could be detected, but any impact at a population level within the SAC would be associated with sites much closer. As a result, SNH advised that the proposal will not have an adverse effect on the integrity of the SAC.

Further to the above, embedded mitigation measures to reduce the risk posed by sea lice would be put in place at the Extension via the EMP (see Appendix D), 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.

Furthermore, in order to manage the risk of escapes, the Extension would be managed in accordance with the Escapes Contingency Plan, also presented within the EMP (Appendix D) which 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. As a result of these measures, impacts on host salmonids connected to habitats within the SAC will be of very low magnitude.

In light of the above, no likely significant impacts on the Mingarry Burn SAC, both in the context of the Extension and cumulatively, are predicted.

5 HRA SCREENING CONCLUSION

In light of the above detailed screening process, it is considered likely that the Extension will have no significant impacts on any Natural 2000 Site, and therefore, in accordance the requirements of the Habitats Directive (92/43/EEC) and the Bird Directive (2009/147/EC), an Appropriate Assessment is not required.

The Scottish Salmon Company

Supporting Information for Planning Application

Geasgill Marine Fish Farm

Loch Tuath, Isle of Mull

Date	**June 2019**
Revision No.	**A2**
Author	[redacted]
Approved By	

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GLOSSARY

ABBREVIATION	DESCRIPTION
AoD	Above Ordnance Datum
ABC	Argyll and Bute Council
ABC MCDU	Argyll and Bute Council Marine and Coastal Development Unit
ADD	Acoustic Deterrent Device
AutoDEPOMOD	A software package used for modelling biomass and chemotheraputants for finfish farms in Scotland, developed by SEPA and SAMs
CAR	Controlled Activities Regulations
CCT	Coastal Character Type
CoGP	Code of Good Practice
ECE	Equilibrium Concentration Enhancement
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPS	European Protected Species
EQS	Environmental Quality Standard
FMS	Farm Management Statement
GAP	Good Agricultural Practices
GSSI	Global Sustainable Seafood Initiative
HRA	Habitats Regulations Appraisal
km	kilometre
LCA	Landscape Character Assessment
LCT	Landscape Character Type
LVI	Landscape and Visual Impacts
LVIA	Landscape and Visual Impact Assessment
m	metre
MA	Management Area
MPA	Marine Protected Area
MSS	Marine Scotland Science
NSA	National Scenic Area
PGI	Protected Geographical Indication
PMF	Priority Marine Feature
QMS	Quality Management Systems
ROV	Remote Operated Vehicle
SAC	Special Area of Conservation
SEPA	Scottish Environmental Protection Agency
SHO	Seal Haul Out
SLICE	Sea lice treatment
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSC	The Scottish Salmon Company
SSPO	Scottish Salmon Producers Organisation
T	tonnes
VP	Viewpoint
w	watt
WLA	Wild Land Area
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

This Supporting Information document has been prepared by The Scottish Salmon Company (SSC). SSC are proposing to submit an application under the Town and Country Planning (Scotland) Act 1997 (as amended), for an extension to the existing marine fish farm at Geasgill ('the Existing Site'). The proposed extension comprises of an additional 2 x 100 m circumference fish pens ('the Extension').

A request for a Screening and Scoping Opinion for the Extension was submitted to Argyll and Bute Council (ABC) in January 2019 (Application Reference No: 19/00136/SCRSCO). The Opinion issued by ABC on 14th May 2019 confirmed that an Environmental Impact Assessment (EIA) would not be required and that the application can be considered appropriately through the submission of supporting information rather than an EIA Report.

The Application has therefore been accompanied by supporting environmental information, contained in this document and in the Technical Appendices, and as directed by the consultees' comments received through the pre-application consultation process. These provided details of what was specifically required to be covered within the final planning application, including details of survey and data requirements. As agreed with ABC, technical surveys have informed the Extension application.

The following information, planning figures and elevation drawings will accompany the Application as Technical Appendices.

- Location/ Layout Plans;
- Elevation plans of Proposed Pens;
- Supporting Environmental Information; and
- Technical Appendices A – N.

The supporting environmental Information is provided and discussed in more detail, where necessary, in Section 5 of this document. This document presents an assessment of the potential effects of the Extension upon the environment to establish whether it complies with planning policy.

1.1 Scottish Salmon Company

The Scottish Salmon Company (SSC) is one of the leading Scotland based producers of fresh Scottish Salmon, employing a team of over 600 staff across 60 sites on the West Coast and Hebrides. A total of 19 staff are currently employed across the four existing sites on Mull.

SSC are committed to Scottish Provenance and take great pride in producing quality Scottish Salmon, whilst being committed to the environmental, cultural and economic growth and sustainability of rural Scotland.

SSC are focused on sustainable business development following international demand for Scottish salmon, the UK's largest food export. SSC are 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.

1.2 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 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).

1.2.2 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.

1.2.3 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 site will be operated in accordance with the principles of Integrated Sea Lice Management. A Farm Management Statement has been prepared for the existing site, and this will be updated to take into account the changes associated with the proposed site. This will be finalised after fish are stocked onto the site (Appendix G).

1.2.4 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.

1.2.5 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.

1.2.6 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.

1.2.7 BSI 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.

1.2.8 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 DESCRIPTION OF THE DEVELOPMENT

2.1 Development Overview

The Existing Site is located in the outer reaches of Loch na Keal, on the west coast of the Isle of Mull (see Figures 1 and 2 in Appendix A). Loch na Keal is south-west facing, and extends approximately 10 km from Gruline before opening out into the wider coastal waters off Mull. Approximately 3 km north of the Existing Site, Loch na Keal connects with Loch Tuath via the Sound of Ulva, a narrow passage, 2 km in length. A number of smaller uninhabited islands are located in Loch Tuath and Loch na Keal. Loch na Keal has a complex bathymetry, with many shallow areas and skerries, however depths can also reach in excess of 50 m in places. The depth at the Existing Site ranges between 20 m and 50 m.

There have been aquaculture facilities operating off the coast of the Isle of Mull for a number of years, and these tend to be concentrated in the Sound of Mull and off the west coast of the island, in more sheltered bays and lochs. SSC operates a number of other sites in the surrounding area; Inch Kenneth (approximately 1.7 km to the east), Tuath (approximately 6.6 km to the north) and Gometra (approximately 12.3 km to the north-west). There are five fish farms located in the Sound of Mull (off the northern coast of Mull) which are operated by another company, Scottish Sea Farms.

The Extension is located immediately east of the Existing Site, to the south of the Island of Ulva. There are a small number of isolated properties on the Island of Ulva, approximately 1.5 km to the north, and also on the eastern shore of Loch na Keal, approximately 2 km to the south-east of the Existing Site (Location charts are provided in Appendix A).

2.2 Existing Site Infrastructure

2.2.1 Pens

The Existing Site comprises 12 x 100 m circumference (15.9 m radius) pens. The pens are held in a 12 cell, 60 m x 60 m mooring grid and are arranged in one group, in two linear rows of six pens.

2.2.2 Feed Barge

The feed barge associated with the Existing Site is located on the south side of the group, measures 25 m in length and 16 m in width, and has a capacity of 180 tonnes. It is proposed that the existing feed barge will also serve the Extension and there is no intention to change either the feed barge location or type as part of this application.

2.2.3 Pen Nets

The pen nets currently installed on the Existing Site are 10 m deep.

2.3 Proposed Development Infrastructure

2.3.1 Pens

The Extension would comprise of 2 x 100 m circumference pens. The pens will be held in adjacent linear rows of two pens, immediately to the east of the Existing Site. The whole site (Existing Site and Extension) will be held within a total 14 x 60 m mooring grid layout. Further infrastructure would include moorings and bird nets for the Proposed Pens. The Proposed Pens would be linked to the feed barge associated with the Existing Site via surface feed pipes.

2.3.2 Pen Nets

The proposed net depth of the Proposed Development will be 12 m. Nets will be manufactured by Knox and will be specifically designed to suit site conditions and husbandry requirements. Nets are

subject to a regular strength testing and maintenance program (this generally takes place during the fallow period) and are generally replaced after six 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.

2.3.3 Bird Nets

Top nets, tensioned 2" fine-meshed nets in conjunction with bird net supports, will be installed in accordance with RSPB recommendations, to reduce predation and the risk of bird entanglement. Maintenance of effective husbandry practices will also help to reduce the number of birds attracted to the Proposed Development, thus further reducing the risk of interaction and entanglement. An example of the type of bird net to be used is provided in Appendix B.

Effective husbandry practices will ensure top nets are inspected and re-tensioned on a daily basis and maintenance will be conducted as required, minimising the potential risk of accidental entanglement of birds.

These measures are currently in use at the Existing Site and have successfully prevented both bird attack and bird entanglement.

2.3.4 Moorings

The Proposed 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 site. The moorings system will be checked as part of the daily containment checks on site and a full inspection of component parts is also undertaken by trained staff at the end of every production cycle. Mooring checks methodologies are outlined in a Standard Operating Procedure for the site and the program for checks is outlined in the Escapes Prevention and Contingency Plan for the site (provided as Annex 1 of Appendix D).

The wider area of the Proposed Development including moorings will be 18,565 m^2. The moorings layout is shown in Appendix B.

2.3.5 Boat Access

Access to the Proposed Development will be from the existing SSC Ulva Ferry shore base. The Proposed Development will be serviced by small Polarcirkel or other rigid-hulled inflatable (RIB) type boats for staff access and routine operations, and workboats for heavier operations.

Daily journeys to site will involve one or two return journeys by Polarcirkel or RIB, and one return journey by workboat, if this is required for specific site operations.

2.3.6 Pen lighting

As part of the production cycle it may be necessary during periods of reduced daylight hours to use underwater lighting for the pens. Typically, underwater lights at farm sites are used during the first winter of the marine production cycle but may also be used out-with these times. Such lighting is held at depth within the pens and is directed downwards into the pens and not 'off-site'.

It is proposed that two 1000W lights will be used per pen. This is the same equipment that is used at the Existing Site. These lights will be downward facing and will be installed at a depth of 6 m. The

potential effect from these lights will be a slight underwater illumination, seen as a green glow, and has minimal visibility from the surface. Surface lighting will only be used in accordance with Northern Lighthouse Board (NLB) recommendations and as specified on the Marine Mooring and Navigation Licence.

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

2.3.7 Navigational lighting

Navigational lighting requirements for the Extension will be as agreed with the NLB.

2.4 Husbandry

2.4.1 Production cycle

It is planned that the Geasgill site 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. An example production cycle for the maximum biomass at the Proposed Development is detailed in the production prediction spreadsheet (Appendix C), which provides information on the proposed time of stocking, input numbers, expected growth, estimated mortality and harvest numbers.

An application has been made by SSC to vary the SEPA CAR Licence (reference CAR/L/100808) for the Existing Site to include the Extension and a draft CAR licence has been received in June 2019. The maximum weight of fish held at any time at the Geasgill site (Existing Site and Extension) will not exceed a total of 2500 tonnes.

Over the fallow period, essential maintenance and any repairs will be carried out at the site 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 the 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.

2.4.2 Stocking

At the start of the production cycle, a well boat will be used to stock the Extension with smolts. This will be synchronised with operations at the Existing Site.

2.4.3 Food and Feeding

The Extension will be routinely serviced from the existing SSC shore base at Ulva Ferry, where staff and work boats will depart to site. Food and feeding equipment for the normal operation of the Extension will be stored in the existing feed barge.

Food deliveries will be carried out predominantly by sea, which reduces the requirement for transporting food by road to the Ulva Ferry shore base and the pressure on the islands' road network. The number of feed deliveries estimated during the production cycle will increase by approximately five deliveries (based on c. 165 tonne feed deliveries), from 24 to 29 deliveries, as a result of the Extension. Whilst food will be delivered by sea whenever possible, there may be some occasions e.g. poor weather, when deliveries by road may be required. This is currently the case with the existing SSC sites serviced from the Ulva Ferry shorebase. It is believed that the additional feed boat activity will have a low impact on maritime traffic in the vicinity of the Extension, and this is scoped out of further assessment.

2.4.4 Staff Access

Staff access to the Proposed Development will be by vehicle to the Ulva Ferry shore base followed by boat journey. It is anticipated that the staff vehicle usage will be 1-2 return journeys each day between normal working hours (0800 – 1700), in line with existing operations serviced from the Ulva Ferry shorebase. It is normal practice for staff to share transport where possible.

2.4.5 Grading

Grading occurs at all SSC sites 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 stock production, and reduce the risk of aggression developing within the stocked population. Standard grading operation procedures and associated risk assessments are currently undertaken at all SSC sites and these will also be used at the Development. Fish are first crowded within the pen net, before being pumped onto a well boat, 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.

2.4.6 Harvesting

Fish that are required for harvest are first crowded within the pen net and then pumped into a purpose designed well boat. The harvest vessel will be required to visit the site an additional five times during the production cycle. Harvesting will usually take place over six months in the second year of production. During these harvesting months the harvest boat activity across will be around five 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 are transported live to a harvest station (SSC harvest stations are located at Arnish (north region) and Ardyne (south region)). 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 and then bleeding of the gills. Carcasses are then transported onto either the Cairndow (Argyll) processing plant or the Marybank (Outer Hebrides) processing plant for primary processing and filleting.

2.4.7 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 de-lousing can potentially be carried out without the use of medications, reducing the use of chemicals and reducing the likelihood of resistance to de-lousing 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. 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 onto site 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 Environmental Management Plan (EMP) included in Appendix D.

2.4.8 Veterinary Treatment and Chemicals

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 the Fish Vet Group who have clinical responsibilities for fish stocks. The SSC focus is on the prevention of disease through integrated health management, effective monitoring and biosecurity controls.

Final decisions regarding the requirement to treat and appropriate type of treatment are made by the company veterinarian.

As detailed above, an application has been made to vary the SEPA CAR Licence for the Existing Site (reference CAR/L/100808) to include the Extension, which will determine the amounts of medication that may be administered. The draft version of the amended CAR licence has been issued by SEPA in June 2019. A Sea Lice Efficacy Statement is provided in Appendix E.

2.4.9 Non-Chemical Treatment

A Hydrolicer treatment system will be available for use at the Extension should it be required. This will be in line with any required use at the Existing Site.

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. 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 in Appendix D.

2.4.10 Mortalities

Mortalities will be removed from the pens on a regular basis using a Lift-Up system, or similar manual removal system, this is in line with current SSC practices. Mortalities collect at the bottom of the pen net, in the centre, and are pumped up a collection pipe on a regular basis. Any dead fish removed are collected at pen side, then carefully transported ashore and transferred to a sealed skip at the shore base. In addition to this, there will be a regular diver inspection of the pens, during which mortalities that have not collected in the basket are noted and the site manager informed. Mortalities will then be removed and the removal system checked. This skip will be emptied on demand by specialist contractor. In the event of a mass mortality event, extra skip capacity can be made available within an appropriate timescale (see Appendix F).

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.

2.4.11 Farm Management

The Extension will be managed in accordance with the principles of Integrated Pest Management and the National Treatment Strategy, being stocked synchronously with the same year class of fish and treated synchronously with the Existing Site. SSC's West Mull sites are within Code of Good Practice (CoGP) Management Area M-37 and Marine Scotland (MS) Disease Management Area (DMA) 16a. There are no other operators currently farming in these areas, therefore there is no requirement for Farm Management Agreements (FMAs). However, Scottish Salmon Producers Organisation (SSPO) CoGP does require that all marine sites have a Farm Management Statement (FMS) in place. The FMS for the Existing Site has been provided as Appendix G. The FMS will be amended to account for the Extension and finalised after fish are stocked on site, once the health status of fish stocked 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.

2.5 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.

3 CONSULTATION ANALYSIS

3.1 Consultation

Stakeholder consultation has been undertaken throughout the development and planning process. SSC has sought to obtain stakeholders support at key stages throughout the development and planning process, 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: Pre-application consultation;
- Phase 2: Ongoing consultation; and
- Phase 3: Planning assessment 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; and
- Correspondence (emails & letters).

The pre-application phase included consultation and agreement on the specification of surveys and studies as well as consultation on certain technical aspects.

Through discussion with stakeholders, SSC's proposed approach to the Extension was introduced. The meetings also provided an opportunity to establish key concerns and issues that have been dealt with as part of this application submission.

Table 3.1 details the statutory stakeholders that the SSC Site Development Team engaged with.

Table 3.1 Statutory stakeholder scoping summary

Stakeholder Issue	Stakeholders	Date(s)
Benthic Ecology	Scottish Natural Heritage (SNH) Marine Scotland Science (MSS) Scottish Environment Protection Agency (SEPA)	18th April 2019 (email) 14th May 2019 (Scoping response)
Wild Salmonids	MSS	14th May 2019 (Scoping response)
Landscape and Visual Impacts	SNH Argyll and Bute Council	15th May 2019 (email) 14th May 2019 (Scoping response)
Species or Habitats of Conservation Importance, including Sensitive Sites	SNH	14th May 2019 (Scoping response)

A summary of communication separate to that contained within the pre-application process is provided in Table 3.2 below.

Table 3.2 Summary of pre-application discussions

Stakeholder	Subject discussed	Date (s)
Argyll and Bute Council	Approach to application	20th November 2018 (letter)
Scottish Natural Heritage (SNH)	Details of scoping request Viewpoints to be included in LVIA	18th April 2019 (call and email) 15th May 2019 (email)
West Coast Regional Inshore Fisheries Group (WCRIFG)	Summary of proposed Extension	30th April 2019 and 16th May 2019 (email)
Mull Fishermen's Association (MFA)	Summary of proposed Extension	25th April 2019 (meeting)
Mull and Iona Community Trust (MICT)	Summary of proposed Extension	25th April 2019 (meeting)
Argyll Fisheries Trust (AFT)	Summary of proposed Extension	18th April 2019 (email)
Argyll District Salmon Fisheries Board (ADSFB)	Summary of proposed Extension	22nd May 2019 (email)
Royal Yachting Association (RYA)	Summary of proposed Extension	8th May 2019 (email)

3.2 Gap Analysis

This section of the report summarises the scoping responses to date and highlights the issues raised. The tables below cover the following areas;

- Table 3.2: Non-statutory Consultees;
- Table 3.3: Benthic Impacts;
- Table 3.4: Water Column Impacts;
- Table 3.5: Interactions with Predators;
- Table 3.6: Interactions with Wild Salmonids;
- Table 3.7: Impacts upon Species or Habitats of Conservation Importance;
- Table 3.8: Navigation, Anchorage, Commercial Fisheries etc;
- Table 3.9: Landscape and Visual Effects;
- Table 3.10: Noise;
- Table 3.11: Marine Cultural Heritage;
- Table 3.12: Waste Management;
- Table 3.13: Socio-economic, Access and Recreation;
- Table 3.14: Traffic and Transport; and
- Table 3.15: Any Other Issues.

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

Table 3.3 Non-statutory Consultee Advice

Stakeholder	Stage	Response Date	Summary of main comments/issues	How comment has been addressed/SSC response	Cross reference
Royal Yachting Association	Pre-application	29th May 2019	The RYA do not foresee any issues with the proposed Extension.	The site will be marked in accordance with NLB recommendations. Should NLB request any specific marking or lighting to be put in place at this site, SSC will comply with this.	N/A

Table 3.4 Benthic Impacts - Consultee Scoping Summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	The applicant should submit the full modelling (benthic, pollution, chemical and hydrographic) reports in support of any planning application.	A hydrographic report has been provided with this application. Modelling has been undertaken for benthic footprint, in-feed treatments and bath treatments, and a summary report provided with this application.	Appendix J and Appendix I
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	A modelling report has been submitted. Providing there are no changes to this proposal, no additional information is required should the applicant progress this application to planning.	No further changes have been made to the proposed site design since the original proposal. The modelling report has been submitted alongside this application.	Appendix I

Table 3.5 Water Column Impacts - Consultee Scoping Summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	The nutrient calculation submitted indicates that the proposed increase should not result in unacceptable impacts to the water column. Providing there are no changes to the proposed biomass or to the consented biomass in Loch na Keal, no additional information is required should the applicant progress this application to planning, however the applicant should review this prior to submission and update if required.	There is no change proposed to the details submitted with the Scoping Report. It is not predicted that the proposed biomass increase associated with the Extension will result in unacceptable impacts to the water column.	Section 4.16 and Appendix K
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	The applicant is requested to provide a full ECE calculation with the final planning application	A full ECE calculation has been undertaken and provided with this application.	Section 4.16 and Appendix K

Table 3.6 Interaction with Predators - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	The applicant should provide specific details of proposed use of ADD's as specified by SNH, as part of any planning application. A predator control plan, detailing the sequential steps and triggers for specific control measures, should also be submitted with the final planning application.	A site specific Predator Control Plan and ADD Deployment Plan have been prepared for the Proposed Development i.e. the Existing Site and Extension. These have been submitted as supporting information to this application.	Section 4.2, Section 4.3, Appendix D and Appendix L

Table 3.7 Interaction with Wild Salmonids - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	While the applicant has identified a number of mitigation measures to limit potential impacts on wild salmonids from the operation of the farm, additional information will be required in order to fully assess the likely risk to wild salmonids from the proposed expansion. Mitigation should include: • Final EMP; • Escapes/Containment Plan and attestations for equipment; • Farm Management Statement; • Site specific sea lice action/management plan; • Efficacy statement in terms of availability of sea lice chemical treatments; • Operational details for other sea lice management measures including cleaner fish and mechanical removal, and • Evidence of effectiveness of more recent sea lice management measures (cleaner fish and mechanical removal).	An Environmental Management Plan has been prepared for the Existing Site and Extension, and provided with the planning application. A draft Farm Management Statement has been provided as supporting information, this will be finalized once the health status of the stocked fish can be confirmed. An Efficacy Statement has been provided, based on the medicine amounts currently being determined by SEPA through the CAR application process. Attestations and specifications for additional equipment have been provided. Details on lice levels during the most recent production cycle at the Existing Site have been provided as part of the final application.	Appendix D, Appendix G and Appendix E.
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	Some evidence, provided by the applicant, of the current ability to control sea lice numbers on the site may be useful in making an assessment of risk associated with the modification of the site. The evidence could take the form of an attestation from the applicant indicating the existing sites compliance with CoGP, their own targets and their success in treatment of lice on site. The attestation should cover information for the current and previous cycle. The following is a suggested format an attestation could take: • Dates of information provided;	An attestation, based on the last 3 production cycles at the Existing Site, has been provided with the planning application.	Appendix E

Consultee	Stage	Identified Actions	Project Response	Cross Reference
		• Are there any breaks in weekly count Y/N; • If so, is a reasonable explanation given (e.g. severe weather conditions) Y/N; • Are bioassays of lice carried out at lease yearly for the treatments utilized? Y/N; • Have any strategic treatments been carried out in the management area (even if levels are below the CoGP suggested criteria for treatment) Y/N; • Have you adopted the COGP suggested criteria for treatment? Y/N; • If not, what criteria for treatment of lice do you work to; • Is treatment carried out when the criteria for treatment for lice is reached? Y/N; • Are alternating methods of treatment utilized? Y/N; • Are treatments successful i.e. drop to below criteria for treatment levels? Y/N; • If no, are unsuccessful treatments a regular occurrence? Y/N; • Are treatments successful i.e. drop to a stated target level? Y/N; and • If no, is this a regular occurrence? Y/N.		
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	The modelling report submitted for the proposed pen arrangement and biomass indicates that there would be sufficient in feeds available to treat a maximum biomass of up to 4 times however there is no indication that the applicant has taken into account SEPA's interim statement on the use of emamectin benzoate and any effect this may have on the quantities likely to be available for use on the site. This information should be	Information on lice management strategy in relation to SEPA's interim position statement on emamectin benzoate has been provided with the final planning application.	Section 4.9

Consultee	Stage	Identified Actions	Project Response	Cross Reference
		reviewed to prior to submission of any future planning application.		
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	The bath treatment modelling report should be submitted along with any future planning application.	There has been no change to the bath treatment modelling report since the Scoping submission and this has been submitted with the final planning application.	Appendix I

Table 3.8 Impacts upon species or habitats of conservation importance, including Sensitive Sites - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	Under the Habitats Regulations, a Habitats Regulations Appraisal (HRA) must be carried out to consider whether or not the Geasgill extension will have a 'likely significant effect' on the integrity of European Designated Sites (Natura sites).	HRA Screening has been carried out and is provided with the planning application. It is determined that the Proposed Development will not result in likely significant effects on the integrity of any Natura 2000 Sites.	Section 4.22 and Appendix N
Scottish Natural Heritage (SNH)	Fish Farm Scoping Opinion	<u>Inner Hebrides and the Minches SAC</u> Harbour Porpoise are frequently recorded within this area of the SAC and we note that Acoustic Deterrent Devices (ADDs) could be used at this site. Intended to deter seal attacks, ADDs can cause disturbance and displacement to cetaceans, including harbour porpoise. We would advise that this development could have a likely significant effect upon the harbour porpoise interest of the SAC and that the development could be subject to an appropriate assessment.	The potential effect on cetaceans from ADDs has been considered within the Supporting Information document. HRA Screening has also been undertaken to determine 'likely significant effects' (LSE) on the integrity of the Inner Hebrides and Minches SAC and has determined that LSE are unlikely to result from the Extension. The Predator Control Plan (PCP) focuses on passive measures of predator deterrence e.g. effective husbandry, and outlines measures to be taken to reduce the potential disturbance effect of ADDs, should they require to be deployed.	Section 4.1, 4.22, Appendix E, Appendix L and Appendix N

Consultee	Stage	Identified Actions	Project Response	Cross Reference
		This application must be supported by a species impact assessment. The assessment should consider the direct and indirect impacts of the development upon the common porpoise interest of the SAC. The impact of seal scaring devices such as ADDs upon harbor porpoise must be considered at an individual development level and cumulatively, with others in inner Loch na Keal, as well as Loch Tuath. We would advise that any future planning application is supported by an ADD deployment plan, which details the following: • The model, firing details, frequency and number of ADDs within the target area (i.e. outer and inner Loch na Keal, as well as Loch Tuath) • Protocol for ADD activation/deactivation • Monitoring and review procedures for ADD usage Protocol and agreements to limit systematic ADD usage within the target area.	Should ADDs be required to be deployed, an ADD Deployment and Usage Plan will be followed. This plan details notification and record keeping procedures. Information on ADD use and effectiveness will be made available to Argyll and Bute Council, if requested. The ADD Plan is provided as supporting information to the planning application.	
SNH	Fish Farm Scoping Opinion	<u>Mingarry Burn SAC</u> We advise that although the proposal could have a significant effect upon the Mingarry Burn SAC it will not have an adverse impact upon site integrity. To minimize impacts upon local sea trout and wild salmon populations the application should however be supported by: • Predator control plan, • Escapees contingency plan, • Lice treatment and monitoring plan.	HRA Screening has been undertaken, and is provided with the planning application. This indicates that the Extension will not result in likely significant effects on any Natura 2000 sites. The documentation requested by SHC (Predator Control Plan, Escapes Plan and Lice Treatment and Monitoring Plan) forms part of the Environmental Management Plan submitted with the application.	Appendix N

Consultee	Stage	Identified Actions	Project Response	Cross Reference
SNH	Fish Farm Scoping Opinion	Several cetacean species are recorded within the Loch na Keal area. We would advise that the above assessment for harbour porpoise also considers the direct and indirect impacts of the development against these interests.	The Supporting Information provided with the application details the potential impacts on harbour porpoise, and the mitigation measures proposed. Potential impacts on the Inner Hebrides and Minches SAC have also been examined through the HRA Screening process and it is determined that the Extension will not result in likely significant effects on the integrity of the designation.	Section 4.1 and Appendix N

Table 3.9 Navigation, Anchorage, Commercial Fisheries, other non-recreational maritime uses (MOD) - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	The applicant is advised to consult with the Mull Fishermen's Association and the West Coast Regional Inshore Fisheries Group in the first instance.	SSC has consulted with the Mull Fishermen's Association and the West Coast Regional Inshore Fisheries Group. Neither group have raised significant concerns regarding the Extension.	Section 4.21
ABC MCDU	Fish Farm Scoping Opinion	The applicant is requested to submit mooring and pen coordinates, including maps detailing pen group and feed barge. In addition, the applicant is requested to provide full details of underwater and navigation lighting within the final application.	Equipment specifications have been included in the final planning application submission.	Appendix B

Table 3.10 Landscape and Visual Impacts - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	The applicant has further discussed with Argyll and Bute Council and SNH to undertake a full Landscape and Visual Impact assessment (LVIA) with agreed Zones of Theoretical Visibility (ZTV) to define viewpoint locations. It is suggested that these ZTV and photomontages should be taken from existing viewpoints.	Existing viewpoints have been considered in the ZTV and LVIA, along with additional viewpoints requested by SNH.	Appendix M
Scottish Natural Heritage (SNH)	Fish Farm Scoping Opinion	We advise that a LVIA should be produced for this proposal; there have been a number of stepped increases in the size of this fish farm and it is important to ensure that this proposal and any suggested mitigation are appropriate for this location. We note the basic LVIA within the scoping document and would encourage this to be built upon and supported by visuals/wirelines as required. Further details of any additional infrastructure (including feed barge design and location) should be given in a further application. The applicant should refer to our updated guidance.	An LVIA has been undertaken by a third party contractor. The LVIA and all visualisations contained within it have been produced in accordance with current SNH guidance. This application refers to two additional pens and associated mooring infrastructure. No further additional equipment is to be installed as part of this application. Potential cumulative landscape and visual impacts have been mitigated, as two pens will be removed from the Inch Kenneth site as part of this application.	Appendix M

Table 3.11 Noise - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)	Fish Farm Scoping Opinion	Based on information provided by the applicant, it is considered unlikely that the proposed expansion of this farm will result in increased levels of noise compared to the existing development.	There is no change proposed to the location of the feed barge. The generator used on the feed barge is housed within the structure and is soundproofed.	N/A

Table 3.12 Marine Cultural Heritage - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Historic Scotland	Fish Farm Scoping Opinion	We do not consider that the proposed extension to the existing Geasgill Fish Farm (consisting of additional two 100m circumference fish pens) is likely to have any significant adverse impacts on sites within our remits.	SSC agrees with this assessment. The Existing Site has been in operation for a number of years with no apparent adverse impacts on marine cultural heritage features in the area. Any impact of the addition of two pens to the Existing Site on marine cultural heritage features is expected to be minimal.	N/A

Table 3.13 Waste Management (non-fish) - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
No Scoping response received.				

Table 3.14 Socioeconomic, Access and Recreation - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
No Scoping response received.				

Table 3.15 Traffic and Transport - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
No Scoping response received.				

Table 3.16 Any other issue - Consultee scoping summary

Consultee	Stage	Identified Actions	Project Response	Cross Reference
Marine Scotland Science (MSS)	Fish Farm Scoping Opinion	The nature of the modifications proposed are not expected to impact husbandry procedures for the removal and disposal of mortalities on site, confirmation of this should be provided.	There is no change proposed to the established procedures for the removal and disposal of mortalities on the Existing Site, these will be rolled out across the Extension. A Fish Mortality Plan has been provided with the final planning application.	Appendix F
MSS		A draft farm management statement (FMS) or a farm management agreement (FMag) for the modified site should be submitted. Detailed information on strategies for the management of seal ice in the FMA have also been provided in the Environmental Management Plan (EMP).	A draft Farm Management Statement (FMS) has been prepared and is submitted with the final planning application. The FMS will be finalized following confirmation of the health status of the stocked fish.	Appendix G
MSS		Chemotherapeutant bath treatments will be administered in full enclosure tarpaulins or in a well boat. An efficacy statement for the practical application times should be submitted. Further information should be provided on how the impacts of treating additional pens will be managed on site so that	An efficacy statement, including application times for the Existing Site and Extension (i.e. 14 pens), has been submitted. Details on treatment strategy have been provided in the Environmental Management Plan.	Appendix E and Appendix D

Consultee	Stage	Identified Actions	Project Response	Cross Reference
		the risks to effective sea lice management on site and in the FMA are not increased from the proposed modifications.		
MSS		Recent changes made to SEPA's interim position statement on the use of emamectin benzoate may influence the quantities of SLCE permitted for use on site. Details should be submitted of how the expected permitted quantities of emamectin benzoate are proposed for use on site as part of the sea lice management plan. The applicant should make an assessment on any impact this may have on the overall sea lice management plan in order to demonstrate how they will ensure satisfactory measures remain in place on site for the control and reduction of parasites. It may be useful to indicate how SLICE has been utilized in previous cycles to demonstrate the change.	Information on proposed lice management at the Extension in relation to SEPA's interim position statement has been provided.	Section 4.9
MSS		The proposed contingency plan for dealing with an escape event should be updated with the correct contact details for the FHI prior to submission with the planning application but is otherwise satisfactory.	An updated Escapes Contingency Plan has been included in the Environmental Management Plan, submitted with the final planning application.	Appendix D
MSS		Assurance is sought that the nets, pens and any additional moorings equipment required are of a same standard as that currently used and evidence that equipment 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.	Equipment attestations and specifications have been provided with the final planning application.	Appendix B
Argyll and Bute Council Marine Coastal Development Unit (ABC MCDU)		The applicant should undertake pre-application discussion with relevant stakeholders including Argyll District Salmon Fisheries Board, the Mull fishermen's Association and the West Coast Regional Inshore Fisheries Group in the first instance. Where appropriate, the applicant should provide a summary of pre-application discussion undertaken with key stakeholders in support of a full planning application.	Pre-application discussion has been undertaken with the Mull Fishermen's Association and the West Coast Regional Inshore Fisheries Group. Neither organization has raised significant concerns regarding the Extension.	Section 4.21

4 SUPPORTING ENVIRONMENTAL INFORMATION

The information contained within this Section has been specifically requested by consultees (as outlined in Section 4) through the pre-application consultation process. The order of information follows that of Argyll and Bute Council (ABC)'s Screening and Scoping Opinion and the consultee requesting the specific information is indicated.

