COMHAIRLE NAN EILEAN SIAR

The Town and Country Planning Scotland Act 1997 – Section 36(1)

Town and Country Planning General Development Procedure Order 2013 Regulation 16

Planning Register – Part 1

Application Details

Reference Number	**24/00251/FFPA**
Date registered as valid	**18/07/2024**
Description of Development	**Redevelopment of the existing 14 pen fish farm at Caolas, Loch Portain. Install 12 x 100m circumference circular pens to be moored in a 60m x 60m square mooring grid in a 2 x 6 layout. Increase and adjust existing mooring containment area to accommodate the required mooring system. Install a 400T automated feed barge to the NW of the pen group. Maximum stocked biomass 1720 tonnes.**
Address or description of location to which the development relates	**Marine Site, Caolas, Loch Portain, Isle of North Uist**
Co-ordinates	**N 869 236, E 948 29**
Applicant Name	**Loch Duart Ltd Per Dr Caroline Roberts**
Applicant Address	**Badcall Salmon House, Scourie, Sutherland, IV27 4TH**
Agent name (if applicable)	**N/A**
Agent Address (if applicable)	

The above application summary is accompanied by plans and drawings sufficient to describe the development and where relevant any design statement.

Important Note: on Tuesday 07 November 2023, Comhairle nan Eilean Siar experienced a criminal cyber incident and is working with Police Scotland, the Scottish Government and the National Cyber Security Centre to investigate the matter.

The Online Planning Portal remains unavailable as does our suite of integrated software and hardwaresystems. In order to enable access by the wider public to application documents and consult upon planning applications, interim systems have been put inplace on the temporary website of Comhairle nan Eilean Siar, including a rudimentary facility to display a limited number of documents per application.

Any party wishing to view the application file in full may do so at the offices of Comhairle nan Eilean Siar at Sandwick Road, Stornoway Isle of Lewis, HS1 2BW or Balivanich, Isle of Benbecula. HS7 5LA, ordinarily between 9am and 5pm Monday to Friday (excluding public and local holidays). It is recommended that in advance of visiting an office to view an application that you make an