4.1 Species Impact Assessment (harbour porpoise and cetacean species) (Requested by: SNH)

4.1.1 Baseline Characteristics

The Extension lies approximately 500 m within the boundary of the Inner Hebrides and Minches SAC, which is designated for harbour porpoise, supporting important numbers of the UK population. HRA Screening, to assess whether the Extension is likely to result in likely significant effects on the integrity of the SAC has been undertaken and the results of this are presented in Appendix N.

All marine mammals recorded in the wildlife log at the Existing Site (including common seal, grey seal, otter, bottlenose dolphin and harbour porpoise) are European Protected Species (EPS). Harbour porpoise have been observed all year round and occur in low densities. Bottlenose dolphin have also been seen throughout the year, in low to moderate densities. Records also indicate that the surrounding waters are considered to be suitable habitat for these species, and they are considered to be resident in inshore waters on the west coast.

4.1.2 Assessment of Production Cycle Effects

Impacts that may affect cetacean species within the local area are considered to be:

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

The assessment of potential production cycle effects on harbour porpoise is presented in the HRA Screening Report (Appendix N) and are not discussed in this Section.

Entanglement Risk

The risk of entanglement for cetacean species with aquaculture infrastructure (moorings, nets and pens) is generally considered low[1]. Bottlenose dolphins have been recorded occasionally and in low abundance at the Existing Site in 2018, so the risk is considered to be low. No net entanglement of cetaceans has been recorded at the Existing Site to date, where a net tensioning system is installed to hold the pen nets uniformly taut. This presents a 'wall' to any underwater predator with no slack areas for entanglement. The use of a net tensioning system removes the need for predator nets and therefore eliminates the risk of entanglement for predatory species. The use of net tensioning is recognised by SSPO as good practice in terms of predator control. The net tensioning system

[1] Inner Hebrides and the Minches Proposed SAC – (Multi-agency) Advice to Support Management. Available at: https://www.nature.scot/sites/default/files/2017-10/Consultation%20-%20Harbour%20Porpoise%20-%20Inner%20Hebrides%20and%20the%20Minches%20pSAC%20-%20Combined%20Reg%2033%20%20MOP%20-%20A1918723.pdf. Accessed 06/03/2019

employed successfully at the Existing Site will be extended to the Extension (detailed in the Predator Control Plan, presented as part of the Environmental Management Plan, Appendix D). The potential for this impact is considered negligible as a result of the Extension.

Contaminants

Cetaceans may be at risk of bioaccumulation from chemical pollution, principally from persistent organic pollutants (POPs), due to their toxicity, abundance and persistence in the marine environment. Harbour porpoise and bottlenose dolphin were recorded occasionally at the Existing Ste, and the risk is considered to be negligible.

The Extension will maintain high standards of practice for the application of chemical treatments and waste management. Additionally, the coastal process of the Extension location will result in the dispersal and dilution of waste deposits in the vicinity (see Modelling Report, Appendix I). The potential for impact to cetaceans from contaminants associated with the Extension is therefore considered to be negligible.

Disturbance and Collision Risk from Marine Vessel Usage

Vessel activity associated with the Extension will primarily include the workboat for the Existing Site, a slow moving vessel used over short distances. This will be operated in accordance with best practise methods (such as the Scottish Marine Wildlife Code)[2]. The Extension will be served by the feed barge associated with the Existing Site (moored alongside the Existing Site at all times of the production cycle, there are no changes proposed to the location of the barge).

Feed administered via a feed barge causes low/ negligible noise levels compared to boat and raft methods (these can create greater levels of noise from open generators and feed sprayers). Although vessel activity could result in temporary avoidance behaviour in foraging marine mammals, the effect with be temporary and of low magnitude. In light of the above, any effects on cetaceans from the use of vessels associated with the Extension are expected to be minimal.

Underwater Noise

Not all delphinids (marine dolphins and porpoises) are similarly affected by ADDs. At-sea trials have shown that ADDs that produced an evasive response by bottlenose dolphins, failed to elicit any similar behaviour in common dolphins[3], with other research showing little notable response at all from ADDs from bottlenose dolphin.

The ADDs to be used at the Extension (OTAQ devices) will emit noise within the low frequency range of between 8 - 12 kHz, which is below the key hearing range for bottlenose dolphin, which lies between 40 to 100 kHz[4].

Bottlenose dolphins prefer coastal habitats and are often sighted all year round[5]. The Extension lies out with known important habitat 'hot spots' for bottlenose dolphins[5], therefore any potential effect from ADD on these dolphin species is predicted to be minimal.

[2] 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 01/03/2019

[3] 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

[4] Johnson, C.S. (1967). Sound detection thresholds in marine mammals, in: Tavolga, W.N. (Ed.) Marine bio-acoustics, Volume 2: Proceedings of the Second Symposium on marine bio-acoustics held at the American Museum of Natural History, New York, April 13-15, 1966. pp. 247-260

[5] Hebridean Whale and Dolphin Trust Website .https://hwdt.org/bottlenose-dolphin Accessed 06/03/2019

4.2 Acoustic Deterrent Devices (ADD) Deployment Plan (Requested by: SNH, ABC and ABC MCDU)

An ADD Deployment Plan has been prepared for the Geasgill site (i.e. including the Existing Site and the Extension) and is provided in Appendix L. The installation and operation of the Extension will require an additional four ADDs to be made available for use at the site.

The ADD Plan outlines the equipment specification for the Geasgill site, including model, firing details, frequency and number of units to be installed. The procedures in place for activating/ deactivating ADDs and recording performance are also provided. Furthermore, SSC commits to sharing this information with ABC, if required. Through adherence to the ADD Plan, SSC aims to demonstrate the commitment to limiting use of ADDs at the Geasgill site whenever possible.

4.3 Predator Protection Plan (predator control plan, detailing the sequential steps and triggers for specific control measures) (Requested by: SNH, ABC and ABC MCDU)

The Predator Control Plan (PCP) for the Existing Site has been amended to take into account the proposed additional pens. The PCP is contained within the Environmental Management Plan (EMP) (Appendix D).

The Predator Control Plan contains a wildlife assessment, based on sightings recorded in the site Wildlife Log and publicly available information[6] [7]. A summary of sightings recorded during 2018 at the Existing Site is provided in Table 4.1 below.

Table 4.1 Summary of Wildlife Log records (1st January 2018 – 27th December 2018)

Avian species	
• Cormorant (*Phalacrocorax carbo*) • Eider (*Somateria mollissima*) • Grey heron (*Ardea cinerea*) • Geese spp • Buzzard (*Buteo buteo*) • Black headed gull (*Chroicocephalus ridibundus*)	• Gannet (*Morus bassanus*) • Sea eagle (*Haliaeetus albicilla*) • Barn owl (*Tyto alba*) • Mallard (*Anas platyrhynchos*) • Black-throated diver (*Gavia artica)*
Mammal species (excluding cetaceans)	
• Common (harbour) seal (*Phoca vitulina*) • Otter (*Lutra lutra)*	• Grey seal (*Halichoerus grypus*)
Cetacean species	
• Bottlenose dolphin (*Tursiops truncatus*) • Harbour porpoise (*Phocoena phocoena*)	

The wildlife assessment indicates that seals are likely to be the most common predatory species potentially associated with the Extension. Any effects on seals and predatory bird species during the operation of the Extension will be associated with the management and mitigation measures detailed in the PCP. These measures include the following;

[6] Stone, C.J. *et al*, (1995), An atlas of seabird distribution in north-west European waters, 326 pages, A4 softback, ISBN 1 873701 94 2
[7] Marine Scotland National Marine Plan Interactive. https://marinescotland.atkinsgeospatial.com/nmpi/. Accessed 09/05/2019

- Appropriate husbandry practices which aim to reduce stock mortality that may inadvertently attract predators;
- Selection of the most appropriate new designs and tensions, with installation of Seal Blind (false bottom) nets;
- Tensioned top nets with supports to prevent bird attacks;
- Use of Acoustic Deterrent Devices (ADDs) to deter seal attacks; and
- Maintenance of a Wildlife Log to help assess and monitor changes in wildlife occurrence and distribution in marine habitats surrounding the Development over time.

Should it be determined to be necessary to use ADDs at the Extension, the decision-making process (including recognised triggers) will be documented and agreed with ABC, and ADD use will be in line with an ADD Deployment Plan (provided as Appendix L). This will ensure that any potential impact from ADD on non-target species is kept to a minimum.

4.4 Escapes Contingency Plan (Requested by: SNH, ABC and ABC MCDU)

The Escapes Contingency Plan (ECP) for the Existing Site has been amended to take into account the proposed additional pens. The ECP is contained within the Environmental Management Plan (EMP) (Appendix D).

4.5 Lice Treatment and Monitoring Plan (It is suggested that given the scale of expansion, consideration should be given to the provision of site specific information in relation to sea lice management, in order to determine how well the existing site is performing). (Requested by: SNH, ABC and ABC MCDU)

The Environmental Management Plan (Appendix D) provides details of the lice treatment and monitoring plan proposed to be employed across the Existing Site and Extension. The plan outlines a number of measures that will employed at the site to minimise any potential risk of sea lice infestation across the Existing Site and Extension.

Sea lice control measures in place at the Existing Site have recorded significant improvements in lice control in recent generations, with effective control predicted for future generations. A summary of the trends in sea lice populations at the Existing Site over the past three generations (2012 S0, 2014 S0 and 2016 S0) as well as the current generation (2018 S0) up to April 2019, are presented in Chart 4.1 (below), and demonstrates that although earlier generations experienced higher levels of sea lice, an improving picture in the success of sea lice control is evident in more recent generations, particularly in the current generation, where lice levels are low.

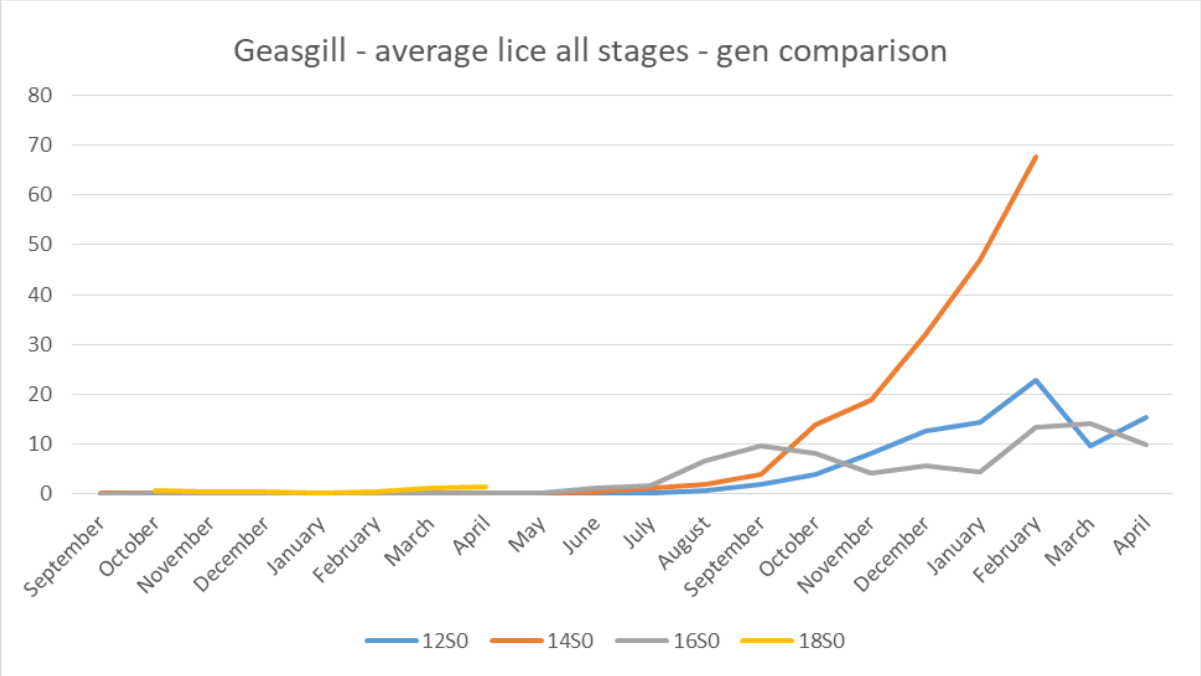

Chart 4.1 Monthly Trends in Sea Lice Production at the Existing Site

4.6 Landscape and Visual Impact Assessment with agreed Zones of Theoretical Visibility to define viewpoint locations. (Requested by: SNH, ABC and ABC MCDU)

ABC noted that the ZTV and photomontages should be taken from existing viewpoints and that any development should consider/ include; scaled diagrams and photomontages including pens, top nets, feedbarge and any other ancillary equipment (pen and top net height).

A chartered Landscape Architect has undertaken a Seascape, Landscape and Visual Appraisal (SLVA) including preparation of a ZTV to define viewpoint locations. Existing agreed viewpoints were included in the SLVA, and a number of additional viewpoints agreed with SNH. These viewpoints, and the potential effects on them, are considered in the SLVA, provided as Appendix M.

The Extension comprises an additional 2 x 100 m circumference pens immediately east of the Existing Site. The pens will be equipped with bird nets, supported by 'hamster wheel' supports. No further surface equipment will be required as part of this proposed development.

The main visual effects will be experienced by footpath users on Ulva due to close distance and slightly elevated views from the land. However, fish farming is a typical feature of this local area and the addition of two pens is not considered uncharacteristic. The landscape of the Loch na Keal NSA is vast, dwarfing the Extension which forms a small feature in the wider seascape.

The addition of two further pens is considered to be a slight to negligible change due to the addition of more man-made features at this location. However, the changes neither detract nor contributes to the seascape or visual resource resulting in neutral landscape and visual effect at the Existing Site.

The Extension is located entirely within the Loch na Keal NSA. Due to the limited size of the Extension within the context of the Existing Site and the large-scale landscape and varied coastline of the NSA it is considered there will be no landscape effects on the NSA. Moreover, two pens will be removed from the Inch Kenneth site as part of the proposal, therefore there will be no overall increase in cage infrastructure in the NSA as a result of this development and therefore no cumulative effect.

It is considered there will be no adverse landscape and visual effects or adverse cumulative effect as a result of the Extension.

4.7 Priority Marine Feature Impact Assessment and Mitigation Plan (Requested by: SNH and SEPA)

4.7.1 Introduction

SNH requested that a survey for Priority Marine Features (PMF) within and adjacent to the application site was undertaken. It was also requested that a PMF impact assessment and mitigation plan should be submitted.

SEPA stated that a number of species/ components of PMFs were known to be present within the vicinity of the fish farm, including; burrowed mud, northern sea fans and sponge communities, tall seapen, native oysters, sand goby, ling, saithe, harbour seal and basking shark.

SSC has consulted publicly available data, and previous benthic surveys undertaken at the Existing Site, to determine presence and quality of PMFs within, and adjacent to, the Extension area. SNH advised that a visual survey would not be required for the Extension, if the increase in Allowable Zone of Effect (AZE) was within the thresholds stated by SEPA[8]. The Allowable Zone of Effect (AZE), which is the area of acceptable benthic impact, for the Existing Site is 100,286 m^2. This is predicted to increase by 6,143 m^2 to 106,429 m^2 as a result of the Extension. This represents a 6% increase in spatial footprint, and is well below the SEPA threshold for a video survey requirement, therefore no additional video survey has been undertaken for this development.

4.7.2 Benthic Habitats and Species

4.7.2.1 Baseline Characteristics

A benthic survey was undertaken by SSC in January 2018, to monitor compliance with the SEPA CAR Licence conditions for the Existing Site, this involved collection of sediment samples at seven stations along pre-defined transects using a van Veen grab. Physico-chemical data was obtained, including sediment descriptive information, particle size analysis, redox and sediment chemistry. Benthic macrofauna were also sampled, with identification to the lowest level possible.

The benthic footprint associated with the Existing Site extends in both an easterly and westerly direction from the site, and the primary sampling transect is to the east. Therefore, the stations sampled in the 2018 benthic survey are located underneath where the potential benthic footprint from the Extension would be. The seabed slopes in an eastwards direction to depths in excess of 40 m. The average depth across the Existing Site and Extension is 28.9 m.

Sediment across the Existing Site footprint was predominately soft sand or muddy sand, with a small amount of coarser sediment at the southern end of the pens of the Existing Site. Sediment analysis demonstrated a reasonably uniform composition across the Existing Site footprint, with redox profiles positive throughout (no SEPA Redox Action levels were exceeded). Sediment chemistry found low carbon LOI (loss on ignition) levels throughout the Existing Site footprint, with these being well within the SEPA Environmental Quality Standard (EQS) allowable limit.

Benthic macrofauna varied across the survey area and was determined by physical and chemical changes in the sediment, with the faunal analysis showing a diverse range of species with a moderate

[8] SEPA Fish Farm Manual: Annex F Seabed Surveys https://www.sepa.org.uk/media/114761/ffm_anx_f.pdf

abundance at all sampling stations. Conditions at the edge of the Existing Site benthic footprint are similar to those recorded at reference stations (Appendix H).

Publicly available information, on the NMPi, indicates that the broad habitat 'Northern Sea Fans and Sponge Communities' has been recorded approximately 140 m south-east of the additional pens which form the Extension[9]. This habitat is characterised by aggregations of the Northern sea fan and the cup coral (*Carophyllia smithii*). These component species are usually found on vertical surfaces of bedrock and boulders in depths of 10 m to 35 m, therefore potential impacts resulting from the installation and operation of the Extension have been considered (see Sections 4.7.2.2 and 4.7.2.3).

There are some recorded observations of burrowed mud component species (tall seapens) on Eorsa and the eastern shore of Loch na Keal, approximately 3.5 km from the Existing Site and Extension.

4.7.2.2 Assessment of Installation Effects

Installation effects will be restricted to the physical placement of moorings on the sea bed and the securing of pens and moorings into the rope and chain grid matrix, with a site specific design taking environmental conditions into account. Installation of the moorings will result in localised disturbance of the sea bed; however this is likely to be temporary, with disturbance effects on benthic habitats expected during the installation phase only.

Northern Sea Fan and Sponge Communities

This habitat and overall community has a medium sensitivity to physical change and loss of the seabed, with a medium sensitivity to abrasion or disturbance of the seabed[10].

There are no records of the component species of Northern Sea Fan and Sponge Communities within the benthic footprint of the Existing Site or the Extension area. The closest recorded observation is approximately 90 m south-east of edge of where the proposed Extension deposition footprint is predicted to extend to. The moorings associated with the Extension will not extend to this area, therefore there is predicted to be minimal impact associated with the mooring installation.

4.7.2.3 Assessment of Production Cycle Effects

During the Extension production cycle it is recognised that waste material, including uneaten food, fish faeces and chemical residues from sea lice bath treatments may deposit on benthic habitats within the Extension footprint. Potential impacts on benthos include the following:

- Deposition of waste, resulting in the sedimentation and smothering of benthic habitats;
- Blocking of water, oxygen and nutrient exchange; and,
- Prevention of filter feeding organisms from effectively feeding and thriving.

Materials in the form of waste feed, which may contain in-feed medicine residues if they have been used at site such as SLICE (Emamectin benzoate, for the treatment of sea lice), and fish faeces may collect on benthic habitats directly under fish farm pens. Waste 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.

Where waste deposition forms a 'footprint' of impact (i.e. the Allowable Zone of Effect), smothering of the seabed can result in anoxia, growth of bacterial mats and lead to changes in the faunal community. Where waste is re-suspended and transported elsewhere in the marine environment, this may reduce the effect of the deposition of benthic habitats directly under the pens and in the immediate environs.

[9] Marine Scotland National Marine Plan Interactive. Accessed 09/04/2019
[10] Marine Scotland FEAST tool. Available at: https://www.marine.scotland.gov.uk/FEAST/ . Accessed 09/05/2019

The Existing Site and Extension are characterised by moderate current velocities, and therefore a medium spatial footprint around the Site was expected, as well as some export from the model domain. Site specific depositional AutoDEPOMOD modelling has been carried out for the Extension and Existing Site (Appendix I) and indicates that 43% of waste sediment will be exported from the model domain, and that this exported mass may affect an area of up to 2.3 km^2, with local deposition of material immediately around the pen groups, and predominantly to the south and east of the pens[11]. The modelled resuspension frequency is considered to be moderate at the near-bed cell, with an estimated 1,075 tonnes potentially exported from the model domain per year. The effect of dispersion out with the modelled domain is expected to be comparable to background levels (4g/m^2/year), and therefore will not impact the wider area, other than insignificantly. For the purposes of AutoDEPOMOD, the wider area is considered to be Loch na Keal and the waters surrounding Staffa and its neighbouring islands.

Northern Sea Fan and Sponge Communities

Northern Sea Fan and Sponge Communities habitat is considered to be sensitive to organic enrichment and siltation changes, which may be associated with the effects of the build-up of waste material deposits from aquaculture operations[12]. Typically, an increase in organic particulate matter results in a reduction in species numbers, abundance and biomass (Pearson and Rosenberg, 1978). Certain component species are considered to have a low recoverability to siltation changes. Component species may also have a high intolerance to substratum loss, displacement, decrease in salinity, changes in oxygenation and extraction of other species[13].

The Existing Site has been in operation for a number of years, and does not appear to have an adverse effect on the closest observed recording of this feature. Depositional modelling predicts that the benthic footprint of the Extension will extend slightly to the east of the Existing Site footprint, but that there will still be approximately 90 m between the edge of modelled Extension footprint and the recorded observation of the PMF. As noted above, the effect of waste dispersion out with the AZE is predicted to be similar to background levels (4g/m^2/year) therefore, it there is expected be a minimal impact on this feature, as a result of the Extension.

4.7.2.4 Mitigation Measures and Ongoing Monitoring Requirements

During the installation phase, moorings can be micro-sited to avoid sensitive benthic habitats and species, which may be vulnerable to physical disturbance. ROVs may be utilised to ensure that the mooring anchors are placed on the seabed in areas where identified sensitive species and habitats are not present; therefore it is considered unlikely that any such species will be impacted by Development installation.

Benthic Habitats and Species

Mitigation will be employed to minimise waste with monitoring undertaken to assess the extent of waste deposition against SEPA licence conditions. An application for a variation to the existing SEPA CAR licence (CAR/L/1000808) is currently being determined and a determination is expected in July 2019. This variation is for the proposed pen location, arrangement and biomass required, with sufficient sea lice medicine to effectively treat the proposed biomass. Regular monitoring will be undertaken to ensure that benthic impacts do not exceed the limit specified in the CAR licence.

[11] SSC, 2013 Biomass and In-Feed Modelling Report
[12] Marine Scotland FEAST tool. Available at: https://www.marine.scotland.gov.uk/FEAST/. Accessed 09/05/2019
[13] MarLIN, 2018. Northern Sea Fan. Available at: https://www.marlin.ac.uk/species/detail/1276. Accessed 22/04/2019

4.7.3 Harbour seals

4.7.3.1 Baseline Characteristics

The Extension is located within the foraging range (i.e. within 30 km for harbour seals) of seven seal haul-out sites (SHOs)[14]:

- WSS-012 Inch Kenneth and Geasgills, the Existing Site and Extension are located within this SHO;
- WSS-004 South Ulva Islands and Little Colonsay, approximately 2 km east of the Extension;
- WSS-006 Laggan Bay (Mull), approximately 4 km north of the Extension;
- WSS-003 Loch na Corrobha Skerries, approximately 9 km south of the Extension;
- WSS-007 Eilean an Fheoir, approximately 10 km south-west of the Extension;
- WSS-008 Arinthluic, approximately 28 km north-west of the Extension; and
- WSS-011 Friesland, approximately 30 km north-west of the Extension.

SHOs are onshore coastal areas where seals come ashore to rest, moult or breed. Seals using these habitats are legally protected from intentional or reckless harassment. The closest seal haul out to the Extension is WSS-012 Inch Kenneth and Geasgills, within which the Existing Site is located (approximately 140 m within boundary). This SHO comprises the entire islands of Inch Kenneth, Geasgill Mor and Geasgill Beg, and associated rocky outcrops. Potential impact on seals from fish farm operations may include; deliberate mortality (via licensed dispatch), and accidental mortality (through net entanglement).

4.7.3.2 Assessment of Production Cycle Effects

Harbour Seals

Harbour seals have a core foraging range of 30 km from haul out sites[15], therefore the Extension is at risk from predation from a relatively large and widespread resident seal population, and thus the effect of any impact could potentially have a large, albeit low magnitude, zone of influence.

One of the methods available to deter seal depredation is the use of Acoustic Deterrent Devices (ADDs). To date, the measures utilised on existing SSC sites have been effective in reducing seal predation, with no evidence of direct impacts, such as injury or morality recorded. The primary potential impact of ADD use is the disturbance or displacement of seals from important feeding or breeding areas. SHOs WSS-008 and WSS-011 are considered remote from the Extension; therefore potential for interaction with, and accidental disturbance of, seals from the Extension is considered negligible. SHOs WSS-003, WSS-004, WSS-006 and WSS-007 are located closer to the Extension, and the Extension is located within SHO WSS-012; therefore should seals from these haul-outs be using underwater habitats for foraging within vicinity of the Extension, it is possible that they may be disturbed by increased underwater noise should ADDs be employed at the Extension. 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. 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 Extension for commuting and foraging.

[14] https://www2.gov.scot/Topics/marine/marine-environment/species/19887/201814/haulouts . Accessed 01/02/2019

[15] 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

The Existing Site is also located within SHO WSS-012, and ADD use at the Existing Site does not appear to impact on feeding in, and use of, habitats within this area. The Extension will employ the same type of ADDs and the same mechanism of use, when necessary, as the Existing Site, therefore it is considered that the ADD use at the Extension will result in a minimal impact on seals utilising the surrounding habitat. Any effects of disturbance and displacement associated with ADD use will be minor, temporary effects on rogue seals. The use of ADDs will be managed through the Predator Control Plan and an ADD Deployment and Usage Plan.

As there is an Existing Site at Geasgill, any additional vessel activity will be localised to the Extension, with regular movements from small rapid staff transfer boats and less frequently, larger fish harvest vessels. Vessel movements associated with the Existing Site and neighbouring SSC site at Inch Kenneth already take place within the Inch Kenneth and Geasgills SHO site (SHO WSS-012), with no apparent disturbance of seals using this site. There will be a minor increase in vessel movements throughout the production cycle from the existing SSC Ulva Ferry shorebase, which is located approximately 2 km to the north of this SHO, however any impact is expected to be minimal. The potential for accidental disturbance of seals using this haul-out from vessels associated with the Extension is therefore considered low and unlikely.

Despite the moderate level of seal activity in the local environment (determined from wildlife logs at the Existing Site), only one seal licence for the dispatch of a 'rogue' seal at the Existing Site has been required over the last three years. This suggests that the non-lethal predation prevention measures, as well as effective husbandry currently in place at existing SSC sites, are very successful at reducing seal predation of stock and thus the potential effects of the fish farm on local seal populations. Application of seal licences at the Extension will only be considered where other management options are precluded or have proven unsuccessful in deterrence. It is considered that the seal licence for the Existing Site is adequate to cover the Extension at this time, this will be reviewed annually.

As the measures utilised on the Existing Site will be rolled out to the Extension, any potential impact on seals in the surrounding area is predicted to be minimal. It is therefore expected that the requirement for rogue seal dispatch remains low and the impact would be of low magnitude.

4.7.3.3 Mitigation Measures and Ongoing Monitoring Requirements

Effects on harbour seals during the Extension production cycle will be managed and mitigated by a series of specific measures, detailed in the site specific PCP (Annex 2 of Appendix D). These include the following:

- Appropriate husbandry practices which aim to reduce stock mortality that may inadvertently attract predators;
- Use of the most appropriate net designs and tensions, including installation of Seal Blind (false bottom) nets;
- Tensioned top nets with supports to prevent bird attacks;
- Use of Acoustic Deterrent Devices (ADDs) to deter seal attacks; and,
- Maintenance of a Wildlife Log – to help assess and monitor changes in wildlife occurrence and distribution in marine habitats surrounding the Development over time.

The proposed ADD for the Extension will be the same as that which is in use at the Existing Site i.e. it will be a triggered system to ensure optimum efficiency and to reduce the likelihood of impacts on harbour porpoise. Details on the system to be used at the Extension are provided in the PCP and ADD Plan (Appendix L). Sightings of seals, in close proximity to the Extension and Existing Site, will be recorded by site staff regularly in the Wildlife Log. Seal activity associated with a threat to fish health and welfare will result in appropriate action being taken in line with the PCP.

As a last resort, seals which are found within a pen, or cause a persistent threat through frequent attacks, will be removed by specialist, licensed contractors. This practice will follow all requirements and strict guidelines, as determined in the Marine (Scotland) Bill, with respect to the shooting of seals[16].

4.7.4 Basking shark

4.7.4.1 Baseline Characteristics

NMPi data indicates that low density observations of basking shark (*Cetorhinus maximus)* have been recorded in the wider Loch na Keal area, however there have been no observations of basking shark recorded in the Existing Site wildlife log.

The Marine Biological Association's ('MBA') Marine Line Information Network ('MarLIN') tool shows the basking shark is not considered sensitive to underwater noise or visual disturbance[17], and has a medium level of sensitivity to collision risk and physical barriers to movement. The MBA however also 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.

4.7.4.2 Assessment of Production Cycle Effects

Whale and Dolphin Conservation (WDC) that if tensioned nets are used and maintained correctly, the risk of entanglements to basking sharks is significantly reduced[18]. Nets at the Existing Site are correctly tensioned and checked regularly, and the requirement for this is outlined in the site specific Predator Control Plan (PCP) and Escapes Contingency Plan (ECP). These standards and practices will be rolled out across the Extension, and the PCP and ECP updated accordingly. There have been no recorded incidents relating to entanglement of basking sharks at the Existing Site, therefore it is considered that the risk of entanglement at the Extension is very low.

4.7.5 Native oyster

NMPi data indicates that the area surrounding the Existing Site and Extension is suitable habitat for Native oyster (*Ostrea edulis)*, however there have been no observations of native oysters recorded during any benthic sampling at the site.

Native oyster are considered to have low resistance and low resilience, and are therefore considered to be highly sensitive, to physical disturbance of the seabed[19]. Installation of the moorings associated with the Extension will result in a highly localised, temporary disturbance. Benthic sampling for the Existing Site has been carried out within the area in which the Extension moorings will be located, there have been no recorded observations of Native oysters made in this area during this sampling.

Native oyster are also considered to have a low resistance and resilience, and are therefore considered to be highly sensitive, to smothering and siltation changes. The Existing Site has been in operation for a number of years and, whilst there have not been any recorded observations made of Native oysters through routine benthic sampling in the immediate vicinity of the site, it is known that there are Native oysters in the wider area. It is therefore considered unlikely that operations at the Existing Site are having an unacceptable impact on local Native oyster populations. The Extension will result in a minor

[16] Scottish Government (2010): Marine (Scotland) Act 2010 - Part 6 'Conservation of seals'. Available at: https://www.gov.scot/Topics/marine/seamanagement/marineact/Seals Accessed 19/12/2018

[17] https://www.marlin.ac.uk/species/detail/1438

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

[19] MarLIN sensitivity tool. https://www.marlin.ac.uk/species/detail/1146 Accessed 11 June 2019

increase in depositional footprint of 6%. Furthermore, the Extension will not result in a change in Locational Guideline category, which takes into account nutrient enhancement and benthic impact calculations. Therefore, it is considered unlikely that local Native oyster populations will be affected by levels of deposition associated with the operation of the Extension.

4.7.6 Other species (saithe, ling, sand goby)

The Existing Site and Extension are located in an area identified as potential spawning ground for saithe. The potential risk of deterioration of the quality of these waters as spawning ground for saithe as a result of the Extension is considered to be negligible.

4.8 Bath treatment modelling report (Requested by: MSS)

A bath treatment modelling report has been provided as Appendix I.

The modelled bath treatment amounts are provided in Table 4.2 below.

Table 4.2 Bath treatment model outputs

Bath Treatments – Recommended Mass (g)	
Azamethiphos – 3 hours	425.8g in 1.0 pens/3hr
Azamethiphos – 24 hours	219.7g in 1.0 pens/24hr
Cypermethrin – 3 hours	77.1g in 3.6 pens/3hr
Deltamethrin – 3 hours	28.9g in 3.4 pens/3hr

A SEPA CAR application, to modify the CAR licence at the Existing Site to include the Extension has been submitted. The application is to amend the pen configuration, maximum biomass and in-feed and bath treatments at the site. The application is expected to be determined in July 2019.

4.9 Information on the maximum biomass that can be treated on site after consideration of any potential impact of SEPA's interim position statement should be clearly presented, taking into account the relevant EQS (Requested by: MSS)

The Geasgill site currently has sufficient consent to enable 4x SLICE treatments at maximum biomass. SEPA's interim position prefers a maximum of 2x SLICE treatment at maximum biomass. This does not impact SSC's sea lice management plan, as SLICE is used in the early part of the cycle when the fish are small and below maximum biomass levels. If SEPA should adjust their position and reduce consent for Emamectin benzoate further, then SSC will utilise the tools at its disposal to ensure robust and effective sea lice control is maintained. This may involve stocking cleanerfish earlier than planned, administration of bath treatments, or mechanical intervention to keep lice levels low.

4.10 Evidence of the applicant's ability to control sea lice numbers on the current site; the evidence could take the form of an attestation indicating the existing site's compliance with the CoGP, their own targets and the success in treatment of lice on site (Requested by: MSS)

A specific attestation, detailing the information requested by MSS, has been provided as Appendix E. The information provided in Section 5.5 above also demonstrates that lice management is effective at the Existing Site.

4.11 Confirmation of removal and disposal of mortalities (Requested by: MSS)

There is no change proposed to the procedures for removal and disposal of mortalities currently in place at the Existing Site, these will be rolled out across the Extension. A copy of the Fish Mortality Plan is provided as Appendix F.

4.12 A draft farm management statement (FMS) or farm management agreement (FMAg) for the modified site. (Requested by: MSS, ABC and ABC MCDU)

The FMS for the Existing Site has been amended to take account of the Extension. A draft version of the FMS has been provided as Appendix G, this document will be finalised following confirmation of the health status of the fish stocked into the site. SSC is the sole operator of salmon farms within CoGP Management Area M-37, therefore a FMA is not a requirement for this area. All SSC sites within Loch na Keal and Loch Tuath are stocked, treated and fallowed synchronously. This will continue to be carried out across the operation of the Extension.

4.13 An efficacy statement for practical application times of chemotherapeutant bath treatments. (Requested by: MSS, ABC and ABC MCDU)

An Efficacy Statement has been provided as Appendix E, and demonstrates that the bath treatment amounts proposed at the site (i.e. across the Existing Site and Extension) are sufficient to allow for efficacious treatments.

The modelling predicts sufficient consent for both Excis and Alphamax for use as efficacious and practical treatment substances for control of sea lice. Under current practices, consents for both products allows treatment of the whole site within 1-2 working days, independent of resource, which is satisfactory under the SSC Sea Lice Management Strategy.

The consent for Azamethiphos does not allow for treatment in a full cone tarpaulin, however if biomass allows, a wedge tarp could be utilized and enable 1 pen per day to be treated. Treatment time could be reduced by treating within a wellboat, which can reduce the amount of medicinal product to be used, allowing for more pens to be treated per day.

4.14 Details of how the impact of the additional pens and increased treatment times will be managed on site so that risks to effective sea lice management on site and in the FMA are not increased from the proposed modifications. (Requested by: MSS)

The addition of two pens to the Geasgill site will not impact SSC's ability to manage sea lice at the site, or within the wider area. The additional pens would be the equivalent of an extra half day treatment with a mechanical vessel and two days at most if using bath chemotheraputant treatment intervention. Extended treatment shifts can be employed in order to treat the site more quickly, and additional treatment resource can be hired where a risk of sea lice escalation is identified.

The Efficacy Statement, provided as Appendix E, takes the additional pens into account and demonstrates that the modelled amounts are sufficient to treat the whole site (i.e. Existing Site and Extension). The Environmental Management Plan (Appendix D) provides details on the resources that will be available to treat the sites within CoGP M-37, and contains a number of scenarios which might impact on ability to treat, and provides measures which would be taken to minimise any disruption to planned treatments.

4.15 Full modelling (benthic, pollution, chemical and hydrographic) reports. (Requested by: ABC, ABC MCDU and SEPA)

Information on depositional and bath treatment modelling is provided as Appendix I. A hydrographic report, based on data collected in 2018 and which has been used to inform the depositional modelling for the extended site, is provided as Appendix J. Nutrient calculations have been undertaken, to assess potential impacts on the water column, and are provided as Appendix K.

4.16 Full ECE (Equilibrium Concentration Enhancement) calculation. (Requested by: ABC, ABC MCDU and SEPA)

A full ECE calculation has been provided as Appendix K.

In general, the site is classed as moderately flushed, typical of an outer loch location and is considered suitable for a development of the size and nature proposed. Current direction at all depths varied with depth and the major axes were orientated north-west (300^{o}) at the surface, north-west at midwater (310^{o}) and north-east at the seabed (140^{o}). Velocities were moderate with a maximum recorded velocity of 0.309 m/s (recorded at the sub-surface), and a re-suspension threshold of 9.5 cm/s was exceeded 20% of the time for the near-bed data. This indicates there will be moderate re-suspension at the site with some export of released solids from the grid. Current speed and direction showed clear 12.5 h periodicity at all depths and velocity showed clear spring neap variation. A summary report of hydrographic data gathered at the site is provided as Appendix J.

The Equilibrium Concentration Enhancement (ECE) equation was developed by Marine Scotland for the Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. 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 Tproduction-1)
- M = Total Consented Biomass (T)
- Q = Flushing Rate (m3 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 total volume of Loch Na Keal is estimated at 694,700,000 m^3, with a flushing time of 4.3 days. These values were used to calculate the flushing rate of Loch Na Keal as 58,968,720,930 m^3 yr^{-1}.

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 168 µg/l (Working arrangement Requirements of Statutory Consultees (SEPA, SNH, MSS 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, therefore the calculated cumulative ECE, added to background levels, should not be more than 50% of locally relevant background winter concentrations.

The ECE for the Existing Site (Table 4.3) is 2.04 µg L^{-1}, representing 1.21% of the SEPA EQS (168 µg L^{-1}).

Table 4.3 ECE calculations for the Existing Site at Geasgill

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
2091	Black	66.46	58968720930	0.0000028176	2.36	1.40
2091	OSPAR	57.75	58968720930	0.0000024483	2.05	1.22
2091	FRS	48.2	58968720930	0.0000020464	1.71	1.02

The ECE for the Extension is 0.40 µg L^{-1} (Table 4.4), which equates to just 0.24% of the SEPA EQS (168 µg L^{-1}).

Table 4.4 ECE calculations for the Extension at Geasgill

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
409	Black	66.46	58968720930	0.0000028176	0.46	0.27
409	OSPAR	57.75	58968720930	0.0000024483	0.40	0.24
409	FRS	48.2	58968720930	0.0000020464	0.33	0.20

In addition to the Existing Site, there is one other SSC site operating in Loch na Keal. The tonnage across both sites is shown in Table 4.5.

Table 4.5 Cumulative Biomass for Loch na Keal

Site name	Operator	Current Biomass	Proposed Biomass
Geasgill	SSC	2091	2500
Inch Kenneth	SSC	270	270
Total for Loch na Keal		2361	2770

Considering the potential cumulative impact, the ECE from all nearby fish farms within Loch Na Keal including the proposed extension to Geasgill was calculated as having a combined ECE of 2.53 µgL^{-1}. This is added onto the background value of 168 µgL^{-1} and gives a total value of 170.53 µgL^{-1}. This is below the EQS limit (50% above background level, at 252 µgL^{-1}) and therefore, it is anticipated that the risk of water body level impacts is low.

4.17 Final EMP. (Requested by: ABC and ABC MCDU)

The final Environmental Management Plan (EMP) has been provided as Appendix D. The EMP provides details on the proposed management measures and monitoring that will be used at the Geasgill site to reduce the potential risk posed to local wild salmonids.

4.18 Operational details for other sea lice management measures including cleanerfish and mechanical removal, and evidence of effectiveness of more recent sea lice management measures (cleanerfish and mechanical removal). (Requested by: ABC and ABC MCDU)

The requested details are contained within the Environmental Management Plan (Appendix D).

4.19 It is recommended that the Mull Fishermen's Association and the West Coast Regional Inshore Fisheries Group are consulted regarding potential interaction with fishing activity. (Requested by: ABC and ABC MCDU)

SSC met with the Mull Fishermen's Association (MFA) on 25th April 2019 to discuss the Extension, no significant concerns were raised regarding the proposed development. SSC also contacted the West Coast Regional Inshore Fisheries Group (WCRIFG) regarding the proposed Extension (by email on 30th April 2019), there have been no significant concerns raised regarding the proposed development.

4.20 Mooring and pen coordinates, including maps detailing pen group and feed barge, and full details of underwater and navigational lighting should be include with the final application. (Requested by: ABC and ABC MCDU)

These details are provided in Appendix B of this application.

4.21 Confirmation of pre-application discussions. (Requested by: ABC and ABC MCDU)

ABC requested that pre-application discussions should be undertaken with relevant stakeholders including: Argyll District Salmon Fisheries Board, the Mull Fishermen's Association and the West Coast Regional Inshore Fisheries Group in the first instance. It was requested that the applicant should provide a summary of pre-application discussion undertaken with key stakeholders in support of any full planning application.

This summary has been provided in Section 3.

4.22 HRA Screening

ABC noted that, '*as Geasgill is located within the boundaries of the Inner Hebrides and Minches Special Area of Conservation (SAC), designated for its Harbour porpoise population, the Treshnish Isles SAC which has been designated for an internationally important colony of grey seals and rocky reef habitat and that as the Mingarry Burn AC which is designated for its freshwater pearl mussel interest is located approximately 35 km from Geasgill, SNH and ABC's Marine and Coastal Development Officer have advised that the status of these sites means that the requirements of the Conservation (Natural Habitats, &c) Regulations 1994 as amended (the 'Habitats Regulations') apply. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on these SACs before it can be consented (commonly known as Habitats Regulations Appraisal). SEPA advise that they have yet to make HRA/ MPA assessments, it is recommended that further discussions are held with them in this regard*'.

HRA Screening has been undertaken and a summary report is provided in Appendix N. The Screening exercise concludes that the Extension will not result in significant effects on any Natura 2000 site.

5 STATEMENT OF PLANNING CASE

5.1 Planning History

The Existing Site is long established and was consented by the Crown Estate in 1998. The first known registration date is 1989, and consisted of 20 x 17m^2 square pens (with an area of 5,780 m^2).

In 2010, permission was granted for the Existing Site through the Audit and Review procedure under the Town and Country Planning (Marine Fish Farming) (Scotland) Order 2007, for 7 x 100 m circumference pens (with a reduced surface area of 5,559 m^2) and a feed barge. In October 2010, a modification was sought to this permission, specifically for the addition of 3 x 100 m circumference pens ('the 2011 Modification'). The 2011 Modification involved no increase in tonnage and an associated reduction in stocking density and was consented in March 2011 by the Scottish Ministers.

In addition to the 2011 Modification, a separate application was made to ABC in February 2014 for the installation of two additional pens in the gap between two pen groups (14/00520/FUL). This application was consented in July 2014.

The Existing Site has evolved over time and has been operating in a successful manner for over 30 years, in accordance with licencing and environmental quality standards. The Extension will operate in a similar manner to the Existing Site. SSC will utilise best practice and contribute to the Existing Site's ongoing commitment to the local area.

5.2 The Development Plan

5.2.1 Introduction

The Planning Act states that decisions on planning applications must be made in accordance with the Development Plan, unless material considerations indicate otherwise. The process for determining a planning application can be defined as:

- Identification and consideration of the relevant provisions within the Development Plan;
- Clarification of whether the Development is in accordance with Development Plan;
- Identification and consideration of relevant material considerations; and
- Conclusions on whether planning permission is justified.

The key planning policies that are applicable to the Extension have been reviewed. The key implications of the Extension have been established and compliance with the relevant policies has been assessed in order to aid ABC during the determination process.

5.2.2 The Development Plan

The Development Plan is the primary consideration when determining planning applications, and forms the basis for the assessment of the Extension. The weight which is to be given to relevant material planning considerations is a matter for the merits of each planning application.

The Extension falls under the jurisdiction of ABC as the local planning authority, therefore the relevant statutory Development Plan comprises the Argyll and Bute Local Development Plan 2015 ('the ABLDP'), including the relevant Supplementary Guidance (SG).

The ABLDP was formally adopted in March 2015 and is the primary document currently used to assess development proposals within the Argyll and Bute area. The plan sets out a vision statement and spatial strategy for how land will be used by developers for the 10-year period of this plan. By 2024, ABC will have created *'an economically successful, outward looking and highly adaptable area, which enjoys an outstanding natural and historic environment, where all people, working together, are able*

to meet their full potential and essential needs, locally as far as practicable, without prejudicing the quality of life of future generations'.

The ABLDP needs to be replaced in the next 1 – 2 years. The new Local Development Plan (ABLDP2) is currently in preparation, and will set out planning and development proposals for the next 10 years from 2020 and a vision for 20 years.

Consideration has been given to the relevant policies contained within the ABLDP during the design of the Extension. Individual policies are not quoted in full (for full policy wording please refer to the relevant Development Plan). The following general policies are relevant to the Extension:

- LDP STRAT 1: Sustainable Development;
- LDP DM 1: Development within the Development Management Zones;
- LDP 3: Supporting the Protection, Conservation and Enhancement of our Environment;
- LDP 5: Supporting the Sustainable Growth of Our Economy;
- LDP 9: Development Setting, Layout and Design;
- SG LDP ENV 1: Development Impact of Habitats, Species and Our Biodiversity (i.e. biological diversity);
- SG ENV 2: Development Impact on European Sites;
- SG ENV 3: Management of European Sites;
- SG LDP ENV 7: Water Quality and the Environment;
- SG LDP ENV 12: Development Impact on National Scenic Areas (NSAs);
- SG LDP ENV 14: Landscape;
- SG LDP CST 1: Coastal Development;
- SG LDP AQUA 1: Aquaculture Development;
    - Annex A: Planning Process for Aquaculture Development;
    - Annex B: Council Adopted Marine and Coastal Plans;
    - Annex C: Responsibilities of Statutory Authorities in Relation to Aquaculture Development; and
    - Annex D: Marine Planning Area for Aquaculture Development.

5.2.2.1 POLICY LDP STRAT 1: Sustainable Development

Policy LDP STRAT 1 states that developers should seek to demonstrate the following development principles, amongst others;

- Maximise the opportunity for local community benefit;
- Support existing communities and maximise the use of existing infrastructure and services;
- Conserve and enhance the natural and built environment and avoid significant adverse impacts on biodiversity, natural and built heritage resources;
- Respect the landscape character of an area and the setting and character of settlements; and
- Avoid having significant adverse impacts on land, air and water environment.

Community benefits

The Existing Site, alongside the other existing SSC sites on Mull provide direct and indirect benefits to the community. SSC provides community support on Mull in various forms, including supporting local initiatives such as beach cleans, shinty clubs, local SWI event, community barbeques and facilitating participation in the Theatres in Schools program. Furthermore, SSC spent approximately £1.8 million with local companies and suppliers on Mull in 2018. The Extension will ensure the continued support of businesses such as engineers, divers, garages, local shops and fishermen.

Impacts on biodiversity, natural and built heritage resources

In their Scoping Opinion, the Statutory Consultees determined that the Extension would not result in unacceptable impacts on biodiversity, natural or built heritage resources. Where potential impacts were identified, it was concluded that, with suitable mitigation measures employed, these impacts would be acceptable.

Landscape character

A chartered Landscape Architect has undertaken a Seascape, Landscape and Visual Appraisal (SLVA) of the proposed Extension. The SLVA was carried out for a number of viewpoints identified through consultation with ABC and SNH. It is considered there will be no adverse landscape and visual effects or adverse cumulative effect as a result of the Extension. The Extension is located entirely within the Loch na Keal NSA. Due to the limited size of the Extension within the context of the Existing Site and the large-scale landscape and varied coastline of the NSA it is considered there will be no landscape effects on the NSA. Moreover, two pens will be removed from the Inch Kenneth site as part of the proposal, therefore there will be no overall increase in cage infrastructure in the NSA as a result of this development and therefore no cumulative effect.

5.2.2.2 POLICY LDP DM 1: Development within the Development Management Zones

Policy LDP DM 1 notes that within Very Sensitive Countryside encouragement will only be given to specific categories of development on appropriate sites. These comprise:

- Renewable energy related development;
- Telecommunication related development;
- Development directly supporting agricultural, aquaculture, nature conservation or other established activity; or
- Small-scale development related to outdoor sport and recreation.

The Existing Site and the Extension are both located adjacent to land categorised as 'Very Sensitive Countryside'. The Extension would be seen in the context of the Existing Site and of small residential steadings and transient maritime travel associated with the loch and the workings and presence of the Existing Site. Due to the location of the Extension along the coastal edge and its limited size within the context of the Existing Site, any impact associated with the Extension is expected to be minimal.

5.2.2.3 POLICY LDP 3: Supporting the Protection, Conservation and Enhancement of our Environment

Policy LDP 3 states that a development will not be supported when it;

- Does not protect, conserve or where possible enhance biodiversity, geodiversity, soils and peat, woodland, green networks, wild land, water environment and the marine environment;
- Does not protect, conserve or where possible enhance the established character and local distinctiveness of the landscape and seascape in terms of its location, scale, form and design;

- Has not been ascertained that it will avoid adverse effects, including cumulative effects, on the integrity or special qualities of international or nationally designated natural and built environment sites; or
- Has significant adverse effects, including cumulative effects, on the special qualities or integrity of locally designated natural and built environment sites.

SSC has highlighted, through the Scoping report, the potential interactions with the natural environment associated with the Extension. Where interactions are expected, SSC has detailed the mitigation which will be employed at the Extension, such that any impact relevant aspects of the natural environment i.e. biodiversity of the marine environment, landscape and seascape and nationally designated sites, will be minimal.

An amendment to the SEPA CAR licence for the Existing Site has been applied for to take account of the Extension. The proposed licensable amounts of biomass and medicines are based on European-directed Environmental Quality Standards (EQS), which will ensure the sustainable operation of the site.

Benthic grab surveys of the area around the site have indicated that no Priority Marine Features (PMFs) are present in the area under where the Extension, or the modelled footprint, will be located. There are some historical records of Northern Sea Fan and Sponge Communities some distance from the Extension, however the modelled footprint of deposition from the site is predicted to lie approximately 90 m from this recorded observation location. At the edge of the modelled footprint, benthic conditions are predicted to be similar to background levels, therefore any potential impact on this feature will be minimal.

A detailed Landscape and Visual Impact Assessment has been undertaken and it has been concluded that no significant adverse impacts will result from the Extension. Any risk of cumulative landscape impacts will be reduced to negligible levels by the removal of two pens from the SSC site at Inch Kenneth, approximately 1.7 km to the south-east.

Nutrient enhancement calculations have been undertaken for the Extension, which demonstrate that the increase in tonnage associated with Extension will not result in an unacceptable increase in nutrient levels discharged from the Geasgill site. The calculations show that the increase in nutrient levels associated with the Extension is minor in relation to background levels. Calculations have also been undertaken on the cumulative nutrient discharge associated with all SSC sites in Loch na Keal, these also demonstrate that the predicted impact is negligible.

The Existing Site and Extension are located just inside the boundary of the Inner Hebrides and Minches Special Area of Conservation ('SAC'), which is designated for harbour porpoise, and is within the Loch na Keal National Scenic Area ('NSA'). The Treshnish Isles SAC and Cnuic agus Cladah Mhuile SPA are 14 km and 2 km distant from the Extension respectively. There are populations of wild salmon and sea trout present within Loch na Keal.

A Habitats Regulation Assessment ('HRA') Screening exercise has been carried out for the following designated areas;

- Inner Hebrides SAC;
- Treshnish Isles SAC;
- Cnuic agus Cladah Mhuile SPA;
- Treshnish Isles SPA; and
- Mingarry Burtn SAC

The Screening concludes that it is likely that the Extension will have no significant impacts on any of these Natura 2000 Sites.

Loch na Keal NSA

The Extension would be seen in the context of small residential steadings and transient maritime travel associated with the use of the Loch and indeed the workings and presence of the Existing Site. It is assessed that, due to the location of the Extension along the coastal edge, its limited size within the context of the Existing Site and the scale of the NSA, any effects would be minimal.

5.2.2.4 POLICY LDP 5: Supporting the Sustainable Growth of Our Economy

Policy LDP 5 states that ABC will support the development of new industry and business which helps deliver sustainable economic growth throughout the area by taking full account of the economic benefits of any proposed development and safeguarding existing industrial and business areas for employment uses. Aquaculture is recognised as a potential growth sector. SSC has a long historical presence on Mull and has provided significant support to local businesses. Mull remains an important production region for SSC, the Extension will strengthen SSC's operations on the island which, in turn, will provide ongoing support for local businesses.

5.2.2.5 POLICY LDP 9: Development Setting, Layout and Design

Policy LDP 9 states that ABC will require developer to produce and execute a high standard of appropriate design in accordance with defined criteria relating to development setting, layout and design. The design and layout of the Proposed Pens has been chosen specifically to minimise any potential visual impacts e.g. pens are of the same size, colour (dark, matt) and alignment as the pens installed on the Existing Site. An LVIA has been undertaken for the Extension, looking at the development in isolation and potential cumulative effects. The LVIA, including all visualisations, has been carried out in accordance with the current Scottish Natural Heritage (SNH) guidance. It has been assessed that any visual effects resulting from the Extension will be slight or negligible, from most viewpoints considered in the Seascape, Landscape and Visual Appraisal. The main visual effects will be experienced by footpath users on Ulva, however fish farming is a typical feature of this local area and the addition of two pens is not considered uncharacteristic. It is considered there will be no adverse landscape and visual effects or adverse cumulative effect as a result of the Extension.

5.2.2.6 SUPPLEMENTARY GUIDANCE SG LDP ENV 1: Development Impact of Habitats, Species and Our Biodiversity (i.e. biological diversity)

This Policy provides additional detail to Policy LDP 3 (Supporting the Protection, Conservation and Enhancement of our Environment) of the Adopted Argyll and Bute Local Development Plan. ABC commits to give full consideration to legislation, policies and conservation objectives such as that contained within the following;

- Habitats and Species listed under Annex I,II & IV of the Habitats Directive;
- Wildlife and Countryside Act 1981; (and as amended by the Nature Conservation (Scotland) Act 2004); Species listed on Schedules 1, 5, 7, 8, 9 and 14; and
- Wildlife and Natural Environment (Scotland) Act 2011. A Code of Practice on Non-Native Species supports this Act.

It is also stated that where there is evidence to suggest that a habitat or species of European, national and/or local importance exists on a proposed development site or would be affected by the proposed development, ABC will require the applicant, at his/her own expense, to submit a specialist survey of the site's natural environment, and if necessary a mitigation plan, with the planning application.

No significant concerns regarding potential impacts on sensitive habitats or species were raised by ABC or Statutory Consultees at Screening and Scoping stage that cannot be adequately addressed by the implementation of appropriate mitigation. Supplementary information has been provided by SSC with the planning application to provide further detail on the mitigation proposed at the Extension.

A total of 8 designated Haul-Out Sites ('HOS') and 3 grey seal breeding sites were recorded within 50 km from the Extension. It is anticipated that seals utilising HOS (i.e. individuals resting onshore) would not be subject to disturbance effects from ADD use due to the separation distance and being out with the water column.

A continually high level of seal activity was recorded around the Existing Site during the last production cycle, however it was only necessary to dispatch one rogue seal during this time, strongly suggesting that the non-lethal predation prevention measures, as well as effective husbandry, currently in place at the Existing Site, are very successful at reducing seal predation of stock and predator interactions, and thus the effects of the fish farm on local seal populations. The most prevalent method to deter seal depredation at the Existing Site is the use of ADDs. To date, these measures, which are managed via the site's Predator Control Plan (PCP), have been effective in reducing seal predation, with no evidence of direct impacts, such as injury or mortality recorded. As these measures would also be employed at the Extension, no additional interactions with seals are predicted.

HRA Screening has been undertaken in relation to the Inner Hebrides and Minches SAC (designated for harbour porpoise), Treshnish Isles SAC (designated for grey seal), Treshnish Isles SPA (designated for storm petrel and Greenland barnacle goose), Cnuic agus Cladah Mhuile (designated for golden eagle) and Mingarry Burn SAC (designated for freshwater pearl mussel). It has been determined that the installation and operation of the Extension will not result in likely significant effects on the integrity of these designations.

Wild Salmonids

The Loch na Keal system supports migratory salmonid species, and the associated wild fisheries are an important economic and social asset. Atlantic salmon is listed on Annex II of the Habitats and Species Directive and Schedule 4 of the Conservation (Natural Habitats, &c) Regulations 1994 (as amended), as such it is a protected species whilst in freshwater. Both sea trout and the multi-sea-winter component of the Atlantic salmon population are included in the UK Biodiversity Action Plan Priority Species List. In addition, both species are listed as Priority Marine Features in Scotland's seas.

Marine Science Scotland ('MSS') highlights that the siting of a farm and control of sea lice numbers are key factors in the mitigation of risk to wild salmonids as a greater number of lice on a farm leads to a greater risk to wild salmonids. Although it is not possible to accurately predict future sea lice numbers, the performance of existing farms could act as a guide to future levels of risk.

SSC is aware of the potential impact of sea lice on wild salmonids. Site specific sea lice mitigation measures have been developed for the proposal and are set out in the Environmental Management Plan ('EMP') submitted alongside the Application. Sea lice control would be undertaken in accordance with the principles of Integrated Sea Lice Management. The EMP details company procedures and a range of sea lice control measures, including:

- Good husbandry;
- Fallow periods;
- Stringent sea lice monitoring at the farm;
- Synchronised sea lice treatments to stay below the industry Code of Good Practice (CoGP) standard of 0.5 adult female lice per fish from 1st February to 30th June and 1 adult female lice per fish from 1st July to 31st January and a target of zero adult female lice in the spring;
- A full range of biological, mechanical, in-feed and bath treatments to produce lice free periods while the fish are on site; and
- Communication with all stakeholders in the area.

The Extension is located within the Marine Scotland Disease Management Area 16a. SSC is the sole operator in this DMA, operating the Existing Site and three further Atlantic salmon farms within the DMA. SSC would be able to synchronise sea lice control and treatment at the Extension with the Existing Site as part of an overarching Farm Management System ('FMS') incorporating both developments. A Sea Lice Efficacy Statement, including outputs from the relevant modelling reports for the proposed pen arrangement and biomass, has been included with the Application. This statement takes into account the proximity of the Extension to the Existing Site and the estimated time it would take to complete treatments across the whole site. The Extension will not impact SSC's ability to effectively treat sea lice at the site, or in the wider area.

In accordance with the Scotland's National Marine Plan, it should be noted that the Extension will not 'bridge' any Disease Management Areas.

Although best practice and management strategies would be applied, there would be a potential need for medicinal treatment to control and remove sea lice. SSC has applied for a Scottish Environment Protection Agency ('SEPA') Controlled Activity (Scotland) Regulations 2011 ('CAR') licence for the Proposed Development with adequate amounts of medicine to ensure effective sea lice treatment. A draft CAR licence has been issued by SEPA in June 2019.

In addition to the EMP, FMS and Sea Lice Efficacy Statement, a site specific Escapes Prevention and Contingency Plan, which details containment policies, as recommended by the Scottish Salmon Producers Organisation ('SSPO') and the CoGP, forms part of the Application.

In order to demonstrate the performance of sea lice control measures at the Existing Site, SSC has provided weekly average sea lice records to the SSPO. These data confirm that effective control sea lice takes place at the Existing Site. Furthermore, the SSPO publishes Fish Health Management Reports providing average lice counts for individual sites. Annual reports for the period 2014 to 2016 provide a summary of monthly average adult female sea lice counts and indicate effective control of sea lice in the region.

The EMP, FMS, Sea Lice Efficacy Statement and Site Specific Escapes Prevention and Contingency Plan form part of the Application and would establish a robust control mechanism within the planning permission to ensure sea lice numbers remain low through the life of the permission. As such the Extension is considered to comply with development plan Policies LDP 3 and SG LDP ENV 1.

The Extension is unlikely to affect protected sites, their setting of the integrity of their designation and therefore is considered compliant with SG LDP ENV 1.

5.2.2.7 SUPPLEMENTARY GUIDANCE SG LDP ENV 2: Development Impact on European Sites

Policy SG LDP ENV 2 states that where development is not directly connected with or necessary to the conservation management of a European site, proposed European site or Ramsar site and which is likely to have a significant effect on the site (either individually or in combination with other plans or projects) it will be subject to an appropriate assessment. Where it cannot be ascertained that the development would not adversely affect the integrity of the site it will not be supported unless:

- There is no alternative solution; AND,
- There are imperative reasons of over-riding public interest that may, for sites not hosting a priority habitat type and/or priority species, be of a social or economic nature.

The Existing Site and Extension are located approximately 500 m within the Inner Hebrides and Minches SAC, designated to protect harbour porpoise. ADDs would be used to deter predators, if considered necessary. The use of ADDs has the potential to disturb cetaceans, although the risk to the harbour porpoise feature of the SAC is considered to be low due to the separation distance.

HRA Screening has been undertaken in relation to the Inner Hebrides and Minches SAC, Treshnish Isles SAC, Treshnish Isles SPA, Cnuic agus Cladah Mhuile SPA and Mingarry Burn SAC. It has been determined that the installation and operation of the Extension will not result in likely significant effects on the integrity of these designations, therefore the Extension is considered to be compliant with SG LDP ENV 2.

5.2.2.8 SUPPLEMENTARY GUIDANCE SG LDP ENV 7: Water Quality and the Environment

Policy SG LDP ENV 7 states that developments that could affect the water environment will be assessed with regard to their potential impact on water quality and leisure and recreational facilities/ users. ABC will only permit developments that may have a significant detrimental impact on the water environment if it can be demonstrated that the impacts can be fully mitigated so as to ensure non-deterioration of waterbody status as required by the EU Water Framework Directive and the River Basin Management Plans covering Argyll and Bute.

Benthic impacts are monitored and regulated by SEPA under the Controlled Activity Regulations ('CAR') with advice from Marine Scotland and SNH. A SEPA CAR licence has been applied for the Site, pen arrangement and biomass set out in the Application. Regular monitoring of the seabed would be undertaken to ensure benthic impact does not exceed the limit specified in the CAR licence.

Short-term and long-term organic and sea lice medicine deposition rates have been predicted for the Proposed Development based on feed and medicine inputs, water depth and current data. The modelling results indicate that short term deposition of waste would be restricted to the area beneath the pen groups. Beyond the immediate area no measureable impact is predicted due to the flushing characteristics of the area.

The likely increase in nutrient levels within the water column and the cumulative overall proposed increase in nutrient tonnage as a result of the farm have been determined by an ECE (Equilibrium Concentration Enhancement) calculation as described in Appendix K. The ECE calculation shows that the nutrient input from the Extension is minimal and is unlikely to cause enrichment of the surrounding waterbody. When nutrient input from the Extension is added to the nutrient levels from the Existing Site, the overall nutrient input is also predicted to be low and unlikely to cause enrichment of the surrounding waterbody.

The Marine Scotland Locational Guidelines (March 2018) class Loch na Keal as a Category 3 area, it is therefore considered to be an acceptable location for fish farm development.

The Extension is considered to be acceptable in relation to Policy SG LDP ENV 7.