appointment by sending an email to planning@cne-siar.gov.uk

Caolas, Loch Portain

- MCA
- Grid (60m x 60m)
- Pens (100m)
- 400T Seamate Barge

N

0 0.25 0.5 1 km

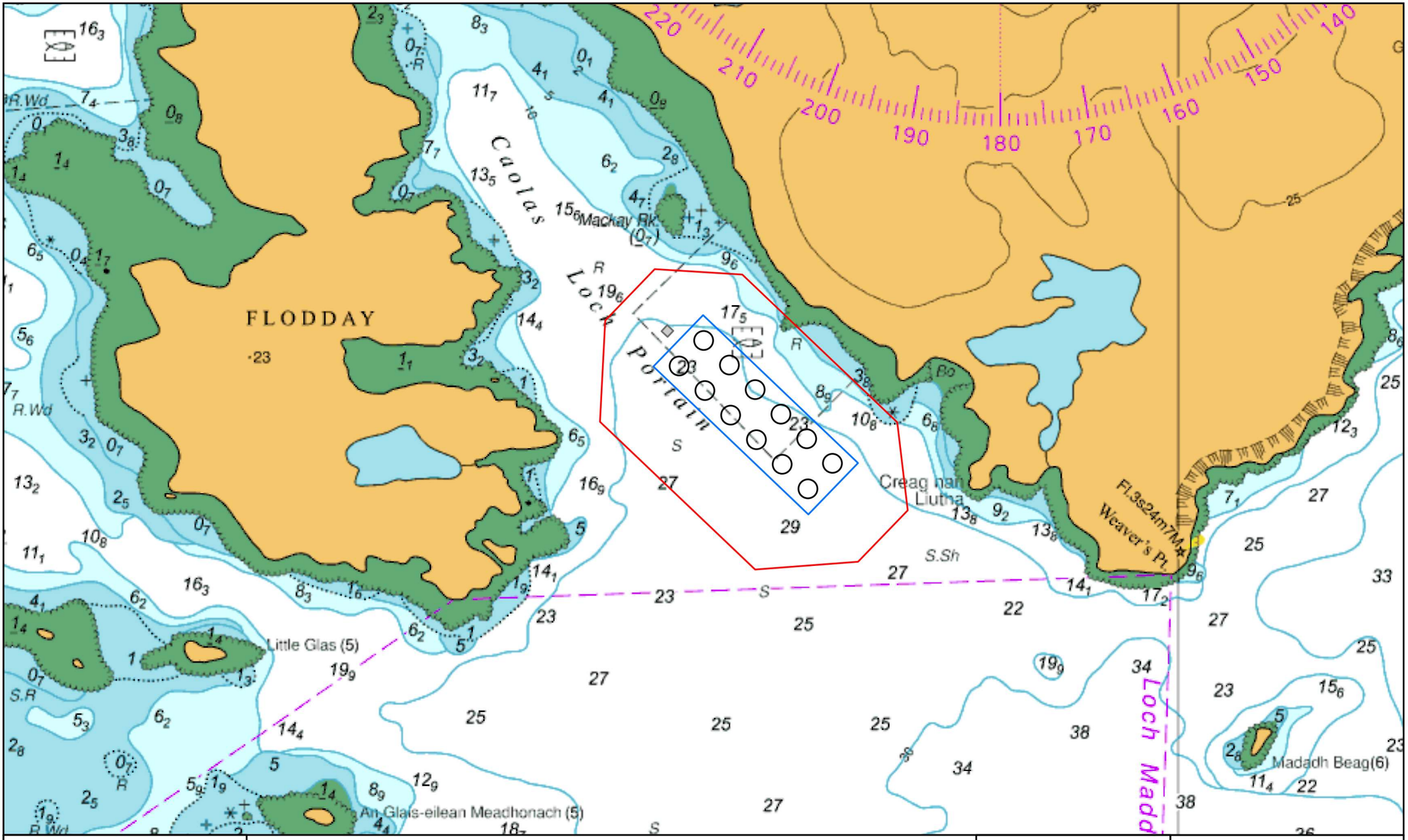
Scale: 1:10,000 at A4

Spatial Reference

Datum: OSGB 1936
Map Units: Meter

MAP: CLP006/PPA
Created: 19/10/2023 ND

LOCH DUART
UNRIVALLED SCOTTISH SALMON



Caolas, Loch Portain

- Grid (60m x 60m)
- MCA
- Pens (100m)
- 400t Seamate Barge

Scale: 1:15,000 at A4

0 0.25 0.5 1 km

N

Spatial Reference
Datum: WGS 1984 Web Mercator (auxiliary sphere)