5.2.2.9 SUPPLEMENTARY GUIDANCE SG LDP ENV 12: Development Impact on National Scenic Areas (NSAs)

Policy SG LDP ENV 12 states that ABC will resist any development in, or affecting, National Scenic Areas that would have an adverse effect on the integrity of the area, or that would undermine the Special Qualities of the area unless it is adequately demonstrated that any significant adverse effects on the landscape quality for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance. In all cases the highest standards, in terms of location, siting, design, landscaping, boundary treatment, materials and detailing will be required for developments within a National Scenic Area. Developments will be expected to be consistent with Policy LDP 9 – Development Setting, Layout and Design, associated SG and the relevant Argyll and Bute Landscape Capacity Assessment.

An SLVA has been undertaken for the Extension, including potential cumulative effects on the Loch na Keal NSA. The Extension is located entirely within the Loch na Keal NSA. The Extension would be seen in the context of the small residential steadings and transient maritime travel associated with the use

of the loch and the workings and presence of the Existing Site. Due to the limited size of the Extension within the context of the Existing Site and the large-scale landscape and varied coastline of the NSA it is considered there will be no landscape effects on the NSA. Moreover, two pens will be removed from the Inch Kenneth site as part of the proposal, therefore there will be no overall increase in cage infrastructure in the NSA as a result of this development and therefore no cumulative effect. The Extension is therefore considered to be compliant with SG LDP ENV 12.

5.2.2.10 SUPPLEMENTARY GUIDANCE SG LDP ENV 14: Landscape

Whilst this Policy relates to development out with National Scenic Areas, it still contains criteria relevant to the Extension. The Policy states that ABC will resist development when its scale, location or design will have a significant adverse impact on the character of the landscape unless it is demonstrated that:

- Any such effects on the landscape quality are clearly outweighed by social, economic or environmental benefits of community wide importance; AND
- ABC is satisfied that all possible mitigation measures have been incorporated into the development proposal to minimise adverse effects.

Developments will be expected to be consistent with Policy LDP 9 – Development Setting, Layout and Design.

The Proposed Pens would be circular, constructed of non-reflective material and of a low profile on the water. The pen group would be aligned parallel with the shoreline, consistent with the arrangement of the pens within the Existing Site. Underwater lights would be used in each Proposed Pen at specific times throughout the production cycle, during periods of reduced daylight hours. No surface lighting would be used on the Extension, apart from that specified on the Marine Licence and to light the working deck for health and safety purposes during occasional short term staff visits outside daylight hours.

Based on an assessment of the Landscape and Visual receptors that were identified as having the potential to be affected by the Extension, a desk based assessment and site visit have been carried out. It is assessed that effects will be slight to negligible.

This is based on a number of factors such as:

- The context of the Existing Site;
- The limited scale of the Extension;
- The large scale of the receiving landscapes, including designated landscape and Landscape Character Types; and
- The proximity and nature of the landscape and visual receptors.

The Extension is assessed within Appendix M and is considered acceptable in relation to Policy SG LDP ENV 14 and Policy LDP 9.

5.2.2.11 SUPPLEMENTARY GUIDANCE SG LDP CST 1: Coastal Development

Policy SG LDP CST 1 states that, in order to safeguard the special environmental and/ or cultural qualities of Argyll and Bute's coastal areas, development proposals on or adjacent to the coast or that have an impact on the coast will require:

- To demonstrate that any positive or negative impacts on the ecological status of coastal and transitional water bodies and coastal processes have been addressed to the planning authorities satisfaction; and

- To assess the proposal against the conservation objectives of any affected Marine Protected Area and the national status of Priority Marine Features; and
- To assess the proposal's impact on existing marine and coastal commercial and recreational activity; and
- To demonstrate that the National Marine Plan, any relevant Regional Marine Plans and ABC adopted local ICZM and marine plans have been taken into account.

The Scoping responses received from ABC and Statutory Consultees has indicated there are no significant concerns with the Extension that cannot be adequately addressed through the mitigation proposed. Consultees have requested supplementary environmental information on particular elements of the Extension, and SSC has provided this information with this planning application.

5.2.2.12 SUPPLEMENTARY GUIDANCE SG LDP AQUA 1: Aquaculture Development

Policy SG LDP AQUA 1 states that ABC will support the sustainable development of finfish proposals where there are no direct, indirect of cumulative significant adverse effects on the Development Criteria in relation to the locational characteristics of the development, and the applicant can demonstrate that level of risk of potential impacts on any Development Criteria, relating to the operation of the site, can be effectively minimised or mitigated by appropriate operational measures.

The Development Criteria are noted as being; landscape/ seascape and visual amenity; isolated coast and wild land; historic or archaeological sites and their settings; priority habitats/ species and designated sites; ecological status of water bodies and biological carrying capacity; commercial and recreational activity; amenity; and economic impact.

The effects of the Extension on the Development Criteria are discussed in Sections 3.2.2.1 to 3.2.2.11. In summary, the Extension would not result in any unacceptable effects upon the outlined criteria. As a result, the Extension is considered to fully comply with Policy SG LDP AQUA 1.

5.3 Relevant Material Considerations

The Extension has been assessed for compliance against the following key material planning considerations.

5.3.1 Scottish Planning Policy (2014)

Scottish Planning Policy (SPP) sets out national planning policies which reflect the Scottish Ministers' priorities for the operation of the planning system and for development and use of land. SPP promotes consistency in the application of policy across Scotland whilst allowing sufficient flexibility to reflect local circumstances. SPP is a material consideration in the determination process for planning applications. SPP highlights the Scottish Government's support for the sustainable growth of the aquaculture sector and the significant contribution it makes to the Scottish economy, particularly for coastal and island communities.

In relation to supporting aquaculture the key policy principles listed are that the planning system should:

- Play a supporting role in the sustainable growth of the finfish and shellfish sectors to ensure that the aquaculture industry is diverse, competitive and economically viable;
- Guide development to coastal locations that best suit industry needs with due regard to the environment; and
- Maintain a presumption against further finfish farm development on the north and east coasts to safeguard migratory fish.

SPP is a non-statutory document which sets out the Scottish Government's policy on land use planning and therefore should be afforded significant weight in the determination process for planning applications.

The Extension is considered to fully comply with the principles of the SPP, as it will contribute to the sustainable growth of the aquaculture industry, leaving minimal effects on the environment and amenity.

5.3.2 National Planning Framework 3 (2014)

National Planning Framework 3 (NPF3) is a statutory document and is the most recent expression of Scottish Government strategy for long-term spatial development. Its findings, including its reiteration of support for growth of the aquaculture sector, should be afforded significant weight in the determination of planning applications.

Paragraph 2.36, under the heading 'A sustainable, successful place', aquaculture is identified as '*…an important aspect of the economy across parts of coastal Scotland supporting many jobs – often in small communities – and representing a significant element of Scotland's exports. The industry has identified ambitious growth targets which we want to see realised*.'

NPF3 identifies that support for the sustainable growth of the aquaculture sector, including through the work of the Ministerial Group for Sustainable Aquaculture, is a key long-term goal for the Scottish Government. The Extension is considered to fully accord with this policy goal by expanding and diversifying the aquaculture industry.

5.3.3 Scotland's National Marine Plan (2015)

Scotland's National Marine Plan was introduced in April 2015 and was prepared in accordance with EU Directive 2014/89/EU of July 2014. The Plan provides a single overarching framework for managing activities within both inshore and offshore waters for the protection of the environment. In regard to aquaculture the Plan states '*Aquaculture contributes to sustainable economic growth in rural and coastal communities, especially in the Highlands and Islands …*', and as a growth industry aquaculture has '*…potential to contribute to future community cohesion by providing high quality jobs in rural areas and help to maintain community infrastructures such as schools, ferries and other services subject to the continued management of risk'*.

The National Marine Plan contains 14 policies relating to aquaculture, those directly relevant to the Proposed Development are:

- Aquaculture 3: In relation to nutrient enhancement and benthic impacts, as set out under Locational Guidelines for Authorisation of Marine Fish Farms in Scottish Waters, fish farm development is likely to be acceptable in Category 3 areas subject to other criteria being satisfied (see section 3.2.2.8 above). Loch na Keal is categorised as a Category 3 area by Marine Scotland Science, and is therefore considered to be an acceptable location for fish farm development.
- Aquaculture 5: Aquaculture developments should avoid and/or mitigate adverse impacts upon the seascape, landscape and visual amenity of an area, following SNH guidance on siting and design of aquaculture (see sections 3.2.2.9 and 3.2.2.10 above).
- Aquaculture 7: Operators and regulators should continue to utilise a risk based approach to the location of fish farms and impacts on wild fish (see section 3.2.2.6 above).
- Aquaculture 8: Guidance on harassment at designated seal haul out sites should be taken into account and seal conservation areas should be taken into account in site selection and operation. Seal licences will only be granted when other management options are precluded or have proven unsuccessful in deterrence (see section 3.2.2.6 above).

- Aquaculture 9: Consenting and licensing authorities should be satisfied that appropriate emergency response plans are in place (the emergency response plan forms part of the EMP submitted alongside the Application).
- Aquaculture 10: Operators should carry out pre-application discussion and consultation, and engage with local communities and others who may be affected to identify and, where possible, address any concerns in advance of submitting an application.

5.3.4 Rural Economy and Connectivity Committee Report on Salmon Farming in Scotland (2018)

The Rural Economy and Connectivity Committee (RECC) of the Scottish Parliament published a report on salmon farming in Scotland in November 2018. The remit of the which was to consider the current state of the salmon farming industry in Scotland, identify opportunities for its future development and explore how the various fish health and environmental challenges it currently faces can be addressed.

The report provides extensive conclusions and recommendations to the Scottish Government for all areas of the salmon farming industry. The Scottish Government will deliberate on these recommendations prior to updating legislation surrounding the industry.

The report highlights issues relating to fish health and sea lice as being key concerns, as well as the environmental impact of salmon farming, the location of farms and the possible impact of climate change. These recommendations were considered throughout the design evolution of the Extension and application process.

5.3.5 A Fresh Start: The Renewed Strategic Framework for Scottish Aquaculture (2009)

The renewed Strategic Framework for Scottish Aquaculture[20] published by the Scottish Government in 2009 sets out the shared vision of the Ministerial Working Group on Aquaculture for the sustainable growth of the industry and provides a platform to ensure a strong future for the industry in Scotland. It has five key themes:

- Healthier fish and shellfish;
- Improved systems for licensing aquaculture and developments;
- Improved containment;
- Better marketing and improved image;
- Improved access to finance.

Issues and desired outcomes are identified under each theme. The framework also sets out a more flexible approach for delivery through a smaller Ministerial Group on Aquaculture.

5.3.6 Supporting Aquaculture Growth and Protecting Scotland's Environment (2017)

The joint ministerial statement[21] published by the Scottish Government confirms that aquaculture is a key contributor to Scotland's rural economy. It provides employment and investment, particularly in some of the most remote coastal communities. The Scottish Government also recognises that a sustainable aquaculture sector is a carbon efficient means of producing animal protein and contributes to national food security. The policy statement sets out how the Scottish Government and its agencies will work constructively with the sector, and others, to operate a policy framework to

[20] Scottish Government (2009). A Fresh Start: The renewed strategic framework for Scottish aquaculture [Online] Available at: https://www.gov.scot/Resource/Doc/272866.pdf (Accessed 03/06/2019)

[21] Scottish Government (2017). Supporting Aquaculture Growth and Protecting Scotland's Environment [Online]. Available at: https://www2 gov.scot/Topics/marine/Fish-Shellfish/MinStatement (Accessed 03/06/2019)

enable sustainable growth whilst balancing economic, environmental and social responsibilities. In particular, the Scottish Government will promote:

- Low-impact production systems which manage fish health challenges and enable continued growth while protecting marine ecology; and
- Collaborative and constructive relationships between the sector and its neighbours.

5.3.7 Aquaculture Growth to 2030 (2016)

The Scottish Government supports the delivery of the Aquaculture Industry Leadership Group growth strategy[22], which aims to double the economic contribution of the sector from £1.8 billion in 2016 to £3.6 billion by 2030 and double the number of jobs to 18,000 over the same timeframe. To achieve these aims, the strategic priorities for the sector are identified and 20 specific actions recommended. The delivery of these 20 recommendations should permit the sector to achieve significant long term social and economic benefits for Scotland.

5.3.8 Aquaculture Growth the 2030: A Strategic Plan for Farming Scotland's Seas (2016)

In 2016, a Working Group of leading aquaculture businesses and organisations came together to create a growth strategy for aquaculture in Scotland to 2030. The aim was to deliver an ambitious, industry-led plan for sustainable growth across the entire aquaculture value chain.

Aquaculture in Scotland is diverse, from the farming of salmon and other finfish species, to the production of mussels and oysters, to the harvesting of seaweed. It contributes over £1.8bn annually to Scotland's economy and sustains the economic and social fabric of the Highlands and Islands in particular. But the potential contribution of farming Scotland's seas is far greater. Research points to a potential annual contribution of £3.6bn or more by 2030. The number of jobs supported by the sector could reach 18,000.

The Working Group recommended three actions considered to be critical to the sustainable growth of aquaculture in Scotland:

- the formation of an Industry Leadership Group (ILG) to drive sector growth and ensure alignment between industry and government;
- an examination of the role of Marine Scotland as both regulator and policy advocate for development. There is an opportunity to align with other food and drink sectors in Scotland by moving the development role into the Scottish Government's Food, Drink & Rural Communities Division; and
- the introduction of Innovation Sites, to allow controlled trials and development of innovative equipment, technologies, disease control measures, and regulation.

5.3.8.1 Summary

The ABLDP supports finfish development where it can be demonstrated that there will not be significant unacceptable impacts directly or indirectly or cumulatively on the environment. As demonstrated above, the Extension is fully compliant with ABLDP Policies LDP STRAT 1, LDP DM, LDP 3, LDP 5, LDP 9, SG LDP ENV 1, SG LDP ENV 2, SG LDP ENV 7, SG LDP ENV 12, SG LDP ENV 14, SG CST 1 and SG LDP AQUA 1. As such, the proposal should be supported by ABC.

In accordance with the Planning Act, the Extension should be determined in accordance with the Development Plan unless material considerations indicate otherwise. It has been demonstrated

[22] Scottish Salmon Producers' Organisation (2016). Aquaculture Growth to 2030 [Online]. Available at: http://scottishsalmon.co.uk/wp-content/uploads/2016/10/aquaculture-growth-to-2030.pdf (Accessed 03/06/2019)

above that the Extension complies with the relevant policies of the AB LDP, Supplementary Guidance and the National Marine Plan. The Extension would ensure the continuation of economic benefits to the local area associated with the Existing Site, including employment opportunities, opportunities for local and regional contractors, and support for aquaculture operations in the region.

6 CONCLUSION

The Extension, the addition of two pens to a long-established site, is of a relatively small scale. Argyll and Bute Council provided a Screening Opinion that the application did not require an EIA and that it would be sufficiently supported by the provision of specific supporting information. SSC has provided the supporting information, as requested by the Statutory Consultees, in this document and accompanying technical submissions.

The design and assessment process adopted by SSC has represented a good practice approach to the responsible development of marine aquaculture. All potential areas of interaction between the Extension and the environment have been addressed, resulting in a well-designed development incorporating appropriate mitigation measures, at a suitable site.

The Extension 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.

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

By email to: planning.olandi@argyll-bute.gov.uk

24 July 2019
Your ref: 19/01293/MFF
Our ref: CDM155997

Dear Sir/Madam,

TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997
PROPOSAL: MODIFICATION OF SALMON FARM COMPRISING THE ADDITION OF TWO X 100 METRE CIRCUMFERENCE CAGES AND INCREASE OF BIOMASS FROM 2091 TONNES TO 2500 TONNES
LOCATION: GEASGILL, LOCH NA KEAL, ISLE OF MULL

Thank you for consulting Scottish Natural Heritage (SNH) on the above development proposal.

Summary

The proposed development is located within the boundaries of the Inner Hebrides and Minches Special Area of Conservation (SAC) and is close to the Sea of the Hebrides possible Marine Protected Area (pMPA). Additionally, the proposed development is located within the Loch na Keal, Isle of Mull National Scenic Area (NSA).

- In our view, based on the information provided, we consider that this proposal is unlikely to result in an adverse impact on the site integrity of the SAC. It should be noted that our advice is based on the ADD Deployment Plan provided with the application.

- The proposal will not have an adverse effect on the integrity of the NSA or the qualities for which it has been designated.

- We recommend that you consider whether conditions are required to ensure the development is implemented as proposed.

Assessment of the Impacts on the Natural Heritage

1. Inner Hebrides and Minches Special Area of Conservation (SAC)

This proposal is located within the Inner Hebrides and the Minches SAC, designated for its population of harbour porpoise. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on the SAC before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements: https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra.

In our view, this proposal is likely to have a significant effect on harbour porpoise within Inner Hebrides and the Minches SAC because the predator control plan includes the use of acoustic deterrent devices (ADDs). Consequently, Argyll and Bute Council is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest. To help you do this, we advise that in our view, on the basis of the information provided and the appraisal carried out to date, it will not adversely affect the integrity of the site. The advice from our appraisal is as follows:

- The hearing range of harbour porpoise includes the sound frequencies emitted by the proposed ADD model. As a result we consider that the use of ADDs may result in disturbance/habitat exclusion [1].

- In our view the ADD deployment plan identifies an appropriate decision making process to guide the activation/deactivation of ADD's and this will ensure that the long term and continuous use of ADD's at this location will be avoided.

- Conservation Objective 2b states that the distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance. Significant disturbance in this context is where changes to the distribution of harbour porpoise occur on a continuing or sustained basis. We consider that in this location any short term temporary disturbance or displacement as a result of the deployment of ADD in line with the ADD deployment plan will not result in significant disturbance.

We would like to highlight the importance of ensuring that the measures outlined in the ADD deployment plan (including the type and number of devices and the requirement for monitoring and reporting) are set as a requirement of any planning consent, should Argyll and Bute Council be minded to approve this application.

We consider that the ongoing review of ADD use is an essential component of the deployment plan and as such we would like to highlight that an appropriate review process should be part of any consent granted. By ensuring a review process is in place Argyll and Bute Council, as the Competent Authority, in consultation with SNH, will maintain a mechanism to require future changes to the plan should they be deemed necessary.

We recommend that you consider whether it is necessary to impose conditions to achieve the above mitigation. You may wish to carry out further appraisal before completing the appropriate assessment.

2. Sea of the Hebrides possible Marine Protected Area (pMPA)

The proposal is within approximately 600m of the Sea of the Hebrides pMPA selected for its basking shark and minke whale.

The Scottish Government has a policy of protecting such sites as if they were designated as set out in the Marine Protected Areas Management Handbook. The legal protection afforded to designated NC MPAs is set out in the Marine (Scotland) Act 2010. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on the pMPA before it can be consented.

There are natural heritage interests of national importance on the site which could be affected by this proposal, but in our view, there is no significant risk of hindering the achievement of the conservation objectives.

2.1 Minke Whale

In our view, this proposal is capable of affecting, other than insignificantly, the minke whale protected feature of the sea of the Hebrides the pMPA. Consequently, Argyll and Bute Council is required to carry out an assessment to determine if there is a significant risk of hindering the achievement of the conservation objectives.

To help you do this we advise that, in our view, based on the information provided and the appraisal carried out to date, the proposal will not result in a significant risk of hindering the achievement of the conservation objectives of the pMPA. The appraisal we carried out considered the impact of the proposals on the following factors:

- The hearing range of minke whale includes the sound frequencies emitted by the proposed ADD model. As a result we consider that the use of ADDs may result in disturbance/habitat exclusion[2]. The same mitigation that applies to the Inner Hebrides and Minches SAC also applies to the Sea of the Hebrides pMPA. We consider that provided the ADD deployment plan is adhered to then any significant risk of hindering the conservation objectives of the pMPA will be avoided.

3. Loch na Keal, Isle of Mull National Scenic Area (NSA)

The landscape effects which would arise as a result of the addition of the two proposed pens would unlikely be of a magnitude that would significantly impact on the NSA's special qualities.

However the incremental extension of such developments results in a shifting baseline which always acts in favour of the extension. Therefore, any future-extension to this fish-farm should be considered cumulatively together with previous extensions and this should also be reflected in the visuals.

If you have any comments or questions regarding the above, please do not hesitate to contact me.

Yours sincerely

Ruari Dunsmuir
Operations Officer
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[2] For example - **Coram** A., Gordon J., Thompson D. & Northridge S. 2014. Evaluating and assessing the relative effectiveness of non-lethal measures, including Acoustic Deterrent Devices on marine mammals. Scottish Government **Götz** T., & Janik V.M. 2013 Acoustic deterrent devices to prevent pinniped depredation: efficiency, conservation concerns and possible solutions. *Marine Ecology Progress Series* 492: 285-302

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

Planning
Shetland Islands Council
8 North Ness Business Park
Lerwick
Shetland ZE1 0LZ

Attn: [redacted]

8th August 2019

Dear [redacted]

Planning ref: 2019/012/MAR - To develop a new Atlantic salmon farm comprising 12 x 120m-circumference cages and a 10m-diameter c-cap feed barge, Wick of Gruting, Fetlar

Thank you for consulting us over this proposal and its associated EIA Report.

Summary

There are natural heritage interests of national and international importance on the site, but in our view these will not be adversely affected by the proposal.

Appraisal

The proposal lies within Fetlar Special Protection Area (SPA) classified for its red-necked phalarope; whimbrel; dunlin; Arctic tern; Arctic skua and great skua and for its seabird assemblage which includes fulmar, and could affect Bluemull and Colgrave Sounds proposed Special Protection Area (pSPA) classified for its red-throated diver.

The Scottish Government has a policy of protecting pSPAs as if they were designated, as set out in Scottish Planning Policy. The sites' status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") or, for reserved matters the Conservation of Habitats and Species Regulations 2010 as amended apply. Consequently, Shetland Islands Council is required to consider the effect of the proposal on the SPA and pSPA before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements (http://www.snh.gov.uk/docs/A423286.pdf).

The proposal is also within Fetlar to Haroldswick Nature Conservation Marine Protected Area (NCMPA), designated for its black guillemot; circalittoral sand and coarse sediment communities; horse mussel beds; kelp and seaweed communities on sublittoral sediment; maerl beds; shallow tide-swept coarse sands with burrowing bivalves. The site's status means that the requirements of the Marine (Scotland) Act 2010 apply. Consequently,

Shetland Islands Council is required to consider the effect of the proposal on the NCMPA before it can be consented.

The proposal is also close to North Fetlar Site of Special Scientific Interest (SSSI) notified for, *inter alia,* common seal and grey seal.

Fetlar Special Protection Area SPA and Bluemull and Colgrave Sounds pSPA

In our view, from the information available, it appears that in this case the proposal is not connected with or necessary for the conservation management of the site. Hence, further consideration is required.

In our view, this proposal is likely to have a significant effect on the fulmar, Arctic tern; Arctic skua and great skua features of Fetlar SPA and the red-thoated diver feature of Bluemull and Colgrave Sounds pSPA. Consequently, Shetland Islands Council is required to carry out an appropriate assessment in view of the sites' conservation objectives for their qualifying interests.

To help you do this we advise that, in our view, based on the information provided, the proposal will not adversely affect the integrity of the site. The appraisal we carried out considered the impact of the proposals on the following factors:

The development will permanently exclude the qualifying seabird species from an area of approximately 1.3 ha that will be covered by the cages. In combination with other recent developments within Fetlar SPA (Flaeshins fish farm and the Fetlar ferry terminal) the area of permanent displacement will be of the order of 4 ha or about 0.03% of the area of the marine part of the SPA.

The operation of the site will also periodically cause wider displacement due to vessels servicing the site, harvesting etc. however this will be short term and temporary and is not expected to result in permanent avoidance by any of the qualifying species.

None of the qualifying species feeds by diving so there is negligible risk of their being caught in the sub-surface nets. The risk of entanglement in top nets will be minimised by use of tensioned 50mm mesh for these, in line with SNH guidance. The use of flexible fibreglass poles, rather than a central floating support to raise the top nets above the water is relatively new and as yet there are no data on which to base an assessment of their effectiveness. The possibility of great skuas becoming entangled cannot therefore be ruled out, however the risk is considered low and as the Fetlar population is robust and increasing, the possible loss of a small number of birds will not undermine the site's conservation objectives.

The site will be serviced by vessels operating from Uyeasound, which will pass for a short distance through Bluemull and Colgrave Sounds pSPA. Given the level of activity in that part of the pSPA due to other aquaculture activity in the vicinity this is unlikely significantly to increase the disturbance or displacement of red-throated divers using that part of the site.

You may wish to carry out further appraisal before completing the appropriate assessment.

It would be useful if bird entanglements in the top nets could be recorded and reported in a systematic way, to inform both future applications for developments using this system nets and, potentially, adaptive management of existing ones. We recommend therefore that, should this application be consented it is subject to a condition to that effect.

Fetlar to Haroldswick NCMPA

In our view, this proposal is capable of affecting, other than insignificantly, the Black Guillemot and Circalittoral Sand and Coarse Sediment Communities (CCS) feature of Fetlar to Haroldswick NCMPA. Consequently, Shetland Council is required to carry out an assessment to determine if there is a significant risk of hindering the achievement of the conservation objectives.

To help you do this we advise that, in our view, based on the information provided, the proposal will not result in a significant risk of hindering the achievement of the conservation objectives of the MPA. The appraisal we carried out considered the impact of the proposals on the following factors:

Black guillemots would be displaced from the area of the cages, however the affected area represents only 0.006 % of the extent of the NCMPA and a minute proportion of the inshore foraging habitat of black guillemot. The bird surveys carried out for the EIA show that the location is not preferentially used by black guillemot with only a small numbers of birds in the farm footprint at any one time.

There is a possibility of black guillemots becoming entangled in sub-surface nets, but with proper tensioning the risk is considered to be small. As with the top nets, it would be useful to systematically record and report any entanglements that do occur.

We note that section 2.6 of the EIA Report states that tensioned gill nets will not be used in the event of escape. Gill nets would present a significant risk of entanglement to black guillemot and we recommend that, for the avoidance of doubt, any consent is subject to a condition that gill nets are not used in the event of an escape of fish from the farm.

Circalittoral Sand and Coarse Sediment Communities are present across much of the farm footprint and the feature is likely to be affected by a reduction in species diversity where it occurs in the immediate vicinity of the proposal. However, the feature is generally considered to have a lower sensitivity to the pressures associated with aquaculture and significant impacts beyond the direct footprint of the proposal are unlikely. The feature is widespread across large areas of the NCMPA and any impacts within the immediate footprint of the proposal are not considered capable of hindering the conservation objectives of site.

In our view, the proposal is also capable of affecting the Shallow Tide Swept Coarse Sands with Burrowing Bivalves feature of the MPA, but in this case the effects are insignificant and further assessment is therefore not required. The benthic baseline survey found the primary indicator for this feature - *Moerella spp*. – only as a single specimen at one survey station and we conclude that the feature is therefore not widespread across the farm footprint. The feature has low sensitivity to aquaculture and consequently unlikely to be significantly affected where it occurs outwith the direct footprint of the proposal.

North Fetlar SSSI

Within North Fetlar SSSI, common seals occur mainly around the islands of Urie, Lingey and Daaey and nearby holms and skerries. Grey seals pup along the north coast of Fetlar to the west of Busta Pund, about 2½km from the proposed salmon farm, and also outwith the SSSI around Hesta Ness immediately to the east of the proposal. Seals within the SSSI are unlikely to be affected by the development, however grey seals pupping around Hesta Ness could be affected and this could have implications for the Fetlar population as a whole. We note from the EIAR that the applicant does not propose to use ADDs on this site unless other

deterrents prove ineffective and then only after consultation with SNH. We recommend that, for the avoidance of doubt, this is secured by means of a planning condition.

Yours sincerely

Jonathan Swale
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From:	Catriona Laird
To:	"registrydingwall@sepa.org.uk"
Subject:	CAR/L/1004226 - Application for Variation of Licence of Authorisation - Bagh Dail Nan Ceann Fish Farm - SNH Response - 26 August 2019
Date:	26 August 2019 12:13:00
Attachments:	Loch Shuna - Enlargement of BDNC fish farm - 18_00005_MFF - SNH response to ABC.pdf

Thank you for your consultation dated the 13th August 2019 requesting comments on the proposed variation of the CAR licence for Bagh Dail Nan Ceann fish farm. For your information, I have attached our response to the planning application which provides comment on the proposed variations for alterations to the fish farm (planning ref: 18/00005/MFF).

In terms of the remit of the CAR licence, the proposal lies within the Loch Sunart to the Sound of Jura Nature Conservation Marine Protected Area (NC MPA) selected for its common skate and Quaternary of Scotland glaciated channels and troughs. The site's status means that the requirements of the Marine (Scotland) Act 2010 apply. Consequently, SEPA is required to consider the effect of the proposal on the NC MPA before it can be consented. In our view, the proposal is capable of affecting the common skate protected feature of the Loch Sunart to the Sound of Jura MPA. We have reached this conclusion because the proposal could theoretically result in a reduced availability of prey species, particularly crustaceans, in a relatively localised area around the proposed development. It could also affect egg-laying areas of common skate locally through deposition of materials onto suitable substrate. However, within the context of the MPA as a whole, we consider that any reduction in prey species or the degradation of egg-laying substrates as a result of the deposition of organic waste is unlikely to be significant. We therefore consider that the risk of this proposal being capable of affecting, other than insignificantly, the protected features of the Loch Sunart to the Sound of Jura NC MPA is low. There would be no effect on the Quaternary of Scotland feature as a result of this CAR variation.

Please don't hesitate to contact me should you have any further queries.

Kind regards,

Catriona

Catriona Laird | Operations Officer – Mid Argyll
Scottish Natural Heritage | 1 Kilmory Industrial Estate | Kilmory | Lochgilphead | Argyll| PA31 8RR | **t:** 0131 316 [redacted]
Dualchas Nàdair na h-Alba | 1 Raon Gnìomhachais Chille Mhoire | Cille Mhoire | Ceann Loch Gilb|Earra-Ghàidheal| PA31 8RR
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All Scottish Natural Heritage (SNH) email addresses have changed to this new format: firstname.lastname@nature.scot. Please note my new email address is **Catriona.Laird@nature.scot**

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

FAO: [redacted]
Argyll & Bute Council
Planning Services
1A Manse Brae
Lochgilphead
PA31 8RD

23 February 2018
Our ref: CDM148988 - A2538266
Your ref: 18/00005/MFF
By email only

Dear Sir / Madam

Town and Country Planning (Scotland) Act 1997
Marine fish farming planning application – Alterations to existing site - Bagh Dail Nan Ceann (BDNC), Loch Shuna – 18/00005/MFF

Thank you for your consultation on the above proposal dated 15 January 2018. The proposal is to enlarge the existing marine fin fish (Atlantic salmon) farm by installing an additional two 120m circumference cages, to upgrade and move the feed barge, and to increase the biomass at this site from 2,500t to 3,500t.

Summary

The proposal could affect the Inner Hebrides and the Minches Candidate Special Area of Conservation (cSAC) selected for its harbour porpoise interest. This proposal could be progressed with appropriate mitigation. However, because it could affect internationally important natural heritage interests and therefore, **we object to this proposal unless it is made subject to conditions, so that the works are done strictly in accordance with the mitigation as detailed in our appraisal below.**

We also provide advice about impacts on other aspects of the natural heritage. We have included details of these in our appraisal below.

Appraisal

1. Inner Hebrides and the Minches cSAC
The proposal lies within the Inner Hebrides and the Minches candidate Special Area of Conservation (cSAC) selected for its harbour porpoise.

The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply or, for reserved matters, The Conservation of Habitats and Species Regulations 2017. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on the cSAC before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements (https://www.nature.scot/professional-

advice/safeguarding-protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations).

In our view, this proposal is likely to have a significant effect on the harbour porpoise qualifying interest of the Inner Hebrides and the Minches cSAC. Consequently, Argyll and Bute Council is required to carry out an appropriate assessment in view of the site's conservation objectives for its qualifying interest. To help you do this, we advise that in our view, on the basis of the information provided and the appraisal carried out to date, if the proposal is undertaken strictly in accordance with the following mitigation, then it will not adversely affect the integrity of the site. Our mitigation advice is as follows:

1) Any Acoustic Deterrent Devices (ADDs) that are deployed at this site will be done so in accordance we the agreed ADD deployment plan (as detailed in annex 1 of the supporting information provided with the application). Any future changes to the plan must be approved by the Planning Authority.

2) The operator must undertake reporting on ADD usage at the site including:
    a. The exact dates when the device was operated, how often it was operated on that date, for what duration, and what was the cue for its manual or auto-sensor operation;
    b. Details of any predation events by seals and any anti-predation measures (including ADD) deployment) in use at the time should be logged;
    c. Details of the person (or persons) responsible for maintaining the logs;
    d. An undertaking that all logs will be maintained for review by the Planning Authority and/or SNH, if deemed necessary by the Planning Authority.

The appraisal that we carried out considered the impact of the proposal on the following factors:

– The risk posed through potential entanglement of cetaceans in farm equipment is not considered to be significant.

– The risk of injury as a result of exposure to sound emanating from ADDs at this site is not considered to be significant. We conclude that it is unlikely that harbour porpoise will spend significant periods of time within the distances required to result in injury from the use of the equipment as proposed within the ADD deployment plan. We therefore consider the risk of auditory injury as a result of this individual development to be low.

– With the proposed mitigation any potential disturbance as a result of exposure to sound emanating from ADDs at this site is not considered to be significant. This is because:
    a) The ADD deployment plan provides an appropriate protocol to ensure that the use of ADDs will be limited, and their repeated, continuous use over prolonged periods of time will be prevented, and;
    b) Due to the relatively low source level of the devices that are proposed. It is predicted that the sound levels emanating from the devices that are proposed at this site will result in a reduced area of potential disturbance, in comparison to some other higher power device types.

– The operator has committed to keeping a record of ADD use at the site and will provide this information to the Planning Authority on request. This will provide an opportunity for the Planning Authority to consider and review the use of ADDs at this site, thus ensuring that long-term cumulative issues can be taken into account in the future.

If the planning authority intends to grant planning permission against this advice without the suggested mitigation, you must notify Scottish Ministers.

We would be happy to provide the full details and reasoning of these recommendations in the form of our Habitats Regulations Appraisal (HRA) proforma.

Background information on the cSAC can be found at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/international-designations/natura-sites/harbour-porpoise-candidate

2. Loch Sunart to the Sound of Jura MPA

The proposal lies within the Loch Sunart to the Sound of Jura Nature Conservation Marine Protected Area (NC MPA) selected for its common skate and Quaternary of Scotland glaciated channels and troughs.

The site's status means that the requirements of the Marine (Scotland) Act 2010 apply. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on the NC MPA before it can be consented. In our view, the proposal is capable of affecting the common skate protected feature of the Loch Sunart to the Sound of Jura MPA.

We have reached this conclusion because the proposal could theoretically result in a reduced availability of prey species, particularly crustaceans, in a relatively localised area around the proposed development. It could also affect egg-laying areas of common skate locally through deposition of materials onto suitable substrate. However, within the context of the MPA as a whole, we consider that any reduction in prey species or the degradation of egg-laying substrates as a result of the deposition of organic waste is unlikely to be significant.

We therefore consider that the risk of this proposal being capable of affecting, other than insignificantly, the protected features of the Loch Sunart to the Sound of Jura NC MPA is low.

The discharge of chemicals is primarily SEPA's remit and we would expect this aspect of the proposal to be considered in detail through the CAR licensing process. Argyll and Bute Council may wish to consult with SEPA when undertaking their own assessment of the effect of the proposal on the NC MPA.

3. Firth of Lorn SAC

The proposal is close to the Firth of Lorn Special Area of Conservation (SAC) designated for its reefs.

The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply or, for reserved matters, The Conservation of Habitats and Species Regulations 2017. Consequently, Argyll and Bute Council is required to consider the effect of the proposal on the SAC before it can be consented (commonly known as Habitats Regulations Appraisal). The SNH website has a summary of the legislative requirements (see link under section 2 above).

In our view, it is unlikely that the proposal will have a significant effect on any qualifying interests either directly or indirectly. An appropriate assessment is therefore not required. We have reached this conclusion because the proposal is located approximately 2.5km from the boundary of the Firth of Lorn SAC. The applicant states that no material is predicted to be exported outwith the modelled domain. However, we note that SEPA have stated that final modelling has not yet been verified for this proposal. Given the separation distance between the proposal and the SAC boundary, and on account of the expansive and energetic nature of this area of water, we would expect any potential waste material exported in to the SAC to be dispersed widely and therefore unlikely to result in any impacts on the feature on the SAC.

The discharge of chemicals is primarily SEPA's remit and we would expect this aspect to be considered in detail through the CAR licensing process.

4. Benthic Impacts

The applicant has reached the decision that no new baseline visual survey is required. At screening/scoping stage we advised that further dialogue between MHS, SEPA and SNH would be required to determine whether or not additional visual survey information was necessary, and if so, to agree where any such transects should be carried out. As far as we are aware this advice does not appear to have been taken into account by the applicant. No further information was provided subsequent to our screening/scoping response being issued and it is unclear whether or not this decision was agreed with SEPA.

We have data from a visual survey carried out in 2015 which suggests that the Priority Marine Feature (PMF) habitat Burrowed Mud is present in the vicinity of the cages. The component PMF species tall sea pen (*Funiculina quadrangularis*) was also recorded. Any increase in the footprint of this site is likely to result in increased impacts on these PMF habitats and species. These features do not have legislative protection, but the basis for protection of their national status across Scottish waters is included in the National Marine Plan.

As the information/dialogue that we requested at screening/scoping was not provided, there is insufficient information to complete an impact assessment for PMFs, and therefore we have no means of predicting the degree or extent of likely impacts. Therefore, we cannot advise further on the benthic impacts arising from this proposal. However, we note that this aspect of the proposal will be considered in detail through the CAR licencing process and we would expect to discuss this further with SEPA during that process.

I trust that our advice is clear but please do not hesitate to contact me if you require any further information or clarification.

Yours faithfully

Andrew Campbell
Operations Manager
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JNCC Report
No: 615

Evidence base for application of Acoustic Deterrent Devices (ADDs) for marine mammal mitigation in coastal and offshore industries

McGarry, T., De Silva, R., Canning, S., Mendes, S., Prior, A., Stephenson, S. & Wilson, J.

Version 2, August 2019

ISSN 0963-8091

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This report is compliant with the JNCC Evidence Quality Assurance Policy http://jncc.Defra.gov.uk/default.aspx?page=6675.

This report is a 'live' document and the intent is for it to be updated periodically in line with additional information on the acoustic deterrents described herein, and on the basis of new technologies that become available.

Whilst every effort was made to ensure that the information in itis complete, accurate and up to date, no guarantee is provided and JNCC shall have neither liability nor responsibility to any person or entity with respect to any loss or damage arising from the use of this report. We will act on any inaccuracies that are brought to our attention and will do our best to correct them in subsequent versions.

Contents

Glossary of Terms and Abbreviations

Term	Definition / Description
ADD	Acoustic Deterrent Device
AHD	Acoustic Harassment Device
Duty cycle	The cycle of operation of a device which operates intermittently rather than continuously
DAERA	Department of Agriculture, Environment and Rural Affairs
EPS	European Protected Species
EC	European Council
FCS	Favourable Conservation Status
Frequency	The number of times that a periodic function occurs or repeats itself in a specified time
Harmonics	A wave with a frequency that is a positive integer multiple of the frequency of the original wave, known as the fundamental frequency
HRA	Habitats Regulation Appraisal/Assessment
JNCC	Joint Nature Conservation Committee
MMO	Marine Management Organisation
MSFD	Marine Strategy Framework Directive
NRW	Natural Resources Wales
PTS	Permanent Threshold Shift
RMS	Root Mean Square – square root of the mean value of the square of the quantity taken over a given time interval
SAC	Special Area of Conservation
SEL	Sound Exposure Level - a measure of the total sound energy of an event normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like-for-like basis
SEL_{cum}	Cumulative Sound Exposure Level – a measure of the total sound energy of a number of events (e.g. over the course of a day) normalised to one second
SNH	Scottish Natural Heritage
SNCB	Statutory Nature Conservation Body
Source level	The sound pressure level SPL at a unitary distance assuming an infinitesimally small source dimension
SPL	Sound Pressure Level – a logarithmic measure of the pressure of a sound relative to a reference value
TTS	Temporary Threshold Shift
UXO	Unexploded Ordnance

Summary

Subsea noise produced by anthropogenic activities in coastal and offshore waters has the potential to cause injury or death to marine mammals. To reduce this risk, mitigation solutions have included the deployment of acoustic devices in proximity to the noise-producing activity, to deter animals from potential injury zones.

Acoustic devices have been applied across various marine industries. The range of applications for these devices, i.e. different industries, intended purpose, or different target species, has led to a wide variety of available technologies on the market. Whilst all emit medium to high frequency sounds, the acoustic characteristics of each device differs in terms of the sound levels produced, frequency range, temporal pattern/duty cycle and harmonics. In addition, there are also differences in the method of deployment and operating functions.

Extensive reviews of devices are available; however, they are often too detailed and lengthy to enable all the information to be processed for the purpose of providing advice. The purpose of this report is to provide a collated reference report for SNCBs in the UK, mainly when providing advice to marine industries on the use of acoustic devices to deter marine mammals from areas where there is a risk of injury or death. The report reviews evidence on the effectiveness of acoustic devices at deterring a range of marine mammal species. A coarse assessment of the risk of injury from all ADDs is also undertaken with a conclusion that the risk of injury is low for all devices. The report also provides a summary of the key relevant legislation and regulations pertaining to the protection of marine mammals in the UK.

1 Project purpose and approach

1.1 Introduction

1.1.1 Background

Subsea noise produced by anthropogenic activities in coastal and offshore waters has the potential to cause injury or death to marine mammals. In order to reduce this risk, mitigation solutions have included the deployment of acoustic devices in proximity to the noise-producing activity, in order to deter animals from potential injury zones. 'Acoustic deterrent device' is a generic term applied to a variety of different devices which, although differing in their sound emitting characteristic, all have a similar purpose, which is to deter/alert marine mammals from a specific hazard/area.

Acoustic devices have been applied across various marine industries. Originally developed for the aquaculture industry to deter marine mammals, largely seals from fish farms, the deterrents deployed were relatively low power. Problems of habituation by animals exposed to these sounds led to technological development with the production of devices (referred to as 'acoustic harassment devices (AHDs)', 'seal scrammers' or 'seal scarers') that could emit higher amplitude sounds that would be painful to seals, and potentially other species. Wider application of this technology across fisheries includes the use of devices known as 'pingers', on static fishing nets, to reduce bycatch of marine mammals. Other offshore industries have since adopted acoustic devices to be used as part of mitigation strategies. For example, acoustic deterrent devices (ADDs) have been widely applied to reduce the risk of injury to marine mammals during pile-driving at offshore wind farms, or for underwater explosive ordnance (UXO) clearance activities.

The range of applications of the devices, i.e. different industries, intended purpose, or different target species, has led to a wide variety of available devices on the market. Whilst all emit medium to high frequency sounds, the acoustic characteristics of each device differs in terms of the sound levels produced, frequency range, temporal pattern/duty cycle, and harmonics. In addition, there are also differences in the method of deployment and operating functions.

Although there are several reports that provide extensive reviews of the devices available, their acoustic characteristics, and importantly their proven effectiveness on different species, they are too detailed and lengthy to allow use by the Statutory Nature Conservation Bodies (SNCBs). In addition, there is no single report that provides information on all the devices available for use in fisheries and offshore industries.

1.1.2 Purpose of report

The purpose of this report is to provide a collated reference report for UK SNCBs, when providing advice to marine industries on the use of acoustic devices to deter marine mammals from areas where there is a risk of injury or death.

This report has been produced with input and review by a steering group, comprised of the Joint Nature Conservation Committee (JNCC), Natural England, Scottish Natural Heritage (SNH), National Resources Wales (NRW) and Department of Agriculture, Environment and Rural Affairs (DAERA) of Northern Ireland.

This report has been developed to address two key issues considered by the SNCBs when providing advice in relation to acoustic devices:

1. Is there a device available with a proven track record of deterring the species of concern at the distances required?

2. Can it be feasibly employed as a mitigation measure?

The report provides SNCBs with an easily accessible reference to the types of acoustic devices that are currently, or due to be, commercially available. For each device, the report highlights their purpose, proven effectiveness, limitations, gaps in knowledge, and risk to marine mammals (i.e. potential risk of injury from deployment of the device itself). This report will help SNCBs assess whether proposed acoustic devices and operating methods in mitigation plans are the most appropriate for the purpose intended and may inform discussions on the potential for disturbance arising from the devices.

It should be noted that this report represents a 'live' document which can be updated periodically in light of additional information provided by ADD manufacturers, as new ADD technologies become commercially available.

This report also provides a summary of the key legislation and regulations pertaining to the protection of marine mammals and refers to the potential for an offence to be committed as a result of ADD deployment under the various regulations of the devolved administrations (England, Wales, Scotland and Northern Ireland). Information is provided in relation to marine mammals only, however, it should be noted that under UK legislation, an offence could be committed on other protected species including basking shark, marine turtles and Atlantic sturgeon.

1.1.3 Structure of report

The acoustic devices reviewed for this report have been categorised in different ways to allow the reader of this report to quickly navigate to the information of relevance. Click on the section reference in the "Link" below, to navigate between sections of the report.

Table 1-1. Report navigation.

Section	Overview	Link
Part 1: Project purpose and approach		
1.1 Introduction	Background to the project and purpose of the report	1.1
1.2 Methodology	Description of the approach to the literature review, categorising the devices and production of the database.	1.2
Part 2: Acoustic device selection		
2.1 Available devices	Full list of devices available, including name, manufacturer, duration of commercial availability and link to manufacturer's website	2.1
2.2 Acoustic characterisation of devices	Categorisation of devices according to their acoustic characteristics: source level, frequency, constant or intermittent sound, manually controlled or automatically triggered.	2.2
2.3 Device characterisation by species/species group	Categorisation of devices according to which species group they were developed for, available literature on species impacts, and their intended industry purpose.	2.3

Section	Overview	Link
Part 3: Deployment of devices		
3.1 General training requirements	Training and/or experience required for the deployment of ADDs.	3.1
3.2 General principles for deployment	Recommendations for deployment, testing and failsafe planning for mitigation including example ADD protocol and task plan.	3.2
Part 4: UK Legislation and Guidance		
4 Introduction	Overview of how legislation relates to ADD deployment	4
4.1 Legislation and Regulations	Key legislation on the protection of marine mammals with relevance to ADD use	4.1
4.2 Wildlife licensing requirements	Marine and/or wildlife licensing requirements, by devolved administration.	4.2
4.3 Current guidance documents	Key guidance documents for the assessment of impacts on marine mammals and marine/wildlife licensing.	4.3
Appendices		
6.1 to 6.30	Acoustic device technical information.	6

1.2 Methodology

1.2.1 Literature review

A search was undertaken to identify all the ADDs that have been used across the aquaculture, fisheries and offshore industries. A comprehensive literature review was then undertaken of all available reviews and field studies that included any of the ADDs identified on the list. The search included peer reviewed and published scientific studies, non-peer reviewed reports, and manufacturers information. The following information was collated from each report:

- acoustic device name;
- author;
- year;
- journal/publication;
- title;
- receptor (species or species group studied);
- study type (e.g. field observations, field experiment, captive experiment, modelling, or review paper);
- response type (physiological, behavioural, neural, other);
- research objectives/stated hypothesis;
- noise source details (pulsed/continuous, source level, frequency, pulse length, marine mammal auditory thresholds);
- study site;
- method/approach;
- response (including type of response (avoidance or other), distance of effect, duration of response, proportion of animals responding);
- peer reviewed (Y/N); Robustness and key limitations (including methods used or margins of error in data);
- additional reviewer comments, and

- hyperlink to journal/publication.

This literature review provided the evidence base with respect to the efficacy of devices to deter different species/species groups from a given area. Where this evidence has been presented for each of the reviewed devices, the key findings of the study have been summarised and the publication source acknowledged. An evidence score was also assigned to provide a level of confidence in the available information.

1.2.2 ADD technical specifications review

Technical specifications for each ADD were obtained through a web-based search, direct contact with manufacturers or from the literature review (Section 1.2.1). In the first instance, a simple information request spreadsheet, listing the following characteristics, was sent to all of the manufacturers for their input:

- source level - typically measured as a sound pressure level at a distance of 1m from the device in dB re 1µPa re 1m;
- frequency - given as range (in Hz) which, if designed with a particular species in mind, would likely overlap with the key hearing sensitivity of that species;
- continuous or intermittent - describes whether the output is delivered as a continuous sound or whether the sound is pulsed with delays between each pulse;
- duty cycle - description of the cycle of operation of a device;
- range –the range of effectiveness of a device for the intended use;
- battery – a description of the battery type / capacity / characteristics;
- training requirements – training recommend prior to use by the manufacturer;
- device testing – manufacturers suggested method of testing functionality prior to use;
- deployment – suggested method of deployment; and
- functionality – description of any additional functionality of interest.

The response rate from manufacturers was 50% with eight respondents out of 16 manufacturers contacted. There were no contact details available for three further manufacturers. Therefore, the technical information gathered for this report relies largely on what was available on the internet and in published papers that had studied the devices.

1.2.3 Categorisation of devices

Information obtained from the literature search and ADD technical specification review was used to categorise the devices into a format that was accessible by the user:

a) Table of available devices (Table 2-1)

The devices were tabulated in alphabetical order by name and manufacturer (Table 2-1). Each device has been given a device identification number (ID) to facilitate cross referencing across the tables and within the associated database. Hyperlinks have been provided to the manufacturers' websites or to the individual device specification itself. Further information provided for each device includes their commercial availability, intended industry use and target species group/species. A cross reference has been provided to the relevant technical specification in Appendix A.

b) Table of devices by acoustic characteristics (Table 2-2)

The devices were tabulated, as before, in alphabetical order by name and manufacturer (Table 2-2). Information was provided for each device relating to their key acoustic characteristics. This included their sound pressure output level, frequency range and whether the sound source was continuous or intermittent. As before, a cross reference has been provided to the relevant technical specification in Appendix A.

c) Table assigning devices to marine mammal species or species group (Table 2-3)

The devices were grouped according to the species or species hearing group (as in Southall et al. 2019) for which information was available: Hearing groups are:

- very high frequency cetaceans;
- high-frequency cetaceans;
- low-frequency cetaceans; and
- pinnipeds.

Where evidence relates to a particular species within the group, that species is listed.

All available evidence is summarised, and references are given. The information comes from a variety of sources, directly from the manufacturer, from reports and peer-reviewed publications.

Evidence Scoring System

For each device reviewed, an evidence score is assigned to provide a level of confidence in the information available on the effects of the ADD on a certain species or species group. For example, for some devices peer-reviewed studies are available which provided a high level of confidence in the conclusions. The supporting evidence can therefore be assigned the highest evidence score of 3. For other devices the information available as to the effectiveness on a given species might be provided by the manufacturer but without a supporting scientific study; in these instances the evidence score is 1. This does not mean that those devices might be less effective but simply that the evidence is limited or not reported in more detail.

The Evidence Scoring system was applied as follows:

1 = Low confidence (intended for use as stated by the manufacturer with limited published evidence to support conclusion)
2 = Medium confidence (backed by non-peer reviewed grey literature)
3 = High confidence (backed by at least one peer reviewed study)

For each device reviewed in Table 2-3, a cross-reference has been provided to the device ID so that the reader can find the correct device listed in the two previous tables (Table 2-1: List of available devices and Table 2-2: Acoustic characteristics of devices).

Table 2-3 provides the range of deterrence distances derived from the literature or manufacturer's information. Deterrence range is defined here as the distance over which an animal of a specific species/species group is observed or predicted (using noise modelling) to move away from the ADD in response to activation. This does not infer that all animals of that specific species/species group will be deterred at that distance. In addition, it is important that these deterrence distances are interpreted with caution as for each device the literature shows a wide range of effect distances for a given species. One reason for this is that there are considerable differences in factors that influence the observed response, such as an animal's behaviour at the time of exposure, previous exposure history, sex and age of individual, background noise and the environmental conditions that affect local propagation. Another factor to account for is the differences between noise models and hearing thresholds used by the different studies to predict the deterrence distances. Therefore, the deterrence distances presented in the Table 2-3 below, should not be used as a definitive measure of the effectiveness of a device.

The deterrence ranges summarised in Table 2-3 were subsequently used to inform the categorisation of mitigation ranges provided in the searchable database, grouped into three bands, where deterrence occurred over ranges of: <500m; 500 – 1,000m; and >1,000m.

1.2.4 Database development

The information gathered through the literature review and search of ADD technical specifications was used to populate a searchable database. Table 1-2 below provides a summary of the information within the database.

Table 1-2 Structure of the searchable database linked to this report.

Field	Description
Device ID	Numerical identifier for each device.
Manufacturer	ADD Manufacturer
Model	Most recent name that the device is known under.
Control	Manual or automatic
Link to website	Hyperlink to manufacturer's website or to the specific device if available
Current known uses	Industry application, e.g. offshore piling mitigation, aquaculture, bycatch mitigation
Acoustic characteristics	Source level, frequency, intermittency, continuous/pulsed, pulse width
	Score given to each of the ADDs based on the available literature
Evidence score	Level of confidence in the information available on the effects of the ADD on a certain species or species group
Mitigation range	Approximate range of effectiveness broadly grouped into three categories: <500m; 500 – 1,000m; and >1,000m. Exact ranges are not given as it is important not to place too much emphasis on effect ranges in other studies due to difference in propagation between sites.

1.3 Exploring the potential for ADDs to cause hearing damage in marine mammals

There are concerns within academia and industry, that some of the louder ADD devices may have the potential to result in hearing damage in the form of onset of permanent threshold shift (PTS onset), particularly from accumulated exposure to the sound. In order to investigate the potential for auditory injury due to use of ADDs, a simple empirical model was developed to estimate the cumulative Sound Exposure Level (SEL_{cum}) that marine mammals swimming away from an active ADD could be exposed to.

The modelling assumes a conservative swim speed of 2.5ms^{-1} and utilises the source noise data, frequency and pulse rate specific to each ADD. The modelling assumes 30 minutes of activation and is based on a simplistic 15 log R propagation assumption.

It should be noted that the sound exposure calculations are based on a set of simplistic assumptions and that real-world sound propagation is more complex. Therefore, the modelling should be treated as a high-level risk-based approach rather than a definitive statement or assessment as to whether there is potential for any ADD in any situation to cause injury.

The NOAA (2018) Permanent Threshold Shift (PTS) onset threshold (i.e. hearing frequency weighted SEL_{cum}) for all mammals was not exceeded beyond a range of 100m for any of the devices except the SaveWave Orcasaver where, according to the model, it is theoretically possible that PTS could occur in very high frequency cetaceans at a range of up to 130m. It is therefore concluded that the risk of injury due to ADD deployment is low for all devices.

It is theoretically possible that a temporary threshold shift (TTS) could occur at short ranges for some devices but this has not been assessed.

1.4 Limitations of this report

The information provided in this report is subject to a number of limitations listed below:

- Only half of the manufacturers contacted responded and therefore the technical specifications provided in the Appendix have information gaps;
- Without contact from some manufacturers, and therefore with conclusions based on the literature review and web-based searches alone, it was sometimes difficult to determine whether a given device was still available. Therefore, the literature review included all devices, irrespective of their commercial availability. In these cases, the report states ‘unknown’ for their commercial availability;
- The level of detail within each publication varies considerably. Not many of the studies reviewed undertook field measurements on the devices themselves and quoted other studies or relied on the technical specifications provided by manufacturers instead. This can be problematic since often measured acoustic properties differ from those given by manufacturers and there may be slight differences between different units of the same device;
- Several devices have been renamed and therefore it was often difficult to determine if a device reviewed in the literature was the same as the name given on a manufacturer’s website. Where possible, this report identifies the most recent name given to a device and highlights where a device has been known by other names;
- Whilst some devices have been designed for a specific species or species group, studies often looked at effects on other species or species groups. The most common situation encountered was where devices had been designed for seals, but the study looked at disturbance effects on harbour porpoise.
- Many of the papers reviewed reported a change in behaviour in response to an ADD, but there was no statistical significance in the results. The summary of evidence provided refers to whether a result had been found to be statistically significant or not;

- Studies did not always provide clear information on the range over which animals were deterred;

- For some of the devices that had several associated research studies there was disparity in the reported range of effects. Therefore, the table reports the range across all the studies; and

- For studies on pingers, the focus was more on whether marine mammals stopped attacking fish or reduced bycatch rather than the range of deterrence. These studies often cited the closest approach.

2 Acoustic devices

Overview

Part 2 provides information on available devices (Section 2.1, Table 2-1) and acoustic characteristics of available devices (Section 2.2, Table 2-2). Devices are listed alphabetically in both tables for ease of reference. In the final section, the devices have been categorised according to the species group or species for which they are effective (Section 2.3, Table 2-3).

Alphabetical listing is by the device name, but devices have also been grouped by manufacturer to facilitate searching. The report first provides information on the general use of each device (Section 2.1) and then on the acoustic characteristics of the devices (Section 2.2). Each device has been assigned a unique identifier (Device ID) which relates to the make and model of the device. In Section 2.3 the devices are grouped according to the available evidence on their effectiveness across the different species/species group. The table in Section 2.3 provides a cross reference to the Device ID to enable the user to go back to Sections 2.1 and 2.2 to look up the general properties and acoustic characteristics of the device(s) of interest for a specific species/species group.

The accompanying database also provides a searchable tool that can be used to look up information on a particular device or to narrow down the list of devices by searching under a particular field. For example, the user can search for all devices by manufacturer name, acoustic characteristics, industry use, or species/species group. The database provides hyperlinks to evidence for each device.

2.1 Available devices

A full list of available devices is provided in Table 2-1 with details of name, manufacturer, commercial availability, and link to technical information (Appendix). The main industries the devices are designed for are provided, however there may be industries for which devices may be suitable that are not currently listed. In addition, the table lists the species or species group for which the device was designed, according to information from the manufacturer.

Table 2-1: List of acoustic deterrent devices

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
1	Ace Aquatec marine Mammal Mitigation Device (MMD) LOW (Pinnipeds and Low Frequency Cetaceans)	Ace Aquatec	https://www.aceaquatec.com/	Y	Pile-driving, oil spills, underwater explosives, protection of wild fish stocks in rivers, underwater turbines	Pinnipeds and low frequency cetaceans	Appendix 6.1
2	Ace Aquatec marine Mammal Mitigation Device (MMD) Ultra LOW frequency (fish)	Ace Aquatec	https://www.aceaquatec.com/	Y	Pile-driving, oil spills, underwater explosives, protection of wild fish stocks in rivers, underwater turbines	Fish	Appendix 6.2
3	Ace Aquatec marine Mammal Mitigation Device (MMD) (Mid Frequency) Pinnipeds and Cetaceans	Ace Aquatec	https://www.aceaquatec.com/	Y	Pile-driving, oil spills, underwater explosives, protection of wild fish stocks in rivers, underwater turbines	Pinnipeds and high-frequency cetaceans	Appendix 6.3
4	Ace Aquatec marine Mammal Mitigation Device (High Frequency) Pinnipeds and Odontocetes	Ace Aquatec	https://www.aceaquatec.com/	Y	Pile-driving, oil spills, underwater explosives, protection of wild fish stocks in rivers, underwater turbines	Pinnipeds and very high frequency cetaceans	Appendix 6.4

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
5	Ace Aquatec: Universal Scrammer (US2)[1]	Ace Aquatec	https://www.aceaquatec.com	N (but may be in use)	Aquaculture	Seals	Appendix 6.5
6	Ace Aquatec: Universal Scrammer (US3) [2](previously 'Silent Scrammer') and Hull Deterrent (HD). The US3 and HD are two devices with same acoustic specification but different applications.	Ace Aquatec	https://aceaquatec.com/products/predator-control/	Y	Aquaculture (US3) and Fishing vessels (HD)	Seals	Appendix 6.6
7	Ace Aquatec: RT1	Ace Aquatec	https://aceaquatec.com/products/predator-control/	Y	Aquaculture	Not given	Appendix 6.7

[1] It is understood that the Ace Aquatec US2 and US3 Universal Scrammers were formally Ferranti Thomson Mk2 and Mk3 Seal Scarers. The name of these ADDs changed following the acquisition of Ferranti Thomson by Ace Aquatec. Ferranti Thomson was also part of a series of mergers between various companies that became Thale Underwater Systems Limited (TUS). However, it is understood that the ADD element of the business was sold on, and as such the devices have been rebranded as mentioned above.

[2] See footnote 1.

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
8	Airmar dB plus II (now Mohn Aqua MAG seal deterrent)	Airmar	http://www.airmartechnology.com/uploads/specapps/dbplus.pdf	Y (since 1993)	Aquaculture	Seals	Appendix 6.8
9	Airmar: Gillnet Pinger	Airmar	http://www.airmar.com/productinfo.html?category=AD&name=Acoustic%20Deterrents	Y	Gill net entanglement	Harbour porpoise	Appendix 6.9
10	Aquamark 848	Aquatec	http://www.aquatecgroup.com/11-products/25-aquamark-848	Y	Offshore construction, sea fishing	Marine mammals	Appendix 6.10
11	Aquamark 100	Aquatec	http://www.aquatecgroup.com	N[3]	Oil and gas industry but also offshore fisheries	Harbour porpoise	Appendix 6.11

[3] Aquatec Group has informed the authors that the Aquamark 100, 200, 210 and 300 are not in production. However, it is highly likely that a large number of these units will still be in market circulation.

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
12	Aquamark 200	Aquatec	http://www.aquatecgroup.com	N[4]	Oil and gas industry and traditional trammel nets	Dolphins	Appendix 6.11
13	Aquamark 210	Aquatec	http://www.aquatecgroup.com	N[5]	Where predation is severe, 210 is recommended for nets	Dolphins	Appendix 6.11
14	Aquamark 300	Aquatec	http://www.aquatecgroup.com	N[6]	Oil and gas industry and commercial gill net fisheries	Harbour porpoise.	Appendix 6.11
15	Cetasaver V.03	IFREMER/ IXTrawl	http://wwz.ifremer.fr/	Y	Gillnet fisheries	Harbour porpoise and dolphins	Appendix 6.12
16	Dolphin Deterrent Devices & Dolphin Interactive Deterrent	STM Products	http://www.stm-products.com/en/products/fishing-technology/	Y	Fishing	Dolphins	Appendix 6.13

[4] See footnote 3.

[5] See footnote 3.

[6] See footnote 3.