Map Units: Meter

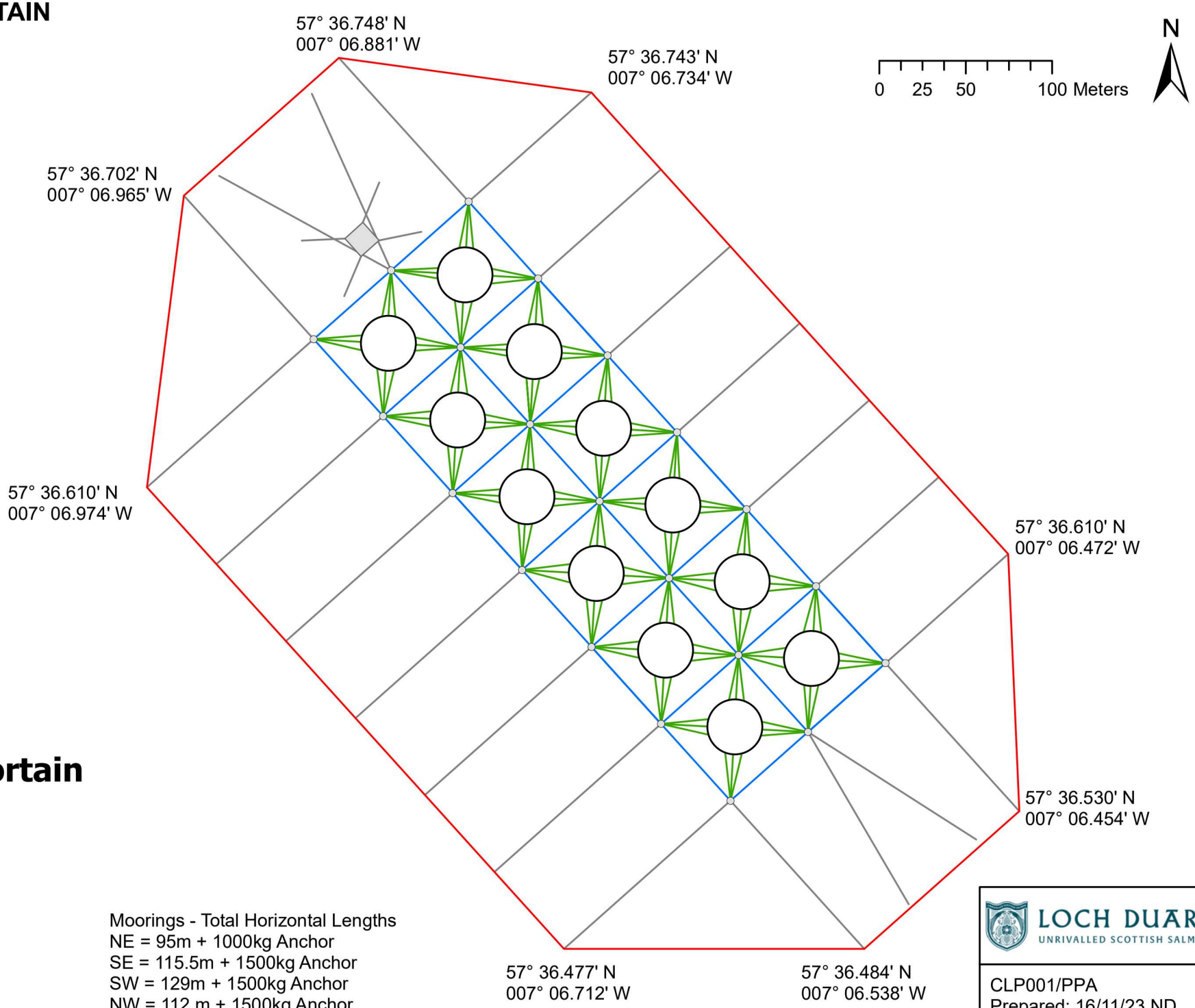
MAP: CLP004/PPA
Created: 19/10/2023 ND

LOCH DUART
UNRIVALLED SCOTTISH SALMON

CAOLAS, LOCH PORTAIN
SCALED SITE PLAN

Scale: 1:3,000 at A4

Site Centre NF 94829 69326



Caolas, Loch Portain

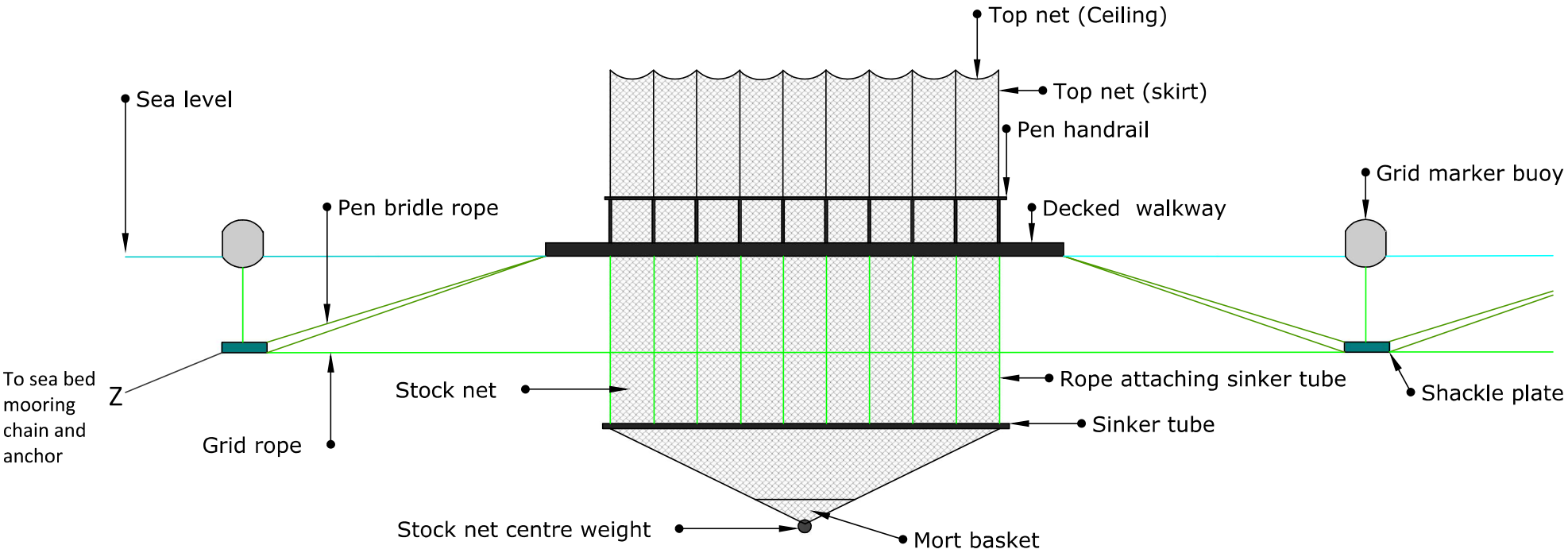
- MCA
- Pens (100m)
- Grid (60m x 60m)
- 400T Seamate Barge