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
17	Dukane NetMark 1000	Dukane Corporation	http://www.dukane.com/	Y	Set net bycatch	Harbour porpoise	Appendix 6.14
18	Future Oceans Dolphin Pinger (previously 'Fumunda 10')	Future Oceans	https://futureoceans.com/pingers/dolphin-pinger/	Y	Gill net fisheries	Dolphins	Appendix 6.15
19	Future Oceans Whale Pinger	Future Oceans	https://futureoceans.com/pingers/whale-pinger/	Y	Gill net fisheries	Whales	Appendix 6.15
20	Future Oceans Porpoise Pinger	Future Oceans	https://futureoceans.com/pingers/porpoise-pinger/	Y	Gill net fisheries	Harbour porpoise	Appendix 6.15
21	Banana Pinger (50-120)	Fishtek Marine	https://www.fishtekmarine.com/product/deterrent-pinger-50-120/	Y	Fisheries, reduction of bycatch	Porpoise and dolphin species	Appendix 6.16
22	Banana Pinger whale (3-20)	Fishtek Marine	https://www.fishtekmarine.com/deterrent-pingers/	Y	Fisheries, reduction of bycatch	Baleen and beaked whales	Appendix 6.16

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
23	Banana Pinger Porpoise (10)	Fishtek Marine	https://www.fishtekmarine.com/product/deterrent-pinger-10/	Y	Fisheries, reduction of bycatch	Porpoise	Appendix 6.16
24	Dolphin Anti-depredation pinger –	Fishtek Marine	https://www.fishtekmarine.com/anti-depredation-pinger/	Y	Mitigating fisheries depredation and bycatch, mitigation of marine mammal interactions with construction operations	Dolphin species and porpoise	Appendix 6.16
25	F3 Porpoise – PAL (Programmable Alert system)	F3: Maritime Technology UG Ltd	http://www.f3mt.net/harbour-porpoise---pal.html	Y	Fisheries, reduction of bycatch	Porpoise species	Appendix 6.17
26	F3: 10kHz – PAL	F3: Maritime Technology UG Ltd	http://www.f3mt.net/10-khz---pal1.html	Y	Fisheries, reduction of bycatch, Marine construction	Marine mammals	Appendix 6.17
27	F3: Wideband PAL	F3: Maritime Technology UG Ltd	http://www.f3mt.net/wideband---pal.html	Y	Fisheries, reduction of bycatch, Marine construction	Marine mammals	Appendix 6.17
28	F3: Whale PAL	F3: Maritime Technology UG Ltd	http://www.f3mt.net/whale---pal.html	Y	Fisheries, reduction of bycatch, Marine construction	Whales	Appendix 6.17

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
29	L2/L3	Lien	None listed	Unknown	Unknown	Unknown	No details available
30	LU-1 prototype	Loughborough University	None listed	Unknown	Unknown		Appendix 6.18
31	Lofitech Seal Scarer/FishGuard	Lofitech	http://www.lofitech.no/en/seal-scarer.html	Y	Aquaculture and capture fisheries	Seals and odonocetes	Appendix 6.19
32	Marexi Pinger: Acoustic Pinger V2.2	Marexi Marine Technology	http://www.marexi.com/PDF/Pinger_V22_english.v2_P.pdf	Y	Fisheries	Not given	Appendix 6.20
33	SalmonSafe	GenusWave Ltd	http://www.salmonsafe.co.uk/	N	Fish farming	Seals	Appendix 6.21
34	SaveWave SealSalmon Saver (High-impact)	SaveWave	http://savewave.eu/seasalmon-saver-EN.html	Y	Aquaculture, offshore wind mitigation	Dolphins, seals	Appendix 6.22

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
35	SaveWave OrcaSaver	SaveWave	http://savewave.eu/orca-saver-EN.html	Y	Long line fisheries	Orcas	Appendix 6.22
36	SaveWave Long Line Saver	SaveWave	http://savewave.eu	N	Unknown, but probably fisheries	Not given	Appendix 6.22
37	SaveWave Endurance Saver	SaveWave	http://savewave.eu	N	Unknown, but probably fisheries	Not given	Appendix 6.22
38	SeaGuard Seal Deterrent	Gael Force	http://www.gaelforcemarinetechnology.com/Aquaculture-Sea/Seal-Deterrents/SeaGuard-Seal-Deterrent.aspx?lang=nb-no	Y	Aquaculture	Seals	Appendix 6.23
39	FaunaGuard – Porpoise Module	Van Oord and Seamarco	https://www.vanoord.com/sites/default/files/leaflet_faunaguard_0.pdf	Y	Dredging and marine construction, including piling and drilling & blasting	Porpoise species	Appendix 6.24
40	Fauna Guard – Seal Module	Van Oord and Seamarco	https://www.vanoord.com/sites/default/files/l	Y	Dredging and marine construction, including piling and drilling & blasting	Seals	Appendix 6.25

Device ID	Device	Manufacturer	Weblink	Commercial availability	Potential Industry Application	Target species	Technical specification in this Report
			eaflet_faunaguard_0.pdf				
41	Fauna Guard – Turtle Module	Van Oord and Seamarco	https://www.vanoord.com/sites/default/files/leaflet_faunaguard_0.pdf	Y	Dredging and marine construction, including piling and drilling & blasting	Turtles	Appendix 6.26
42	Fauna Guard – Fish Module	Van Oord and Seamarco	https://www.vanoord.com/sites/default/files/leaflet_faunaguard_0.pdf	Y	Dredging and marine construction, including piling and drilling & blasting	Fish	Appendix 6.27
43	Seamaster: Fish Protector	Sea Master Enterprise Co. Ltd	http://www.seamaster.com.tw/sea-master-protector.htm	Y	Fisheries such as gill net and trawling	Dolphins, particularly bottlenose dolphins	Appendix 6.28
44	SealFENCE 3	OTAQ	https://www.otaq.com/sealfence/	Y	Fish farms	Seals and sea lions	Appendix 6.29
45	Terecos DSMS-4	Terecos Ltd	No website available	Y	Unknown	All species	Appendix 6.30

2.2 Acoustic device characteristics

Table 2-2 provides a summary of the key acoustic characteristics of the devices available and listed in Table 2-1. Devices are presented in alphabetical order. Please refer back to Table 2-1 for manufacturer details and weblinks.

Note that a number of available devices used by UK fishing vessels have been authorised by the Department of Environment, Food and Rural Affairs (Defra) as meeting specific signal and implementation characteristics defined by EU regulation. There are many EU regulation compliant devices and some of these are listed on the UK government webpage (https://www.gov.uk/guidance/reduce-dolphin-and-porpoise-by-catch-comply-with-regulations).

Table 2-2: Acoustic characterisation of devices.

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
1	Ace Aquatec Marine Mammal Mitigation Device LOW (Pinnipeds and Low Frequency Cetaceans)	Nominal SPL output = 195dB re 1µPa at 1m. Measured sound level = 195-205 dB re 1µPa (RMS)	1 – 5kHz (can be restricted to 1 – 2kHz).	Intermittent sound source	Appendix 6.1
2	Ace Aquatec Marine Mammal Mitigation Device Ultra LOW frequency	Nominal SPL output = 184dB re 1µPa at 1m	20 – 90Hz	Intermittent sound source	Appendix 6.2
3	Ace Aquatec Marine Mammal Mitigation Device (Mid Frequency) Pinnipeds and Cetaceans	Nominal SPL output = 195dB re 1µPa at 1m	8 – 24kHz	Intermittent sound source	Appendix 6.3
4	Ace Aquatec Marine Mammal Mitigation Device (High Frequency) Pinnipeds and Odontocetes	Nominal SPL output = 184dB re 1µPa at 1m	20 – 40Hz	Intermittent sound source	Appendix 6.4
5	Ace Aquatec: Universal Scrammer (US2)	Nominal SPL output = 194dB re 1µPa at 1m	8 – 30kHz	Intermittent. Transmission duration of 20s (double scram 40s), and a pulse duration of 20ms	Appendix 6.5

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
6	Ace Aquatec: Universal Scrammer (US3) (previously 'Silent Scrammer')	Nominal SPL output = 195dB re 1µPa at 1m (RMS).	10 – 20kHz (automated randomisation)	Intermittent sound source	Appendix 6.6
7	Ace Aquatec: RT1	Nominal SPL output = 195dB re 1µPa at 1m (RMS)	1 – 5kHz (automated randomisation) - (can be restricted to 1 – 2kHz in applications near harbour porpoise)	Intermittent sound source	Appendix 6.7
8	Airmar dB plus II (now Mohn Aqua MAG seal deterrent)	Nominal SPL output = 198dB re 1µPa at 1m (RMS). Measured sound level = 192dB re 1µPa (RMS) at the fundamental frequency of 10.3kHz (Lepper *et al* 2014)	A broadband spectral response at the beginning of each pulse, with detectable energy levels between 1.5kHz to 50kHz (Lepper *et al* 2014)	Continuous sound source	Appendix 6.8
9	Airmar: Gillnet Pinger	Nominal SPL output = 197dB re 1µPa at 1m	10kHz	Continuous sound source	Appendix 6.9
10	Aquamark 848	Nominal SPL output = 165dB re 1µPa at 1m	Primary bandwidth 5kHz to 30kHz	AQUAmark chirp repertoire for general deterrence	Appendix 6.10
11	Aquamark 100	Nominal SPL output = 145dB re 1µPa at 1m	20 – 160kHz	Continuous sound source	Appendix 6.11
12	Aquamark 200	Nominal SPL output = 145dB re 1µPa at 1m	5 – 160kHz	Continuous sound source	Appendix 6.11

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
13	Aquamark 210	Nominal SPL output = 150dB re 1µPa at 1m	5 – 160kHz	Continuous sound source	Appendix 6.11
14	Aquamark 300	Nominal SPL output = 132dB re 1µPa at 1m	10kHz	Continuous sound source	Appendix 6.11
15	IFREMER/IX Trawl / Cetasaver V.03	Nominal SPL output = 165dB re 1µPa at 1m	30 – 150kHz	Continuous sounds source	Appendix 6.12
16	Dolphin Deterrent Devices & Dolphin Interactive Deterrent	Nominal SPL output = 165dB re 1µPa at 1m	5 – 500kHz (Random)	Intermittent sound source	Appendix 6.13
17	Dukane NetMark 1000	Nominal SPL output of a pulse is 132dB re 1µPa at 1m	10kHz	Continuous sound source	Appendix 6.14
18	Future Oceans Dolphin Pinger	Nominal SPL output = 145dB re 1µPa at 1m	70kHz	Continuous sound source	Appendix 6.15
19	Future Oceans Whale Pinger	Nominal SPL output = 145dB re 1µPa at 1m (±4dB)	3kHz	Continuous sound source	Appendix 6.15
20	Future Oceans Porpoise Pinger (previously the 'Fumunda 10')	Nominal SPL output = 132dB re 1µPa at 1m	10kHz	Continuous sound source	Appendix 6.15
21	Banana Pinger (50-120)	Nominal SPL output = 145dB re 1µPa at 1m	50kHz - 120kHz. Intermittent sound source. Ping duration of 300ms, and ping interval 4-12s	Intermittent sound source. Randomised ping interval and structure	Appendix 6.16

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
22	Banana Pinger whale (3-20)	Nominal SPL output = 135dB re 1µPa at 1m	3kHz - 20kHz	Intermittent sound source. Ping duration of 300ms, and ping interval of 4s	Appendix 6.16
23	Banana Pinger porpoise (10)	Nominal SPL output = 132dB re 1µPa at 1m	10kHz	Intermittent sound source. Ping duration of 300ms, and ping interval of 4s	Appendix 6.16
24	Dolphin Anti-depredation pinger	Nominal SPL output = 175dB re 1µPa at 1m	40kHz	Intermittent sound source. Ping duration of 30ms, and ping interval 4 - 12s. Randomised ping interval and structure	Appendix 6.16
25	F3 Porpoise PAL (Programmable Alert System)[7]	Nominal SPL output 145dB re 1µPa at 1m	133kHz	Intermittent. 1-3 signals of 1.3s length followed by a variable pause	Appendix 6.17

[7] The authors have been informed by the manufacturers of the F3 Porpoise PAL (Programmable Alert System) it uses a porpoise specific communication signal to alert porpoises in the western Baltic to nets. In addition, it can also be used to calibrate acoustic porpoise detection equipment in the field. It is advised that for additional information on the specific functionality of the system, the manufacturers are contacted.

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
26	F3: 10kHz – PAL	Nominal SPL output = 132dB re 1µPa at 1m	10kHz narrow band	Intermittent. One signal, 0.3s in length followed by a 4s pause	Appendix 6.17
27	F3: Wideband PAL	Nominal SPL output = 145dB re 1µPa at 1m	20 – 160kHz wideband	Intermittent. One signal, 0.3s in length followed by a variable pause	Appendix 6.17
28	F3: Whale PAL	Nominal SPL output = 145dB re 1µPa at 1m	3kHz narrow band	Intermittent. One signal, 0.3s in length followed by a 4s pause	Appendix 6.17
29	L2/L3	Limited information available			No details available
30	LU-1 prototype	Nominal sound pressure level output = 145dB re 1µPa at 1m (Larsen & Eigaard 2014).	40 - 120kHz	Intermittent	Appendix 6.18
31	Lofitech Seal Scarer/FishGuard	Nominal SPL output = 191dB re 1µPa at 1m. Measured sound level = 204dB re 1µPa at 1m (McGarry *et al* 2017).	10 – 20kHz	Intermittent sound source	Appendix 6.19
32	Marexi Pinger: Acoustic Pinger V2.2	Nominal SPL output = 132 dB re 1µPa at 1m (± 4 dB).	10kHz (±2kHz) tonal.	Continuous sound source	Appendix 6.20

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
33	SalmonSafe	Measured SPL output = 180 - 182dB re 1µPa at 1m (RMS) for signals centred at 10kHz (Gotz & Janik 2015)	500Hz – 22kHz	Unknown	Appendix 6.21
34	SaveWave SealSalmon Saver (High-impact)	Nominal SPL output = 155dB re 1µPa at 1m (Franse *et al* 2005)	Double signal 5 – 30kHz and 30 – 160kHz wide band sweeps, harmonics up to 180kHz (Franse *et al* 2005).	Intermittent sound source	Appendix 6.22
35	SaveWave OrcaSaver	Nominal SPL output = 196(± 2)dB re 1µPa at 1m (SeaWave 2013)	6.5kHz (SeaWave 2013)	Intermittent sound source	Appendix 6.22
36	SaveWave Long Line Saver	Nominal SPL output = 155dB re 1µPa at 1m (Franse *et al* 2005)	Single signal 5 – 60kHz wide band sweeps, harmonics up to 180kHz (Franse *et al* 2005)	Intermittent sound source	Appendix 6.22
37	SaveWave Endurance Saver	Nominal SPL output = 140dB re 1µPa at 1m (Franse *et al* 2005)	Single signal 5 – 90kHz wide band sweeps, harmonics up to 180kHz (Franse *et al* 2005)	Intermittent sound source	Appendix 6.22
38	SeaGuard Seal Deterrent	Nominal SPL output = 198dB re 1µPa at 1m (RMS). Measured sound level = 192dB re 1µPa (RMS) at the fundamental frequency of 10.3kHz (Lepper *et al* 2014).	A broadband spectral response at the beginning of each pulse, with detectable energy levels between 1.5kHz to 50kHz (Lepper *et al* 2014)	Continuous and intermittent options	Appendix 6.23

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
39	FaunaGuard - Porpoise Module	Nominal SPL output = 172dB re 1µPa at 1m	60 – 150kHz	Intermittent sound source, with randomised intervals varying between 3 and 10	Appendix 6.24
40	Fauna Guard – Seal Module	Nominal SPL output = 182dB re 1µPa at 1m	200Hz – 20kHz	Intermittent sound source, with randomised intervals varying between 3 and 10s	Appendix 6.25
41	Fauna Guard – Turtle Module	Nominal SPL output = 197dB re 1µPa at 1m	200Hz – 1kHz	Intermittent, with randomised intervals varying between 3 and 10s	Appendix 6.26
42	Fauna Guard – Fish Module	Nominal SPL output = 197dB re 1µPa at 1m	200Hz – 1kHz	Intermittent, with randomised intervals varying between 3 and 10s	Appendix 6.27
43	Seamaster: Fish Protector	Nominal SPL output up to 165dB re 1µPa at 1m	Frequency sweep tones and harmonics 10 - 90kHz	Continuous sound source	Appendix 6.28
44	SealFENCE 3	Source level 165 dB re 1µPa at 1m RMS (patrol mode) or 189 dB re 1µPa at 1m RMS (protect mode)	9 – 11 kHz	Intermittent with different pulse rates according to mode selected	Appendix 6.29

Device ID	Device	Sound pressure level (SPL) output	Frequency: kilohertz (kHz) or hertz (Hz)	Continuous or intermittent [1]	Technical specification in this Report
45	Terecos DSMS-4	Programme 1: Measured SPL output = 177dB re 1µPa at 1m (RMS) (± 1dB) at 6.6kHz (Lepper *et al* 2004). Programme 2: Measured SPL output = 179dB re 1µPa at 1m (RMS) (±1dB) and 178dB re 1µPa at 1m (RMS) (±1dB) at 4.7kHz and 6.8kHz respectively (Lepper *et al* 2014).	Fundamental frequencies ranging from 1.8kHz – 3.8kHz Multi-component continuous tones with observed peak level frequencies of 4.7kHz and 6.8kHz	Continuous sound source Continuous sound source	Appendix 6.30

[1] Where multiple devices are deployed the duration between pulses may appear to be reduced due to non-synchronicity between devices thereby effectively producing a more 'continuous' sound than if a single device was deployed. Some models may have settings to allow the duration of non-pulses to be increased.

2.3 Acoustic devices by species or species group

Table 2-3 organises devices by species/species group for which the device has been designed (as per the manufacturers specifications), and/or species/species group assessed in the literature. Details of species impacts/range are provided in Table 2-3 based on the literature review and/or from technical details provided in Appendix A. As described in Section 1.2.3 each device has been rated according to the level of evidence available in the literature (Evidence Score: 1, 2 or 3). For each device described, the Device ID is given, which can be used to look up the general description of the device (Table 2-1) or the acoustic characteristics (Table 2-2).

Table 2-3: Categorisation of device by species/species group which were the focus of the research summarised here.

Please refer back to **Tables 2-1** and **Table 2-2** for more information about the devices, using the Device ID given in column 2 of **Table 2-3** below to search for the relevant device.

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Harbour porpoise	Lofitech Seal Scarer [31]	300 -1,200m	Deterred porpoise out to at least 12km and possibly out to 18km from pile driving (not statistically significant for the latter). Reaction to the ADD was equal to or greater than that predicted from pile driving (with a bubble curtain) (Dahne *et al* 2017). Sparling *et al* (2015) (ORJIP review) found that the device provided consistent and effective deterrence ranges for both harbour seal and harbour porpoise. Mikkelsen *et al* (2017) found that it deterred all porpoises to 190m, with mixed behavioural reactions between 350 to 525m. No reports of marine mammal sightings during soft start at active ADD locations (Dudgeon Offshore Wind Farm Ltd 2016). Significant deterrence effect on harbour porpoise out to 7.5km (Brandt *et al* (2012). Clear deterrence effect (100% displacement) up to 1.9km, with deterrence 50% of the time between 2.1 to 2.4km. Closest observed porpoise to device was 798m (Brandt *et al* 2013). Horschle *et al* (2015) concluded up to 75% reduction in harbour porpoise during use at measured distances of 750 and 1,500m. Increased swim speed, surfacing and jumps during device use on a captive harbour porpoise (Kastelein *et al* 2015).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Harbour porpoise	SaveWave SealSalmon Saver [34] (called 'Black Saver' in this paper)	Not measured	Reduction by 65% in harbour porpoise encounters when devices placed at 200m apart were periodically activated. During continuous exposure for 28 days there was no suggestion of habituation (Kyhn *et al* 2015).	3
Very high frequency cetaceans	Ace Aquatec: MMD (High Frequency) [4]	50 – 6,000m	TTS modelled to 4m (using Southall *et al* 2007 criteria). Modelled exclusion up to 6km, however potential to cause injury or mortality in close proximity (1-3m) based on Nedwell *et al* 2007 criteria (ABPmer 2014).	2
Harbour porpoise	Ace Aquatec: Universal Scrammer (US3) [6]	Likely avoidance between 200m and 1.2km. Potential exclusion up to 6km.	Animals did not react to lowest sound levels. As the mean received level increased, significant displacement occurred alongside significantly higher numbers of surfacings, swimming speed and respiration compared to baseline. Likely to deter porpoises at ranges between 0.2 and 1.2km based on noise modelling (Kastelein 2010). As the mean received SPL increased, significant displacement occurred during test periods, and significantly higher numbers of surfacings, swimming speed and jumps occurred in test periods than in associated baseline periods (Kastelein *et al* 2015). ABPmer (2014) found TTS to 4m (Southall *et al* 2007 criteria), potential to cause exclusion up to 6km and potential to cause injury or mortality in very close proximity (1-3m) (based on Nedwell *et al* 2007). Suitable for use during offshore wind farm construction (Sparling *et al* 2015).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Harbour porpoise	Terecos Ltd: DSMS-4 [45]	301m – 1.2km	Porpoise detections measured at 9 stations between 301m and 4.5km. Only weak or minimal response in harbour porpoise; significant decline at 301m with proportional displacement over to 1.2km (Northridge *et al* 2013). Injury threshold would be exceeded if animal was within 100m of device for 2.5 hours, or over 24 hours at 500m (Lepper *et al* 2014).	2
Harbour porpoise	Fauna Guard – Porpoise Module [39]	Observed efficacy of at least 1,000m	Captive response showed increased distance from device (Van der Meij *et al* 2015). Deterrence of harbour porpoise out to 1km. Nearest surfacing was at 1006 m (Geelhoed *et al* 2017). Captive animal's respiration rate increased and distance from device significantly increased (Kastelein *et al* 2017). Sparling *et al* (2015) concluded that device was useful.	3
Harbour porpoise	Airmar dB plus II [8]	200m – 3,500km	No porpoise recorded within 200m of the ADD. Deterrence recorded beyond 3.5km. Porpoise appeared to return to normal levels soon after the AHD was deactivated. No evidence for habituation but study only over 3 weeks (Olesiuk *et al* 2002). Porpoises left the site soon after the ADD was activated and the mean distance of approach was 991m when the ADD was active. Significantly fewer sightings of porpoises within 1,500m when ADD was active. No porpoises were observed within 645m of the device (Johnston 2002).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
			40-75% reported reduction in porpoise detection rate when the pingers were active. During the continuous-exposure scenario, detection rate was reduced by 65% throughout the 28-day trial; effective to 2.5km but no effect between 2.5 and 5km (Kyhn *et al* 2015). Evidence of porpoise feeding within 200m of 10 active ADDs; porpoises returned to areas almost immediately after ADDs are switched off (Northridge *et al* 2010). Potential scope to reduce ADD time below 30 minutes tested (Hoschle *et al* 2015).	
Harbour porpoise	Aquamark 848 [10]	Up to 1,500m depending on species	ABPmer (2014) found potential to deter porpoise up to 200m based on modelled ranges using dBht criteria (Nedwell *et al* 2007).	2
Harbour porpoise	Aquamark 100 [11]	100m	100% (significant) reduction in bycatch at a pinger spacing of 455m; 78% (significant) reduction in bycatch at a pinger spacing of 585m (Larsen *et al* 2007). No significant reduction in bycatch of harbour porpoise (Morizur *et al* 2009). Significant decrease in click detections and observations of harbour porpoise around nets with active device. Observed that porpoises take ~7 hours to recolonize area (Hardy & Tregenza 2010). 48% reduction in porpoises at nets with pingers and evidence that period of exclusion following pinger use could exceed seven hours, with no evidence of habituation (Hardy *et al* 2012). Potential to deter up to 100m (ABPmer 2014)	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Harbour porpoise			No evidence of displacement of porpoises using moored pingers on a simulated gillnet (Desportes *et al* 2006).	
Harbour porpoise	Aquamark 200[12]	Approx. 130m	A net equipped with an acoustic alarm was avoided within audible range. A single pinger created a total exclusion zone of 130m, with a mean closest approach distance of tracked harbour porpoise groups to the pinger of 414m. The porpoises were thus effectively excluded from the ensonified area (Culik *et al* 2001).	3
Harbour porpoise	Aquamark 300 [14]	Not available	The AQUAmark technology has been adapted to meet the NOAA Fisheries Take Reduction Plan pinger regulations, resulting in the AQUAmark 300 product.	
Harbour porpoise	Banana Pinger (50-120) [21]	Approx. 100m	82% reduction in potential bycatch when device in use. cycling-pinger trial: the number of porpoise and dolphin click detections were reduced when the pinger was active but this varied over time (Crosby *et al* 2013). Potential to deter harbour porpoise up to 100m (ABPmer 2014). No dolphins or porpoises were observed in very close proximity to the nets fitted with pingers (<100m) despite being seen in the vicinity (Woolmer 2015). Less porpoises detected moving from 400m to 0m from the pinger when activated (Friis 2017).	3
Harbour porpoise	Banana Pinger (10) [23]	Approx. 50m	Meets acoustic characteristics as set out under US Federal Register/vol. 64, 1999 for use of pingers in US fisheries. Has demonstrated efficacy in mitigating cetacean bycatch in both USA	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
			Harbour Porpoise Take Reduction Plan (HPTRP) and the Pacific Offshore Cetacean Take Reduction Plan (POCTRP). Reduction in entanglement rates of 1/3rd for cetaceans (Barlow *et al* 2003) for pingers with same acoustic characteristics.	
Harbour porpoise	F3 Porpoise PAL [25]	Up to 250m in 'good' weather	Reduction in harbour porpoise bycatch along gill nets in the Western Baltic Sea by over 70% (independently tested by Thünen Institute of Baltic Sea Fisheries; Culik and Dorrien, 2017; Culik *et al.* 2017).	3
Harbour porpoise	Dukane – NetMark 1000 Pinger [17]	208m to 375m	87 - 98% reduction in bycatch at nets with pingers compared to net without pingers (Kraus *et al* 1997). Estimated displacement of 208m, diminishing by 50% in 4 days, therefore evidence that harbour porpoise habituate to pinger (Cox *et al* 2001). Demersal gill nets equipped with acoustic alarms reduced harbour porpoise by-catch rates by 77% over those without alarms (Trippel *et al* 1999). Reduced sighting rate of harbour porpoise up to 375m from pinger (Carlström *et al* 2009). Controlled Exposure Experiments (CEE) found a significant reduction in entanglement with gill nets (Gönener & Bilgin 2009; Bordino *et al* 2002). In a tidal stream setting (where there is potentially higher ambient noise), sound will not propagate far (<20m) before dropping below ambient noise levels (Wilson & Carter 2013).	3
Harbour porpoise	SalmonSafe [33]	Not available	No effect on harbour porpoise (Janik *et al* 2013).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Harbour porpoise	DDD, DID from STM Products [16]	1.2 to 3km	Nets with DDDs caught significantly fewer porpoise. Bycatch was reduced by 95% in nets less than 4km length. Porpoise excluded to at least 1.2km. Partial exclusion may extend to 3km (Northridge *et al* 2011). No significant reduction in bycatch of harbour porpoise (Morizur *et al* 2009). Sparling *et al* (2015) concluded they were not currently useful for mitigation for offshore wind farms.	2
Harbour porpoise	Marexi Pinger [32]	Not available	No significant reduction in bycatch of harbour porpoise (Morizur *et al* 2009).	2
Harbour porpoise	L2/L3 [29]	Not available	Harbour porpoise displaced to at least 125m (Laake *et al* 1998). Significant reduction in bycatch of harbour porpoise in nets with pingers in use (Gearin *et al* 2000). 92.4% of harbour porpoise groups avoided floatline with pinger in use. Closest observed approach distance was 133m. No long-term displacement recorded (Koschinski *et al* 1997).	3
Porpoise	LU-1 prototype [30]	Not available	CEEs with pingers placed on gill nets found a 94% reduction in by-catch (significant difference) (Larsen *et al* 2014). Porpoise reacted by moving away from the sensor, an average distance of 22.8m from the alarm; Swimming and diving pattern and breathing rate recovered to normal immediately after the sounds were switched off. No habituation was recorded (Kastelein *et al* 1997).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Hector's dolphin	Aquamark 200 [12]	Not available	No avoidance reaction or measurable effect on Hector's dolphins to pingers deployed from boat (Stone *et al* 2000).	2
Hector's dolphin	Dukane - Netmark 1000 Pinger [17]	Not available	Avoidance reaction of Hector's dolphin to pingers deployed from boat in 62% of cases, but not significant (Lepper *et al* 2014.	2
High frequency cetaceans	Ace Aquatec: MMD (Mid Frequency) [3]	50 – 1,000m from source	Predicted range of effect provided by manufacturer.	1
Bottlenose dolphin	SaveWave SealSalmon Saver (High-impact) [34]	None provided	Reduction in bycatch in the active condition compared to the no-pinger control but this was not significant Brotons *et al* (2008). Dolphins were significantly less likely to encounter (approach within 500m), interact and engage with gillnets when the device was active, although it did not completely deter all animals from interacting with the nets. The study also found that dolphins increased their echolocation rates around active devices (Waples *et al* 2013). Significant decrease in predation and number of holes in active nets (Northridge *et al* 2003).	3
Odontocetes	Salmon Safe [33]	60 – 250m	Predicted range of effect provided by manufacturer.	1
Dolphins	Aquamark 848 [10]	Up to 1,500m depending on species	Predicted range of effect provided by manufacturer.	1
Dolphins	Aquamark 200 [12]	Not available	Significant reduction in by-catch of striped dolphin of 81% (Imbert *et al* 2007).	2

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Bottlenose dolphin	Aquamark 210 [13]	Not available	Significant reduction in bycatch in the active condition compared to the no-pinger control. These pingers reduced the net interaction rate by 70% in active nets (Brotons *et al* 2008).	3
Bottlenose dolphin	Aquamark 100 [11]	Not available	Pingers did not stop dolphins from approaching the fishing nets but the nets equipped with functional pingers received less damage (87% fewer holes) than nets with non-functional devices or without pingers (Gazo *et al* 2008).	3
Dolphins	Banana Pinger (50-120) [21]	Approx. 100m	Studies by scientists at the University of Malta were able to demonstrate a strong and sustained effect of the Fishtek 50-120kHz pinger at reducing dolphin interactions with set fisherman (Vella 2016). Results indicate that trammel net damage and catch depredation by dolphins were both reduced to 2% and 6% respectively when compared with the original records of damage and depredation before starting the pilot project.	2
Dolphins	Dolphin Anti-depredation Pinger (DDD) [24]	Approx. 50m	Trials conducted in waters off Italy showed the Fishtek anti-depredation pinger to have a significant and strong effect at reducing the interactions of dolphins with set net fishing gear (Ferraro *et al*, 2018). Results showed a 100% increase in catch value and no net damage was recorded on nets equipped with pingers.	2
Humpback dolphin and snubfin dolphin	Future Oceans Dolphin Pinger (previously 'Fumunda 10') [18]	Not available	'At risk' interactions decreased from 81% to 50% in active nets (Read *et al* 2010). The likelihood of the animals leaving an area was not significantly different from the controls (humpback dolphin and Australian snubfin) (Soto *et al* 2013).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Common Dolphin			Suggested audibility to humpback dolphin and snubfin dolphin approx. 100m. Only subtle responses from dolphins and no movement away from an area when pinger active therefore not considered effective for use in mitigation at offshore wind farms for dolphins (Soto *et al* 2013).	
	Cetasaver V.03 [15]	Not available	No major changes in dolphin behaviour were observed during the trials (Berrow *et al* 2008). A reduction in common dolphin bycatch of around 70% during the two years (Morizur,2008).	3
Dolphins	DDD and DID (STM Products) [16]	1.2 to 3km.	Northridge *et al* (2011) report on efficacy of DDD from various studies, as follows: • no significant difference in observed bycatch when DDDs used on gill net fleet in the southwest; significant reduction in bycatch when using DDDs for bass pair trawl beams; • exclusion to at least 1.2km and partial exclusion to 3km for a short string of nets; • limited change in behaviour of common dolphin with no evasive behaviour described (Berrow *et al* 2008); • 31% fewer holes in nets and 28% more fish in monofilament gill nets with active pingers (bottlenose dolphin) (Buscaino *et al* 2009); • a decrease in click detection of common dolphin with pingers attached to nets (Northridge *et al* 2008); • Sparling *et al* (2015) concluded they were not currently useful for mitigation for offshore wind farms.	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Bottlenose dolphin	Future Oceans Dolphin Pinger (previously 'Fumunda 10') [18]	Approx. 100m	No significant difference in behaviour of bottlenose dolphin around active versus control nets in Spanish mackerel gillnet fishery (Read *et al* 2010).	2
Bottlenose dolphin	Seamaster: Fish Protector [43]	Up to 1km	Predicted range of effect provided by manufacturer.	1
Bottlenose dolphin	Marexi Pinger [32]	Not available	Less damage to gillnets when device was present and active, than when it was not (Troncone *et al* 2008).	2
Dolphins	Dukane Netmark 1000 [17]	Not available	Reduction in entanglement rates of 1/3rd for cetaceans (Barlow *et al* 2003). No significant reduction in bycatch or encounters between nets with active and non-active pingers (Cox *et al* 2004). Significant (73%) reduction in by-catch in nets with active pingers (Alfaro Shigueto 2010).	3
Minke Whale	Lofitech [31]	1,000m	Measured response from exposure at 1km range. Increase in speed and directionality during deployment. Animals fled beyond this distance. No injury predicted from model (McGarry *et al* 2017).	2
Low Frequency Cetaceans	Ace Aquatec: MMD (LOW) [1]	50 – 1,000m from source	Measured displacement over ranges of >1km depending on species. Sound detectable at 7km (ABPmer 2014)	2

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Low Frequency Cetaceans	Aquamark 848 [10]	Up to 1,500m depending on species	Predicted range of effect provided by manufacturer.	1
Baleen Whales	Fishtek Marine: Banana Pinger (3-20) [22]	Approx. 100m.	Predicted range of effect provided by manufacturer.	1
Humpback whale	Future Oceans Whale Pinger [19]	Approx. 50m (manufacturer)	No effect of the pinger on the humpback whales; they neither changed direction, changed speed nor altered their surfacing behaviour in response to the pinger, (Harcourt *et al* 2014).	3
Seals	Lofitech Seal Scarer [31]	60 to 473m	Increase in seal observations within 100m of device (Mikkelsen *et al* 2017). No reports of marine mammal sightings during soft start at active ADD locations (Dudgeon Offshore Wind Farm Ltd). Significant reduction in predation by seal (fish) during use at fish traps at a Baltic salmon net fishery (Fjalling *et al* 2006). Number of sightings and amount of time seals spent near nets significantly reduced, although some evidence of habituation in second year of trials (Harris *et al* 2011). ADD deployed from anchored boat found significant decrease in seals over minimum range of 60m with no evidence of habituation (Götz 2008; Götz & Janik 2010). Fewer seals observed at a salmon net fishery with Lofitech device operating than without deterrent (Harris *et al* 2014).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
			Behavioural response when seals within 1km of sound source. Animals involved in direct movement away and minimum approach distance was 473m (Gordon *et a* 2015). No significant effect on absolute abundance but significantly reduced seal movements upstream (Graham *et al* 2009). Playback to captive seals found not significant response during exposure trials although a recording of the Lofitech was used rather than the device itself (Kastelein *et al* 2015).	
Seals	Ace Aquatec: MMD (LOW) [1]	50 – 1,000m from source	Measured displacement over ranges of >1km depending on species. Sound detectable at 7km (ABPmer 2014).	2
Seals	Ace Aquatec: MMD (High Frequency) [4]	50 – 2,000m from source (from manufacturer)	Permanent Threshold Shift (PTS) to 3m and Temporary Threshold Shift (TTS) to 15m (based on Southall *et al* 2007 criteria). Strong avoidance reaction up to approx. 800m (based on Nedwell *et al* 2007) (ABPmer 2014).	2
Grey seals, harbour seals.	Ace Aquatec: Universal Scrammer (US3) [6]	Between 200m and 1.4km	Captive animal behavioural experiments found that during sessions with the lowest level sounds, the seals' behaviour was similar during test and baseline periods. Noise modelling showed that device was likely to deter harbour seal at ranges between 0.2 and 1.4km (Kastelein *et al* 2010). Significant decrease in the number of animals in at least one of the distance ranges tested. Deterrence range of 60m in grey seals. No evidence of habituation or attraction (Götz 2008; Götz & Janik 2010).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
			Harbour seals in captivity hauled out more and spent more time with their heads above water as sound source levels increased (Kastelein *et al* 2015). Fish mortalities (fish farms) reduced by 70% with use (Whyte *et al* 2015). PTS to 3m, TTS to 15m (Southall *et al* 2007 criteria), Strong avoidance reaction up to approx. 800m (Nedwell *et al* 2007 criteria) (ABPmer 2014). Injury threshold for seal at 100m would be exceeded after 3 hours, and 24-hour exposure would be approx. 350m (Lepper *et al* 2014). Suitable for use in offshore wind farm construction (Sparling *et al* 2015).	
Seals	Airmar: dB Plus II [8]	40m radius or up to 3,000m^2	Responses observed at ranges up to 1,037m. Shortest range at which no response was observed was 653m (Gordon *et al* 2015). Device considered unsuitable for use in offshore wind farms due to limited distance of effect (Sparling *et al* 2015). Device effective out to 100m (from salmon farm) with up to 50% reduction in fish mortalities (Mate & Harvey 1986). No effect was observed and seals were observed as close as 44m from the sound source (Jacobs *et al* 2002). Deterrence effect observed between 40 and 50m. No evidence of habituation (Götz 2008; Götz & Janik 2010). Significantly fewer seals fed within a river when ADD was deployed compared to no ADD; deterrence range was 50m (Yurk & Trites 2000).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
Seals			Seal mortality reduced by 50% using ADD at fish farm (Whyte 2015). A seal at 100m would exceed the threshold after about 3.3 hours for a single device. With single device animals remaining at 400m for 24 hours would reach the threshold for injury (Lepper *et al* 2014). Noise modelling suggests signal may be audible to 1.4km before nearing ambient noise levels (Wilson & Carter 2013).	
Seals	Gael Force: SeaGuard Seal Deterrent [38]	System provides up to 3,000m^2	Predicted range of effect provided by manufacturer.	1
Seals	Terecos Ltd: DSMS-4 [45]	Not Available	No reduction in fish mortalities from use of Terecos device (Whyte 2015). Seal injury threshold would be exceeded if seal remained within 100m of device for 9 hours, or 24 hours within 200m (Lepper *et al* 2014). No significant change in seal numbers at any measured distance from the device (Götz 2008). Rapid habituation in both grey and harbour seals. Some avoidance by harbour seals (range not determined) (Götz *et al* 2010).	3
Seals	Fauna Guard – Seal Module [40]	Predicted efficacy of at least 100 – 500m	Behavioural responses ranged from no reaction to increased time with head above the water. Deterrence range estimated at 100 - 500m (Kastelein *et al* 2017).	3
Seals	SalmonSafe [33]	60 – 250m	Significant effectiveness on seals (reduction in predated fish). Response in harbour seal up to 250m. Avoidance may be up to approximately 4km (Janik *et al* 2013, 2015).	3

Species	Device or group of devices and [Device ID]	Range of deterrence distances [1]	Summary	Evidence Score
			Potential usefulness for seals but remains to be demonstrated (Sparling *et al* 2015).	
Seals and sea lions	SealFENCE [44]	Up to 45 m	Predicted range of effect provided by manufacturer	1
Grey Seal	Aquamark 848 [10]	Up to 1,500m depending on species (from manufacturer)	Very localised strong avoidance reactions in grey seal within 28m (based on Nedwell *et al* 2007 criteria) (ABPmer 2014).	2
Grey seal	Aquamark 100 [11]	Up to 3m	Very localised strong avoidance reaction within 3m (ABPmer 2014)	2

[1] These ranges are likely to be influenced by factors such as local propagation characteristics, as well as animal's motivation, previous exposures to device and background noise levels. The range of deterrence distances is derived from the literature or manufacturer's information.

3 Deployment of Devices

Overview

Manufacturers do not provide generic guidelines on deployment of ADDs, as these devices are designed with simple functionality and therefore do not require detailed device-specific guidelines.

The approach for deployment of ADDs must be determined on a case by case basis. If detailed information is required by the Licensing Authority or advisory body, an ADD deployment plan can be produced by the operator or the information could be included as part of a wider mitigation plan. As example, the ADD deployment plan could set out the following information:

- details on the ADD device with technical specifications;
- role of ADD operator, including training requirements and experience;
- location of deployment and deployment depth;
- failsafe procedures in place including spares required and method of testing to ensure that the ADD is functioning effectively; and
- task plan to illustrate how mitigation will be carried out through communication with the offshore Operations/Fisheries Manager.

This section sets out the general considerations for deployment of ADD devices, as listed above.

3.1 Training requirements

There were no training requirements specified for any of the devices reviewed for this report. All devices can be operated by either an on/off switch for manual operation or an immersive switch which triggers the device once deployed. For many industry applications, deployment and operation of ADDs can therefore be undertaken by a member of staff/crew member, and not necessarily a trained marine mammal field biologist. If, however, monitoring is required via a hydrophone and computer interface (see Section 3.2.3), it may be necessary to employ personnel experienced in the use of Passive Acoustic Monitoring (PAM) systems.

3.2 General principles for deployment

3.2.1 Deployment depth

Manufacturers do not give specific deployment requirements for ADDs. Devices are deployed from a platform or vessel to an appropriate depth (specified by a mitigation plan if applicable) and activation is either manual or automatic. In considering the appropriate deployment depth, the operator should aim to locate the transducer below the maximum draft of the boat to ensure 360^{o} coverage and at a sufficient depth to avoid interference by surface water noise.

Devices generally come with a set cable length, but manufacturers may be able to adjust this to specified requirements. The logistics of deploying the ADD should be considered as part of the deployment plan.

3.2.2 Spares

To ensure reliability of the deployment plan, it is recommended that as a minimum a spare battery is included as part of the kit. A more failsafe approach would be to also include one or more back-up devices. The requirement for this depends on the logistical feasibility of replacing a device, should it malfunction.

3.2.3 Testing

It is recommended that both the main ADD unit and back up unit are tested to see if they are working e.g. using a hydrophone and monitoring via computer interface with suitable software (e.g. PAMGuard). This would require suitably trained personnel (e.g. PAM operators). In addition to listening in real time, the computer interface shows a spectrogram (frequency over time) plot of the sound. This provides an indication of amplitude but it is usually uncalibrated and therefore would not yield precise readings. This is not an issue if the device is just being tested for functionality.

Testing should be undertaken before a vessel leaves port e.g. through an initial deploy and test whilst the vessel is docked.

3.2.4 Duration of deployment

The duration of deployment of an ADD is determined on a project-specific basis. Consideration should be given to balancing the need to ensure animals are deterred from the risk zone (i.e. injury zone) and the need to minimise the noise introduced into the environment, which itself could cause a negative effect. Herschel *et al* (2013) recommend that the duration of mitigation should be tailored to allow all animals to swim twice the distance of the injury zone. Where applicable, (usually for activities resulting in considerable elevations of noise e.g. pile-driving), the radius of the injury zone can be estimated from subsea noise modelling.

Selection of the ADD deployed should be based upon available evidence on the distance over which effective displacement of key receptors occurs for a given device (Table 2-3). The duration of ADD deployment can then be informed by published swim speeds of the focal species to calculate the time it would take for an animal, assuming it swims in a straight line directly away from the noise source, to move twice the distance of the injury zone.

Consideration must also be given to the procedure to follow if there is a break in the noise producing activity. For example, in pile-driving there are planned or unplanned breaks that result in periods of non-piling. The applicant must consider the circumstances that would trigger the need to re-deploy an ADD to ensure that the risk of injury to marine mammals is minimised. Figure 1 shows an example of an ADD deployment protocol.

3.2.5 Task plan

As part of the mitigation plan, and for developments that require careful timing of ADD deployment (e.g. offshore piling operations), it is recommended that the applicant produces a task plan to show the lines of communication between the ADD operator and the operations manager. An example of such a task plan has been shown below (Figure 2).

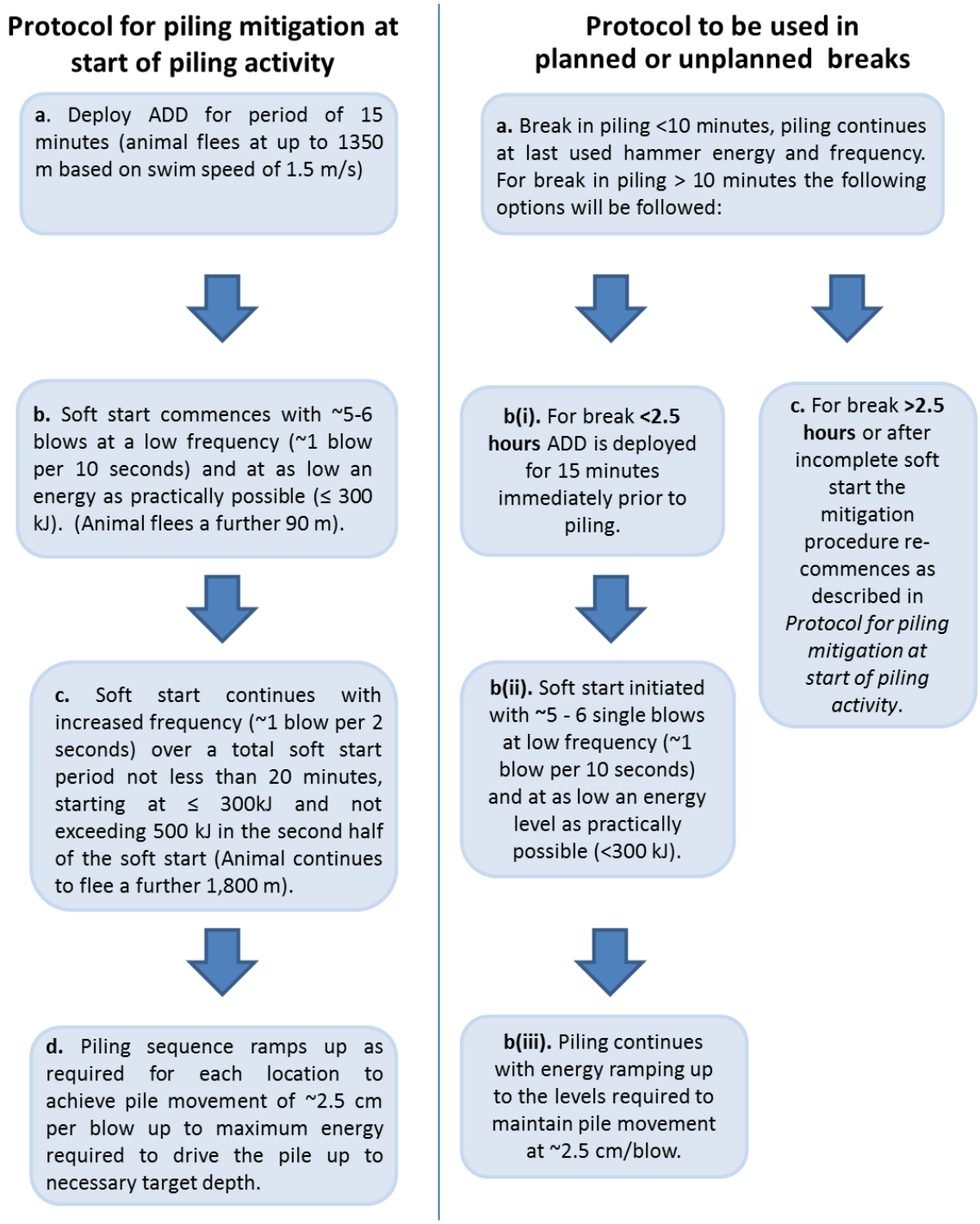

Figure 1. ADD deployment protocol for piling. Note that the fleeing distance has been estimated at each stage of the protocol to demonstrate that the distance cleared is sufficiently greater than the injury range. Reproduced with permission from Beatrice Offshore Wind Farm Ltd (BOWL 2017).

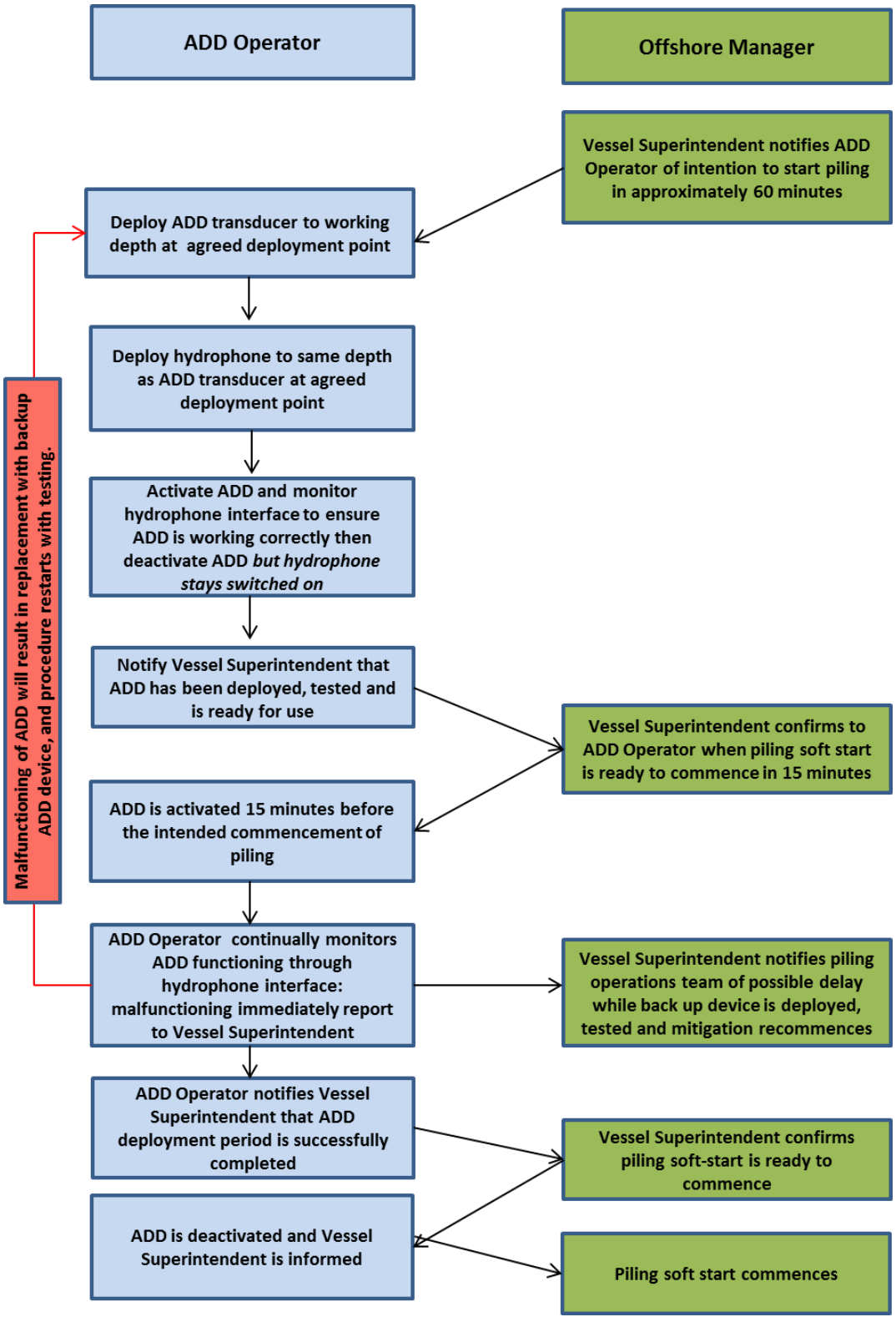

Figure 2. ADD task plan for deployment of an ADD as the primary mitigation measure during pile-driving activity. This task plan was produced for the Beatrice ADD Deployment Protocol as part of the Piling Strategy consent plan (BOWL 2017) (reproduced with permission from BOWL).

4 UK Legislation and Guidance

Overview

Marine mammals are protected in the UK under a series of regulations. Some of these apply to noise and the potential for hearing damage or disturbance. The majority of acoustic devices available emit loud sounds and therefore could carry a risk of an adverse impact on these species. The risk of injury from ADD deployment is likely to be very low (see section 1.3) and would only occur if animals stayed in the vicinity of an operating device for prolonged periods of time. ADDs, if effective, will disturb marine mammals, and the question of whether this could be considered an offence in relation to environmental legislation will depend primarily on how these devices are used, how often, for how long and where they are deployed.

4.1 Legislation and Regulations

There are several key pieces of legislation pertaining to marine mammals within UK and European waters that should be considered in relation to potential ADD deployments. The EC Habitats Directive (92/43/EEC) lists all cetaceans in Annex IV, i.e. species for which a system of strict protection needs to be established, and lists grey and harbour seal, harbour porpoise and bottlenose dolphin as Annex II, requiring the designation of Special Areas of Conservation (SACs).

The EC Habitats Directive is transposed into UK law by the Habitats Regulations by each devolved administration (out to 12 nautical miles (nm)) and beyond 12nm by the Offshore Marine Conservation Regulations. These make it an offence to kill, injure, capture or disturb cetaceans. A summary of relevant Habitats Regulations by devolved administration is provided below:

England and Wales	The Conservation of Habitats and Species Regulations 2017 consolidate and update the Conservation of Habitats and Species Regulations 2010 (as amended)
Scotland	The Conservation (Natural Habitats &c) Regulations 1994 (as amended)
Northern Ireland	The Conservation (Natural Habitats, etc) Regulations (Northern Ireland) 1995 (as amended)
Offshore	The Conservation of Offshore Marine Habitats and Species Regulations 2017, consolidate and update the Offshore Marine Conservation (Natural Habitats &c) Regulations 2007.

In addition to the Habitats Regulations, The Wildlife and Countryside Act 1981 (as amended), sets out protection for all animals listed on Schedule 5, including in England and Wales, all cetaceans[8] from 0 to 12nm. It makes it an offence to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or disturbing animals using such places.

The Conservation of Seals Act (1970), the Conservation of Offshore Marine Habitats and Species Regulations 2017, the Marine Scotland Act (2010), the Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014; and The Wildlife (Northern Ireland)

[8] Basking sharks, marine turtles and Atlantic sturgeon are also listed on Schedule 5 of the WCA.

Order 1985[9], all set out offences relating to seals, protecting them from capture, killing or injury either during closed seasons or year-round, and also prohibit disturbance and harassment in Northern Ireland and some parts of Scotland, respectively.

A summary of legislation relevant to the potential for an offence through the deployment of ADDs is provided in Table 4-1.

Also of relevance to ADD use are European Council Regulation (EC) No 812/2004 "*laying down measures concerning incidental catches of cetaceans in fisheries*" which requires the use of acoustic devices in order to minimise by catch of small cetaceans in areas with "*known or foreseeable high levels of by-catch of small cetaceans*"; and the Marine Strategy Framework Directive (MSFD 2008/56/EEC). Descriptor 11 of the MSFD "Energy including Underwater Noise" has the aim of ensuring that the "*introduction of energy including underwater noise is at levels which do not adversely affect the marine environment*". A UK 'marine noise registry' (MNR), which records the spatial and temporal distribution of impulsive underwater noise (with frequencies between 10Hz to 10kHz), was established in 2016.

[9] Basking sharks are also protected under this Order from intentional or reckless disturbance.

Table 4-1: Summary of offences in relation to cetaceans and seals.

Species Group	England	Wales	Scotland	N. Ireland	Offshore
Cetaceans: European Protected Species (Habitat Regulations, by devolved administration)					
	Deliberately kill, injure or capture a cetacean; Deliberately disturb cetaceans, including in ways likely to: - impair their ability to survive, to breed or reproduce, to rear or nurture their young, to migrate, to shelter or protect themselves. - affect significantly the local distribution or abundance of the species to which they belong.	Deliberately kill, injure or capture a cetacean; Deliberately disturb cetaceans, including in ways likely to: - impair their ability to survive, to breed or reproduce, to rear or nurture their young, to migrate, to shelter or protect themselves. - affect significantly the local distribution or abundance of the species to which they belong.	Deliberately or recklessly kill, injure or capture a cetacean. Deliberately or recklessly disturb or harass a cetacean or a group of cetaceans, including in ways likely to: - impair their ability to survive, to breed or reproduce, to rear or otherwise care for their young, to migrate, to shelter or protect themselves. - affect significantly the local distribution or abundance of the species to which they belong. Deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).	Deliberately kill, injure or capture a cetacean; Deliberately disturb cetaceans, including in ways likely to: - impair their ability to survive, to breed or reproduce, to rear or nurture their young, to migrate, to shelter or protect themselves. - affect significantly the local distribution or abundance of the species to which they belong.	Deliberately kill, injure or capture a cetacean; Deliberately disturb cetaceans, including in ways likely to: - impair their ability to survive, to breed or reproduce, to rear or nurture their young, or to migrate. - affect significantly the local distribution or abundance of the species to which they belong.

Cetaceans: Wildlife and Countryside Act (1981 as amended for England and Wales), Wildlife and Countryside Act (1981) (as amended in Scotland); The Wildlife (Northern Ireland) Order (1985) (as amended).					
	Offence to intentionally kill, injure or take any cetacean, or to intentionally or recklessly damage or destroy a place used for shelter or protection (or obstruct access to such a place). Intentionally or recklessly disturb any wild species of cetacean.	Offence to intentionally kill, injure or take any cetacean, or to intentionally or recklessly damage or destroy a place used for shelter or protection (or obstruct access to such a place). Intentionally or recklessly disturb any wild species of cetacean.	Cetaceans are no longer protected by the Wildlife and Countryside Act 1981 (as amended).	Cetaceans not protected by Wildlife Order.	Not covered by Wildlife and Countryside Act.
Seals: Marine (Scotland) Act 2010; Conservation of Seals Act (1970); Protection of Seals (Designation of Haul-out Sites) (Scotland) Order 2014; The Wildlife (Northern Ireland) Order 1985 (as amended)					
	Cannot take, kill or injure during closed season or on east and southeast coast at any time.	Cannot take, kill or injure during closed season.	Cannot intentionally or recklessly kill, injure or take a seal at any time except under licence or to alleviate suffering. Cannot intentionally or recklessly harass seals at significant haul out sites.	Cannot intentionally or recklessly kill, injure take or disturb at any time of the year, damage, destroy, or obstruct access to any structure or place used for shelter or protection.	Not applicable.

4.2 Wildlife licensing requirements

Overview

A marine wildlife licence or an EPS licence can be required for some activities where there is a potential for offences to a marine EPS or UK protected species (see Table 4-1). As mentioned in Section 1.3, the risk of an injury offence resulting from ADD deployment is likely to be very low, whereas the risk of a disturbance offence is dependent on how these devices are used, how often, for how long and where they are deployed. The deployment of ADDs can be an important component of a mitigation package aimed at preventing the risk of injury to marine mammals arising for example from the detonation of explosives or pile-driving. An ADD deployment protocol (e.g. Figure 1) included in the Marine Mammal Mitigation Plan and agreed by Regulators and SNCBs should ensure that the potential for disturbance from ADD deployment is minimised. However, the risk of an offence should be assessed on a case by case basis noting differences in EPS legislation between devolved administrations.

For prolonged ADD deployments inside or affecting a SAC with marine mammal qualifying interest features, a Habitats Regulations Appraisal/Assessment (HRA) may be required.

4.2.1 Marine Licensing in England

In England, depositing any object in the sea, on, or under the seabed, may require a marine licence. The Marine Management Organisation (MMO) licences most activities in English inshore and offshore waters. A marine wildlife licence or an EPS licence would be required if deployment of an ADD could result in an offence in relation to seals (UK protected species) or cetaceans (EPS species).

The guidance document “The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area” can be referred to for further information.

4.2.2 Marine Licensing in Scotland

Certain activities require a marine licence before they can be carried out in Scotland’s seas. Licensable activities include (but are not limited to): depositing substances/objects into the sea or onto the sea bed, the removal of substances/objects, construction, and explosives. Activities likely to disturb or injure a cetacean in Scottish inshore waters may additionally require an EPS licence.

Marine Scotland licenses most commercial activities in Scottish inshore and offshore territorial waters. SNH has responsibility for EPS licences for conservation work in inshore waters, survey and research. There must be a licensable activity for Marine Scotland/SNH to be able to issue a licence to disturb an EPS.

Where sound is to be produced (such as an ADD), applicants must provide the source level and frequency. The guidance document “The protection of marine European Protected Species from injury and disturbance” (Marine Scotland 2014) should be used to determine whether an offence may occur.

4.2.3 Marine Licensing in Northern Ireland

The Department of Agriculture, Environment and Rural Affairs (DAERA) licences activities in Northern Irish inshore waters. The MMO licences activities in Northern Irish offshore waters.

Certain activities, including the deployment of ADDs, may require a marine licence. A licence to injure or disturb an EPS may be required, as may a Wildlife licence (under Wildlife (Northern Ireland) Order 1985 (as amended) to kill, take, disturb, transport or trade, or injure Schedule 5 marine species (harbour and grey seal). As of 2016 these are issued by the Department of Agriculture, Environment and Rural Affairs (DAERA) Marine and Fisheries division.

4.2.4 Marine Licensing in Wales

Natural Resources Wales (NRW) licences activities in Welsh inshore waters and the Marine Management Organisation (MMO) licences activities in Welsh offshore waters. In Wales, depositing any object in the sea or on or under the seabed may require a marine licence. A marine wildlife licence or an EPS licence would also be required if deployment of an ADD could result in an offence in relation to seals (UK protected species) or cetaceans (EPS species). From 31st March 2017 species licensing becomes the responsibility of Welsh Ministers and licences will be issued by Natural Resources Wales.

The guidance document "The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area", can be referred to for further information.

4.2.5 Marine Licensing in UK Offshore Waters

The MMO and BEIS licence most activities in UK offshore waters. Certain activities, including the deposit of any substance or object, may require a marine licence. The activity may also require an EPS licence. It should be noted that an activity that does not require a marine licence may still require an EPS licence. An EPS licence would also be required if deployment of an ADD could result in an offence in relation to an EPS.

The guidance document "The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area", can be referred to for further information.

4.3 Current guidance documents

The listed guidance documents below should be used in relation to specific requirements by devolved administration. There may be additional or updated guidance available, and applicants should always contact the relevant conservation organisation.

England and Wales and Offshore waters

- The protection of marine European Protected Species from injury and disturbance Guidance for the marine area in England and Wales and the UK offshore marine area: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/681834/Protection_Marine_EP_Injury_Disturbance.pdf.

- Guidance on Activities that may require a Marine Licence: https://www.gov.uk/guidance/do-i-need-a-marine-licence.

- Marine Species: Protection: Cetaceans. https://www.gov.uk/government/publications/protected-marine-species/cetaceans-dolphins-porpoises-and-whales.

- Marine Species: Protection: Seals. https://www.gov.uk/government/publications/protected-marine-species/seals.

Scotland

- The protection of Marine European Protected Species from injury and disturbance. Guidance for inshore waters. Marine Scotland, 2014. http://www.gov.scot/Resource/0044/00446679.pdf.

- Guidance for Marine Licence Applicants, Marine Scotland 2015. http://www.gov.scot/Resource/0052/00524064.pdf.

Northern Ireland

- Marine Wildlife Licensing, Guidance for Applicants, July 2016. DAERA. https://www.daera-ni.gov.uk/publications/marine-wildlife-licensing-guidance-applicants.

- https://www.daera-ni.gov.uk/articles/marine-wildlife-licensing.

Offshore

- Understanding marine wildlife licences and report an incident guidance: https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident.

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6 Appendix: Acoustic Device Technical Information

The following appendices provide a summary of technical information for each of the devices discussed in the report.

Note: the response rate from manufacturers was low (50%) and, therefore, there are information gaps in some of the technical specifications presented.

6.1 Ace Aquatec: Marine Mammal Mitigation Device (Low) – Pinnipeds and LF Odontocetes

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 195dB re 1µPa at 1m.	Measured sound level = 195-205dB re 1µPa (RMS).
Frequency (frequency range and swept band or single frequency)	1 – 5kHz (can be restricted to 1 – 2kHz).	Measured fundamental frequency at 1kHz. The system has been designed to avoid harmonics at higher frequencies.
Continuous/ intermittent	Intermittent.	Duration between pulses is on a random cycle, 12 – 144 scrams per hour selectable.
Duty cycle	A random selection of pulses with a 50% duty cycle for a 5 second period (Lepper *et al* 2004).	Pulse uniformity shorten from 14ms to 3.3ms followed by an upshift in the frequency of the tonal components and their equivalent distribution (Lepper *et al* 2004).
Range	50 – 1000m from source.	Measured displacement over ranges of >1km depending on species. Sound detectable at 7km.
Battery	Automatically charges from AC. 12V gel battery with 90 – 195Ah.	Recharge intervals depend on rate (24 – 48 hours typically). The system also trickle charges and has a DC booster charger connected to mains AC.
Training requirements	No training specified.	Full manual provided and training available if required.
Device testing	None given.	Suggested testing using hydrophone and monitoring via suitable computer software, e.g. PAMGuard.
Deployment	Cable links transducer to control unit, manually and remotely activated.	Standard is for 40m cable, but able to order longer cable if required.
Functionality	Simple on/off switch and set rate.	Manual settings also possible controlling duty cycle, tone quality, pulse interval, sound varieties. Remote updates of sound patterns available.

6.2. Ace Aquatec: Marine Mammal Mitigation Device (Ultra LF) – Fish

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 184dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	20 – 90Hz.	-
Continuous/ intermittent	Intermittent.	Duration between pulses is on a random cycle.
Duty cycle	A random selection of pulses with a 50% duty cycle for a 5 second period (Lepper *et al* 2004).	Pulse uniformity shorten from 14ms to 3.3ms followed by an upshift in the frequency of the tonal components and their equivalent distribution (Lepper *et al* 2004).
Range	50 – 250m from source.	-
Battery	Automatically charges from AC. 12V gel battery with 90 – 195Ah.	Recharge intervals depend on rate (24 – 48 hours typically). The system also trickle charges and has a DC booster charger connected to mains AC.
Training requirements	No training specified.	Full manual provided and training available if required.
Device testing	None given.	Suggested testing using hydrophone and monitoring via suitable computer software e.g. PAMGuard.
Deployment	Cable links transducer to control unit, manually activated.	Standard is for 40m cable, but able to order longer cable if required.
Functionality	Simple on/off switch and set rate.	Manual settings also possible controlling duty cycle, tone quality, pulse interval, sound varieties. Remote updates of sound patterns available.

6.3 Ace Aquatec: Marine Mammal Mitigation Device (MF) – Pinnipeds and Cetaceans

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 195dB re 1µPa at 1m.	Measured sound level = 195-205dB re 1µPa (RMS).
Frequency (frequency range and swept band or single frequency)	8 – 24kHz.	Measured fundamental frequency at 12.1kHz with harmonics at 17kHz and 23kHz (Lepper *et al* 2003).
Continuous/ intermittent	Intermittent.	Duration between pulses is on a random cycle.
Duty cycle	A random selection of pulses with a 50% duty cycle for a 5 second period (Lepper *et al* 2004).	Pulse uniformity shorten from 14ms to 3.3ms followed by an upshift in the frequency of the tonal components and their equivalent distribution (Lepper *et al* 2004).
Range	50 – 1000m from source.	-
Battery	Automatically charges from AC. 12V gel battery with 90 – 195Ah.	Recharge intervals depend on rate (24 – 48 hours typically). The system also trickle charges and has a DC booster charger connected to mains AC.
Training requirements	No training specified.	Full manual provided and training available if required.
Device testing	None given.	Suggested testing using hydrophone and monitoring via suitable computer software, e.g. PAMGuard.
Deployment	Cable links transducer to control unit, manually activated.	Standard is for 25m cable, but able to order longer cable if required.
Functionality	Simple on/off switch and set rate.	Manual settings also possible controlling duty cycle, tone quality, pulse interval, sound varieties. Remote updates of sound patterns available.

6.4 Ace Aquatec: Marine Mammal Mitigation Device (HF) – Pinnipeds and Odontocetes

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 184dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	20 – 40Hz.	-
Continuous/ intermittent	Intermittent.	Duration between pulses is on a random cycle.
Duty cycle	A random selection of pulses with a 50% duty cycle for a 5 second period (Lepper *et al* 2004).	Pulse uniformity shorten from 14ms to 3.3ms followed by an upshift in the frequency of the tonal components and their equivalent distribution (Lepper *et al* 2004).
Range	50 – 2000m from source.	-
Battery	Automatically charges from AC. 12V gel battery with 90 – 195Ah.	Recharge intervals depend on rate (24 – 48 hours typically). The system also trickle charges and has a DC booster charger connected to mains AC.
Training requirements	No training specified.	Full manual provided and training available if required.
Device testing	None given.	Suggested testing using hydrophone and monitoring via suitable computer software, e.g. PAMGuard.
Deployment	Cable links transducer to control unit, manually activated.	Standard is for 40m cable, but able to order longer cable if required.
Functionality	Simple on/off switch and set rate.	Manual settings also possible controlling duty cycle, tone quality, pulse interval, sound varieties. Remote updates of sound patterns available.

6.5 Ace Aquatec: Universal Scrammer (US2)

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 194dB re 1µPa at 1m (RMS).	-
Frequency (frequency range and swept band or single frequency)	8 – 30kHz.	-
Continuous/ intermittent	Transmission duration of 20s (double scram 40s), and a pulse duration of 20 ms.	-
Duty cycle	~3% 5.5 scrams an hour.	-
Range	None specified	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.6 Ace Aquatec: Universal Scrammer (US3) and Hull Deterrent (HD):

NOTE: Ace Aquatec devices are differentiated into MMD's and the US3 and RT1, for offshore/pile driving applications and aquaculture use respectively. The US3 and HD devices have the same manufacturer's specifications but the US3 is used at fish farms whilst the HD is a hull-mounted device, typically used on vessels to deter predators from coming into conflict with fishing vessels.

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 195dB re 1µPa at 1m (RMS).	-
Frequency (frequency range and swept band or single frequency)	10 – 20kHz (automated randomisation).	-
Continuous/ intermittent	Intermittent.	-
Duty cycle	A random selection of pulses in 2 – 5 second cycles.	-
Range	None specified	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.7 Ace Aquatec: RT1

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 195dB re 1µPa at 1m (RMS).	-
Frequency (frequency range and swept band or single frequency)	1 – 5kHz (automated randomisation) - (can be restricted to 1 – 2kHz in applications near harbour porpoise).	-
Continuous/ intermittent	Intermittent.	-
Duty cycle	A random selection of pulses in 2 – 5 second cycles.	-
Range	None specified	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.8 Airmar dB Plus II

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 198dB re 1µPa at 1m (RMS).	Measured sound level = 192dB re 1µPa (RMS) at the fundamental frequency of 10.3kHz (Lepper *et al* 2014).
Frequency (frequency range and swept band or single frequency)	None specified	A broadband spectral response at the beginning of each pulse, with detectable energy levels between 1.5kHz to 50kHz (Lepper *et al* 2014).
Continuous/ intermittent	Continuous.	Sequence of pulsed sinusoidal tonal bursts (Lepper *et al* 2014).
Duty cycle	Each tonal burst is ~1.4ms in duration with 40ms interval. A 2.25s long sequence is then formed from 57-58 tone bursts. The sequence is then repeated with ~50% duty cycle allowing ~2s quiet period (Lepper *et al* 2014).	Low-power mode option where duty cycle is reduced from 2.5s ON - 2s OFF, to 2.5s ON - 6.5s OFF. Manufacturer advises against using this mode for long periods as it will result in less optimal protection from predators.
Range	System provides up to 3000m^2 of protection for a typical aquaculture application.	-
Battery	In remote locations, a wind generator or 4-panel solar array is the recommended power supply. Locations with shore power should utilise mains with a 24 Volt battery.	Normal mode operates when the battery voltage is above 22VDC; power save mode is automatically activated when the battery voltage drops below 22VDC; shut down mode is activated whenever the battery voltage drops below 22VDC.
Training requirements	None specified	-
Device testing	None specified	-
Deployment	Typical deployment involves four transmitters each being fired in turn, each with a 2s quiet period.	-
Functionality	Simple on/off switch. Has a soft start feature with a 70s ramp up to full power when the transmitter is first switched on.	Must be locked in the Off-switch position whenever a person is underwater and within 150 metres of a transducer.

6.9 Airmar: Gillnet Pinger

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 132dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	10kHz.	-
Continuous/ intermittent	Continuous.	-
Duty cycle	Pulse duration 300ms with repeat intervals of 4s.	-
Range	Can be detected by mammals within a 91m radius.	-
Battery	"D" cell alkaline battery.	Over one-year of continuous operation from a single "D" cell alkaline battery.
Training requirements	No training specified.	-
Device testing	None given.	-
Deployment	Designed for placement every 91m at bridles and net ends.	-
Functionality	None specified	-

6.10 Aquatec Group: Aquamark 848

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 165dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	Primary bandwidth 5kHz to 30kHz. Harmonic energy to 120kHz.	-
Continuous/ intermittent	- AQUAmark chirp repertoire for general deterrence; - Pseudo-clicks for echo-location confusion; - Pseudo-noise for echo-location masking; - Random composite of all modes.	-
Duty cycle	None specified	-
Range	Up to 1500m depending on species and nature of interaction.	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.11 Aquatec Group: Aquamark 100, 200, 210, 300

Parameter	Observed Specification			
Device	Aquamark 100	Aquamark 200	Aquamark 210	Aquamark 300
Source level	Nominal sound pressure level output = 145dB re 1µPa at 1m (Dawson *et al* 2013)	Nominal sound pressure level output = 145dB re 1µPa at 1m (Dawson *et al* 2013).	Nominal sound pressure level output = 150dB re 1µPa at 1m (Dawson *et al* 2013).	Nominal sound pressure level output = 132dB re 1µPa at 1m (Dawson *et al* 2013).
Frequency (frequency range and swept band or single frequency)	20 – 160kHz (Dawson *et al* 2013).	5 – 160kHz (Dawson *et al* 2013)	5 – 160kHz (Dawson *et al* 2013)	10kHz (Dawson *et al* 2013)
Continuous/ intermittent	Continuous (Dawson *et al* 2013).	Continuous (Dawson *et al* 2013).	Continuous (Dawson *et al* 2013).	Continuous (Dawson *et al* 2013).
Duty cycle	Signal duration of 200 – 300ms, with a signal interval of 5 – 30s (Dawson *et al* 2013).	Signal duration of 200 – 300ms, with a signal interval of 4 – 21s (Dawson *et al* 2013).	Signal duration of 50 – 300ms, with a signal interval of 5 – 30s (Dawson *et al* 2013).	Signal duration of 300ms, with a signal interval of 4s (Dawson *et al* 2013).
Range	None specified			
Battery	None specified			
Training requirements	None specified			
Device testing	None specified			
Deployment	None specified			
Functionality	None specified			

6.12 IFREMER/IX Trawl: Cetasaver V.03

Parameter	Observed Specification	Notes
Source level	Nominal sound pressure level output = 165dB re 1µPa at 1m (Dawson *et al* 2013)	-
Frequency (frequency range and swept band or single frequency)	30 – 150kHz (Dawson *et al* 2013)	- Signal 1: Frequency modulated signal between 30-150kHz. - Signal 2: Click train at 90kHz. (Berrow *et al* 2008)
Continuous/ intermittent	Continuous (Dawson *et al* 2013).	- Signal 1: 1s duration (random time and frequency organised sweeps of base square wave). - Signal 2: Click train of 0.1s duration, with a constant click time and repetition. (Berrow *et al* 2008)
Duty cycle	None specified	- Signal 1: repeated at a minimum of every 2s, maximum of 5.5s with an average of 4s. - Click train of 0.1s duration, with a constant click time and repetition. (Berrow *et al* 2008)
Range	None specified	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.13 STM Products: Dolphin Deterrent Devices (03L, 03N, 03H, 03U, DiD)

Parameter	Manufacturers Specification				
Device	DDD 03L	DDD 03N	DDD 03H	DDD 03U	DiD
Source level	Nominal sound pressure level output = 165dB re 1µPa at 1m.				
Frequency	5 – 500kHz (Random).				
Continuous/ intermittent	Intermittent (low).	Intermittent (normal).	Intermittent (high).	Intermittent (ultra-high).	Interactive.
Duty cycle	Av. duration between each pulse is 150s. Pulse duration can be random or vary between 500ms and 9000ms.	Av. duration between each pulse is 90s. Pulse duration can be random or vary between 500ms and 9000ms.	Av. duration between each pulse is 40s. Pulse duration can be random or vary between 500ms and 9000ms.	Av. duration between each pulse is 25s. Pulse duration can be random or vary between 500ms and 9000ms.	Device remains in standby until it detects the presence of mammals in the area. It's then the device will emit noise.
Range	None specified				
Battery	Av. battery charge duration is 300 hours. Up to 1000 charging / discharging cycles.	Av. battery charge duration is 120 hours. Up to 1000 charging / discharging cycles.	Av. battery charge duration is 40 hours. Up to 1000 charging / discharging cycles.	Av. battery charge duration is 8-12 hours. Up to 1000 charging / discharging cycles.	Mammal frequency dependent. Up to 1000 charging / discharging cycles.
Training requirements	None specified				
Device testing	None specified				
Deployment	Minimum quantity of 5 units to be deployed. Horizontal distance between two devices from 200m to 400m.	Minimum quantity of 5 units to be deployed. Minimum net length 1km.	For short fixed or moving nets, trawler - purse seine - long lines.	For squid fishing with single line.	For set nets, trawlers, purse seine, longlines and aquaculture, at least 600m far from a DDD.
Functionality	None specified				

6.14 Dukane: NetMark 1000

Parameter	Observed Specification	Notes
Source level	Nominal sound pressure level output of a pulse is 132dB re 1µPa at 1m (Dawson *et al* 2010).	-
Frequency (frequency range and swept band or single frequency)	10kHz.	-
Continuous/ intermittent	Continuous.	-
Duty cycle	-	Signal duration of 300ms with 4 s signal duration (Dawson *et al* 2010).
Range	None specified	-
Battery	None specified	-
Training requirements	None specified	-
Device testing	None specified	-
Deployment	None specified	-
Functionality	None specified	-

6.15 Future Oceans: 10kHz Porpoise Pinger, 70kHz Dolphin Pinger & 3kHz Whale Pinger

Parameter	Manufacturers Specification		
Device	10kHz Porpoise Pinger	70kHz Dolphin Pinger	3kHz Whale Pinger
Source level	Nominal sound pressure level output = 132dB re 1µPa at 1m.	Nominal sound pressure level output = 145dB re 1µPa at 1m.	Nominal sound pressure level output = 145 dB re 1µPa at 1m (±4dB).
Frequency (frequency range and swept band or single frequency)	10kHz (includes multiple ultrasonic harmonics).	70kHz.	3kHz (±5kHz) (includes multiple ultrasonic harmonics).
Continuous/ intermittent	Continuous.		
Duty cycle	Pulse duration of 300ms with an interval of 4s.		
Range	None specified		
Battery	1 x Lithium battery. Will last 12 months based on 12 hours per day use 365 days a year.		1 x Lithium battery. Will last 120 days based on 12 hours per day use 365 days a year.
Training requirements	None specified		
Device testing	None specified		
Deployment	Recommended spacing is one every 100m on gill nets.		Recommended spacing is one every 50m on gill nets.
Functionality	Immersive switch (i.e. will start sounding when the pinger is fully submersed and then turn off when out of the water).		

6.16 Fishtek Marine: Banana Pingers and Dolphin Anti-depredation Pinger

Parameter	Manufacturers specification			
Device	Banana Pinger (50-120)	Banana Pinger whale (3-20)	Banana Pinger porpoise (10)	Dolphin anti-depredation Pinger
Source level	145dB (±3dB) re 1µPa at 1m.	135dB (±3dB) re 1µPa at 1m.	132dB (±3dB) re 1µPa at 1m.	175 dB (±3dB) re 1µPa at 1m.
Frequency (frequency range and swept band or single frequency)	50kHz - 120kHz (±2kHz).	3kHz - 20kHz (±2kHz).	10kHz (±2kHz).	40kHz (±2kHz).
Continuous/ intermittent	Intermittent.	Intermittent.	Intermittent.	Intermittent.
Duty cycle	2.0 – 7.5%.	7.5%.	7.5%.	0.2 – 7.5%.
Range	100m	100m	50m	1000m
Battery	4500 hours of battery life (replaceable 'C' cell alkaline battery).	375 hours of battery life (replaceable 'C' cell alkaline battery).	4500 hours of battery life (replaceable 'C' cell alkaline battery).	175 hours of battery life (replaceable 'C' cell alkaline battery).
Training requirements	Instructions on how the devices should be mounted on the nets are provided in the instruction manual. Bespoke advice offered on contact with company.	Instructions on how the devices should be mounted on the nets are provided in the instruction manual. Bespoke advice offered on contact with company.	Instructions on how the devices should be mounted on the nets are provided in the instruction manual. Bespoke advice offered on contact with company.	Instructions on how the devices should be mounted on the nets are provided in the instruction manual. Bespoke advice offered on contact with company.
Device testing	Battery indicator lights showing functionality.	Audible when submersed in water. Battery indicator lights	Audible when submersed in water. Battery indicator lights	Battery indicator lights showing functionality.

		showing functionality.	showing functionality.	
Deployment	Dependant on use and in consultation with company. Generally, every 200 m attached to headline of fishing gear.	Dependant on use and in consultation with company. Generally, every 100 m attached to headline of fishing gear.	Dependant on use and in consultation with company. Generally, every 100 m attached to headline of fishing gear.	Dependant on use and in consultation with company. Generally, every 100 m attached to headline of fishing gear.
Functionality	Auto-immersive switch which switches off out of water, battery indicator light for fisher and manager functionality checking, rated for use down to 1000m, 5+ year lifespan indicator lights switch off when in water to avoid attracting pinnipeds. Randomised ping structure to prevent habituation. Removable pinger capsule for easy battery replacement.	Auto-immersive switch which switches off out of water, battery indicator light for fisher and manager functionality checking, rated for use down to 1000m, 5+ year lifespan indicator lights switch off when in water to avoid attracting pinnipeds. Removable pinger capsule for easy battery replacement.	Auto-immersive switch which switches off out of water, battery indicator light for fisher and manager functionality checking, rated for use down to 1000m, 5+ year lifespan indicator lights switch off when in water to avoid attracting pinnipeds. Removable pinger capsule for easy battery replacement.	Auto-immersive switch which switches off out of water, battery indicator light for fisher and manager functionality checking, rated for use down to 1000m, 5+ year lifespan indicator lights switch off when in water to avoid attracting pinnipeds. Removable pinger capsule for easy battery replacement.

6.17 F3: Maritime Technology UG Ltd: F3 Programmable Alert (PAL) Systems

Parameter	Manufacturers Specification			
Device	Porpoise PAL	10kHz PAL	Wideband PAL	Whale PAL
Source level	Nominal sound pressure level output = 145dB re 1µPa at 1m.	Nominal sound pressure level output = 132dB re 1µPa at 1m.	Nominal sound pressure level output = 145dB re 1µPa at 1m.	Nominal sound pressure level output = 145dB re 1µPa at 1m.
Frequency (frequency range and swept band or single frequency)	133kHz Porpoise clicks. Narrow band porpoise clicktrain.	10kHz narrow band.	20 – 160kHz wideband.	3kHz narrow band.
Continuous/ intermittent	Intermittent. 1-3 signals.	Intermittent. One signal.	Intermittent. One signal.	Intermittent. One signal.
Duty cycle	Pulse duration is 1s, with the repeat interval 8 – 24s randomised.	Pulse duration is 0.3s, with the repeat interval 4s.	Pulse duration is 0.3s, with the repeat interval 4 - 30s randomised.	Pulse duration is 0.3s, with the repeat interval 4s.
Range	250m in 'good' weather.	150 – 200m.	250 – 350m.	250 – 350m.
Battery	2 years continuous operation, with 4 years shelf life. Typical use is 3 years. Easily replaceable in all devices. Larger batteries with 4 years normal operation and 8 years shelf life are available upon request and fit in the same housing.			
Training requirements	Instructions on how the PAL devices should be mounted on the nets are provided in the instruction manual.			
Device testing	Audible in air at close range. Bat detector. Transparent housing and LED upon request.			
Deployment	PALS must me mounted on the net float lines every 200m.	PALS must me mounted on the net float lines every 100m.	PALS must me mounted on the net float lines every 200m.	PALS must me mounted on the net float lines every 200m.
Functionality	PAL devices are positively buoyant for both battery types and have been pressure tested to a depth of 320m. Each device has a salt-water switch and turns off in air 20 minutes after being retrieved. All PAL devices are programmable and can be adapted throughout their life span to emit acoustic and visual signals reflecting latest research results and varying customer requirements.			

6.18 Loughborough University: LU-1 Prototype

Parameter	Observed Specification	Notes
Source level	Nominal sound pressure level output = 145dB re 1µPa at 1m (Larsen & Eigaard 2014).	-
Frequency (frequency range and swept band or single frequency)	40 - 120kHz.	-
Continuous/ intermittent	Intermittent.	-
Duty cycle	Pulse duration of 300ms. Random pulse interval between 5 and 30s.	-
Range	None specified.	-
Battery	None specified.	-
Training requirements	None specified.	-
Device testing	None specified.	-
Deployment	None specified.	-
Functionality	Manual.	-

6.19 Lofitech: Seal Scarer

NOTE: The control unit is housed in waterproof box with transducer suspended underwater via a 25m cable. It is possible to order the units with longer cables if required.

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 191dB re 1µPa at 1m.	Measured sound level = 204dB re 1µPa at 1m (McGarry *et al* 2017).
Frequency (frequency range and swept band or single frequency)	10 – 20kHz.	Measured fundamental frequency at 14.6kHz with harmonics at 29.2kHz, 43.6kHz, and 72.8kHz (McGarry *et al* 2017).
Continuous/ intermittent	Intermittent.	Duration between pulses is on a random cycle.
Duty cycle	Pulse length 500ms^{-1} with variable length between pauses.	Measured pulse length 752ms^{-1} (McGarry *et al* 2017).
Range	300m from source.	Measured displacement over ranges of >1km depending on species (see Section 2.4.3).
Battery	Auto-Marin 12V (0.4A) with 90-120Ah.	Recharge intervals are 3-4 days.
Training requirements	No training specified.	
Device testing	None given.	Suggested testing using hydrophone and monitoring via suitable computer software e.g. PAMGuard.
Deployment	Cable links transducer to control unit, manually activated.	Standard is for 25m cable, but able to order longer cable if required.
Functionality	Simple on/off switch.	No further settings and no soft start.

6.20 Marexi Marine Technology: Acoustic Pinger V2.2

Parameter	Manufacturers Specification	Notes
Source level	Nominal sound pressure level output = 132dB re 1µPa at 1m (±4dB).	-
Frequency (frequency range and swept band or single frequency)	10kHz (±2kHz) tonal.	- Signal 1: Frequency modulated signal between 30-150kHz. - Signal 2: Click train at 90kHz. (Berrow *et al* 2008)
Continuous/ intermittent	Continuous.	-
Duty cycle	Pulse duration of 300ms (±15ms) and a pulse interval of 4s (±0.2s).	-
Range	None specified.	-
Battery	±9500h (>13-month 24hr/day continuously.	Once the device has consumed its useful life, it should be replaced for another.
Training requirements	None specified.	-
Device testing	None specified.	-
Deployment	None specified.	-
Functionality	Immersive switch.	-

6.21 GenusWave Ltd: SalmonSafe

Note: The Salmonsafe ADD will be the successor to this device, but from the literature there has been no testing of this device published and there no accessible data from the manufacturers.

Parameter	Manufacturers specification	Notes
Source level	None specified.	Measured sound pressure level output = 180 - 182dB re 1µPa at 1m (RMS) for signals centred at 10kHz (Gotz & Janik 2015).
Frequency (frequency range and swept band or single frequency)	500Hz – 22kHz.	A noise pulse centred at ~1kHz is used for deterrence of seals only (this noise pulse was within 10dB of its maximum output between 700Hz and 1500Hz), while a similar pulse centred at ~10kHz would be recommended for deterrence of both seals and odontocetes (odontocetes) (Gotz & Janik 2015).
Continuous/ intermittent	None specified.	-
Duty cycle	None specified.	-
Range	None specified.	60 – 250m (Gotz & Janik 2011, 2015).
Battery	None specified.	-
Training requirements	None specified.	-
Device testing	None specified.	-
Deployment	None specified.	-
Functionality	None specified.	-

6.22 Savewave: SealSalmon Saver, OrcaSaver, Long Line Save, Endurance Saver.

Note: Limited web information for these devices. Hi Impact Endurance and OrcaSaver are not commercially available anymore.

Parameter	Observed Specification			
Device	Seal Salmon Saver (High impact) (Franse *et al 2005)*	Long Line Saver (Franse *et al 2005)*	Endurance Saver (Franse *et al 2005)*	OrcaSaver (Mustad Longline & SeaWave 2013).
Source level	Nominal sound pressure level output = 155dB re 1µPa at 1m	Nominal sound pressure level output = 155dB re 1µPa at 1m	Nominal sound pressure level output = 140dB re 1µPa at 1m	Nominal sound pressure level output = 196 ±2dB re 1µPa at 1m
Frequency (frequency range and swept band or single frequency)	Double signal 5 – 30kHz and 30 – 160kHz wide band sweeps, harmonics up to 180kHz	Single signal 5 – 60kHz wide band sweeps, harmonics up to 180kHz	Single signal 5 – 90kHz wide band sweeps, harmonics up to 180kHz	6.5kHz
Continuous/ intermittent	Intermittent	Intermittent	Intermittent	Intermittent
Duty cycle	Pulse duration 200 – 900ms randomised. Pulse interval 4 – 16s randomised.	Pulse duration 200 – 400ms randomised. Pulse interval 4 – 16s randomised.	Pulse duration 200 – 400ms randomised. Pulse interval 4 – 30s randomised.	Pulse duration from 200ms to 1s
Range	-	-	-	-
Battery	-	-	-	-
Training requirements	-	-	-	-
Device testing	-	-	-	-
Deployment	-	-	-	-
Functionality	-	-	-	-

6.23 Gael Force: SeaGuard Seal Deterrent

Note: Based on the Gael Force specification the only main change is the battery efficiency. Therefore, unless the Gael Force manufacturer's specification describes a parameter slightly differently, it has been assumed that the source levels, frequencies and type of signal are the same as the original Airmar device.

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 198dB re 1µPa at 1m (RMS).	Measured sound level = 192dB re 1µPa (RMS) at the fundamental frequency of 10.3kHz (Lepper *et al* 2014).
Frequency (frequency range and swept band or single frequency)	-	A broadband spectral response at the beginning of each pulse, with detectable energy levels between 1.5kHz to 50kHz (Lepper *et al* 2014).
Continuous/ intermittent	Continuous and intermittent options.	Sequence of pulsed sinusoidal tonal bursts (Lepper *et al* 2014).
Duty cycle	Multiple and random firing patterns, where the length and breaks of the firing pulses can be varied.	-
Range	System provides up to 3000m^2 of protection for a typical aquaculture application.	-
Battery	28V DC, 48V DC and 90V – 250V AC version available.	50% more efficient than the Airmar dBPlus 11.
Training requirements	None specified	
Device testing	None specified	
Deployment	Typical deployment involves four transmitters each being fired in turn, each with a 2s quiet period.	-
Functionality	Simple on/off switch. Has a soft start feature with a 70s ramp up to full power when the transmitter is first switched on.	Must be locked in the Off-switch position whenever a person is underwater and within 150m of a transducer.

6.24 Fauna Guard – Porpoise Module

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 172dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	60 – 150kHz.	-
Continuous/ intermittent	Intermittent, with randomised intervals varying between 3 - 10s.	-
Duty cycle	Sequence of 8 selected signals (square, triangle, saw tooth, sweep).	The signals vary in duration between 9 and 18s and sound at random intervals, varying between 3 and 10s. The average duty cycle of the device is 65% (Kastelein *et al* 2017).
Range	Observed efficacy of at least 1000m.	-
Battery	Operates on 230V (network or generator).	-
Training requirements	No training specified.	Manual and induction can be provided.
Device testing	Sound source check available on sound generator unit; hydrophone attached to transducer.	-
Deployment	Cable of 60m links transducer to sound generator unit; manually activated.	-
Functionality	Simple on/off switch with an automated soft start (ramp up to 3-5 minutes) included.	Device has volume control.

6.25 Fauna Guard – Seal Module

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 182dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	200Hz – 20kHz.	-
Continuous/ intermittent	Intermittent, with randomised intervals varying between 3 - 10s.	-
Duty cycle	Sequence of 16 selected signals (square, triangle, saw tooth, sweep) at 10 seconds per signal.	The average duty cycle of the device is ~60% (Kastelein *et al* 2017).
Range	Predicted efficacy of at least 100 - 500m.	-
Battery	Operates on 230V (network or generator).	-
Training requirements	No training specified.	Manual and induction can be provided.
Device testing	Sound source check available on sound generator unit; hydrophone attached to transducer.	-
Deployment	Cable of 60m links transducer to sound generator unit; manually activated.	-
Functionality	Simple on/off switch with an automated soft start (ramp up to 3-5 minutes) included.	Device has volume control.

6.26 Fauna Guard – Turtle Module

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 197dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	200Hz – 1kHz.	-
Continuous/ intermittent	Intermittent, with randomised intervals varying between 3 - 10s.	-
Duty cycle	Sequence of 7 selected signals (square, triangle, saw tooth, sweep).	The average duty cycle of the device is ~60% (Kastelein *et al* 2017).
Range	-	-
Battery	Operates on 230V (network or generator).	-
Training requirements	No training specified.	Manual and induction can be provided.
Device testing	Sound source check available on sound generator unit; hydrophone attached to transducer.	-
Deployment	Cable of 60m links transducer to sound generator unit; manually activated.	-
Functionality	Simple on/off switch with an automated soft start (ramp up to 3-5 minutes) included.	Device has volume control.

6.27 Fauna Guard – Fish Module

Parameter	Manufacturers specification	Notes
Source level	Nominal sound pressure level output = 197dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	200Hz – 1kHz.	-
Continuous/ intermittent	Intermittent, with randomised intervals varying between 3 - 10s.	-
Duty cycle	Sequence of 20 selected signals (square, triangle, saw tooth, sweep) at 10 seconds per signal.	The average duty cycle of the device is ~60% (Kastelein *et al* 2017).
Range	Predicted efficacy of at least 100 - 500m.	-
Battery	Operates on 230V (network or generator).	-
Training requirements	No training specified.	Manual and induction can be provided.
Device testing	Sound source check available on sound generator unit; hydrophone attached to transducer.	-
Deployment	Cable of 60m links transducer to sound generator unit; manually activated.	-
Functionality	Simple on/off switch with an automated soft start (ramp up to 3-5 minutes) included.	Device has volume control.

6.28 Seamaster: Fish Protector

Parameter	Manufacturers Specification	Notes
Source level	Nominal sound pressure level output up to 165dB re 1µPa at 1m.	-
Frequency (frequency range and swept band or single frequency)	Frequency sweep tones and harmonics 10 - 90kHz.	-
Continuous/ intermittent	Continuous.	-
Duty cycle	Pulse duration of 1.9s with a 15s interval.	-
Range	Up to 1km.	-
Battery	Rechargeable batteries, approximately 12 hours of continuous use and battery life of around 5 years.	-
Training requirements	None specified.	-
Device testing	None specified.	-
Deployment	None specified.	-
Functionality	Immersive switch becomes active after 60s of being immersed.	-

6.29 SealFENCE 3 (OTAQ)

Note: There is also a SealFENCE 4 in production and this will have the same acoustic characteristics as provided below.

Parameter	Manufacturers specification	Notes
Source level	Patrol mode: sound pressure level output = 165dB re 1µPa at 1m RMS. Protect mode: sound pressure level output = 189dB re 1µPa at 1m RMS.	Sound characteristics in protect mode have been verified by the National Physics Laboratory (NPL)
Frequency (frequency range and swept band or single frequency)	9 – 11 kHz.	-
Continuous/ intermittent	Intermittent.	-
Duty cycle	Patrol mode: 2 second transmissions with 20 second gap between pulses Protect mode: 3 second transmissions with random pulse gaps of between 3 and 10 seconds	-
Range	45 m	Provided by manufacturer
Battery	24vDC Power Output.	230vAC required for battery pack Smart projector output
Training requirements	No training specified.	-
Device testing	None given.	-
Deployment	25 m cable	Longer cables available on request High performance polyurethane moulding
Functionality	OceanTALK™ Air Wireless Link for ACM	-

6.30 Terecos Ltd: DSMS-4

Note: The DSMS-4 unit has four different programmes which involve two different pulse sequences. The table has been split out into these four programmes for clarity.

Parameter	Manufacturers specification	Notes
Programme 1 – Sequence 1		
Source level	None specified.	Measured sound pressure level output = 177dB re 1µPa at 1m (RMS) (±1dB) at 6.6kHz (Lepper *et al* 2004). No equivalent source levels of greater than 146dB re 1µPa at 1m (RMS) at frequencies above 27kHz (Lepper *et al* 2014).
Frequency (frequency range and swept band or single frequency)	None specified.	Fundamental frequencies ranging from 1.8kHz – 3.8kHz with uniformly distributed harmonic components (Lepper *et al* 2004).
Continuous/ intermittent	Continuous.	Repetitive five segment (16ms duration) continuous tonal blocks forming an up and down frequency sweep (Lepper *et al* 2004).
Programme 2		
Source level	None specified.	Measured sound pressure level output = 179dB re 1µPa at 1m (RMS) (±1dB) and 178dB re 1µPa at 1m (RMS) (±1dB) at 4.7kHz and 6.8kHz respectively (Lepper *et al* 2014). No equivalent source levels of greater than 145dB re 1µPa at 1m (RMS) at frequencies above 27kHz (Lepper *et al* 2014).
Frequency (frequency range and swept band or single frequency)	None specified.	Multi-component continuous tones with observed peak level frequencies of 4.7kHz and 6.8kHz. Both contain complex multiple frequency components with a broad energy distribution away from the peak level tonal component.
Continuous/ intermittent	Continuous.	Randomly timed sequence of continuous and time variant multi-component tonal blocks (Lepper *et al* 2004).
Programme 3 – Sequence 2		
Source level	None specified.	Measured sound pressure level output = 178dB re 1µPa at 1m

		(RMS) (±1dB) at 4.9kHz (Lepper *et al* 2004).
Frequency (frequency range and swept band or single frequency)	None specified.	Fundamental frequencies ranging from 2.4kHz – 6.0kHz with uniformly distributed harmonic components (Lepper *et al* 2004).
Continuous/ intermittent	Continuous.	Sequence of eight segments (8ms duration) continuous tonal blocks forming an up and down frequency sweep combined with variable continuous multi-component tonal blocks (Lepper *et al* 2004).
Programme 4 – Sequence 1 and Sequence 2		
Source level	None specified.	Combined Sequence 1 and Sequence 2 (See programme 1 and 3).
Frequency (frequency range and swept band or single frequency)	None specified.	Combined Sequence 1 and Sequence 2 (See programme 1 and 3).
Continuous/ intermittent	Continuous	Randomly timed combined sequence of Seq. 1, Seq. 2 tonal blocks, continuous multi-component tonal blocks and time variant multi-component tonal blocks (Lepper *et al* 2004).
Duty cycle	None specified.	-
Range	None specified.	-
Battery	None specified.	-
Training requirements	None specified.	-
Device testing	None specified.	-
Deployment	None specified.	-
Functionality	None specified.	-