- Grid Buoys
- Bridles
- Moorings

Moorings - Total Horizontal Lengths
NE = 95m + 1000kg Anchor
SE = 115.5m + 1500kg Anchor
SW = 129m + 1500kg Anchor
NW = 112 m + 1500kg Anchor

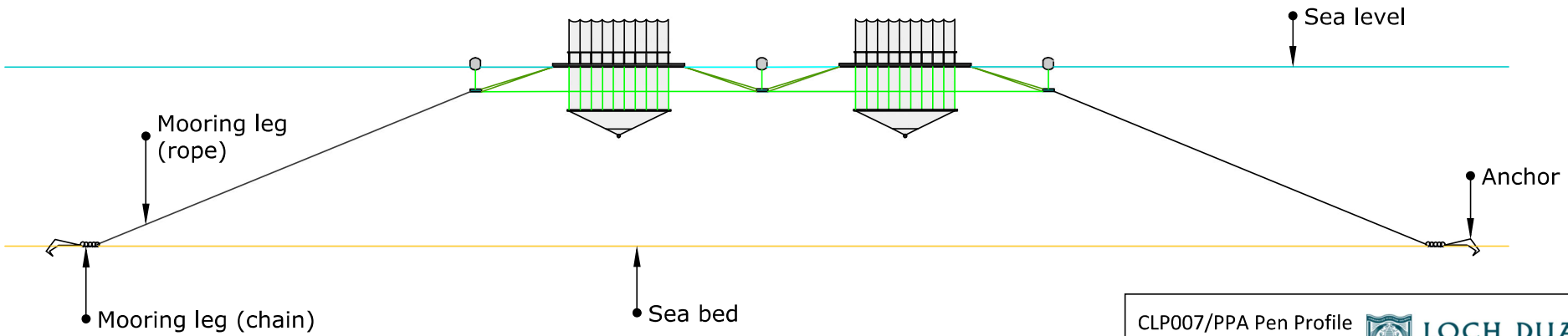
LOCH DUART
UNRIVALLED SCOTTISH SALMON

CLP001/PPA
Prepared: 16/11/23 ND

1. Simplified Underwater Pen Profile (Not to Scale and Zoomed in)

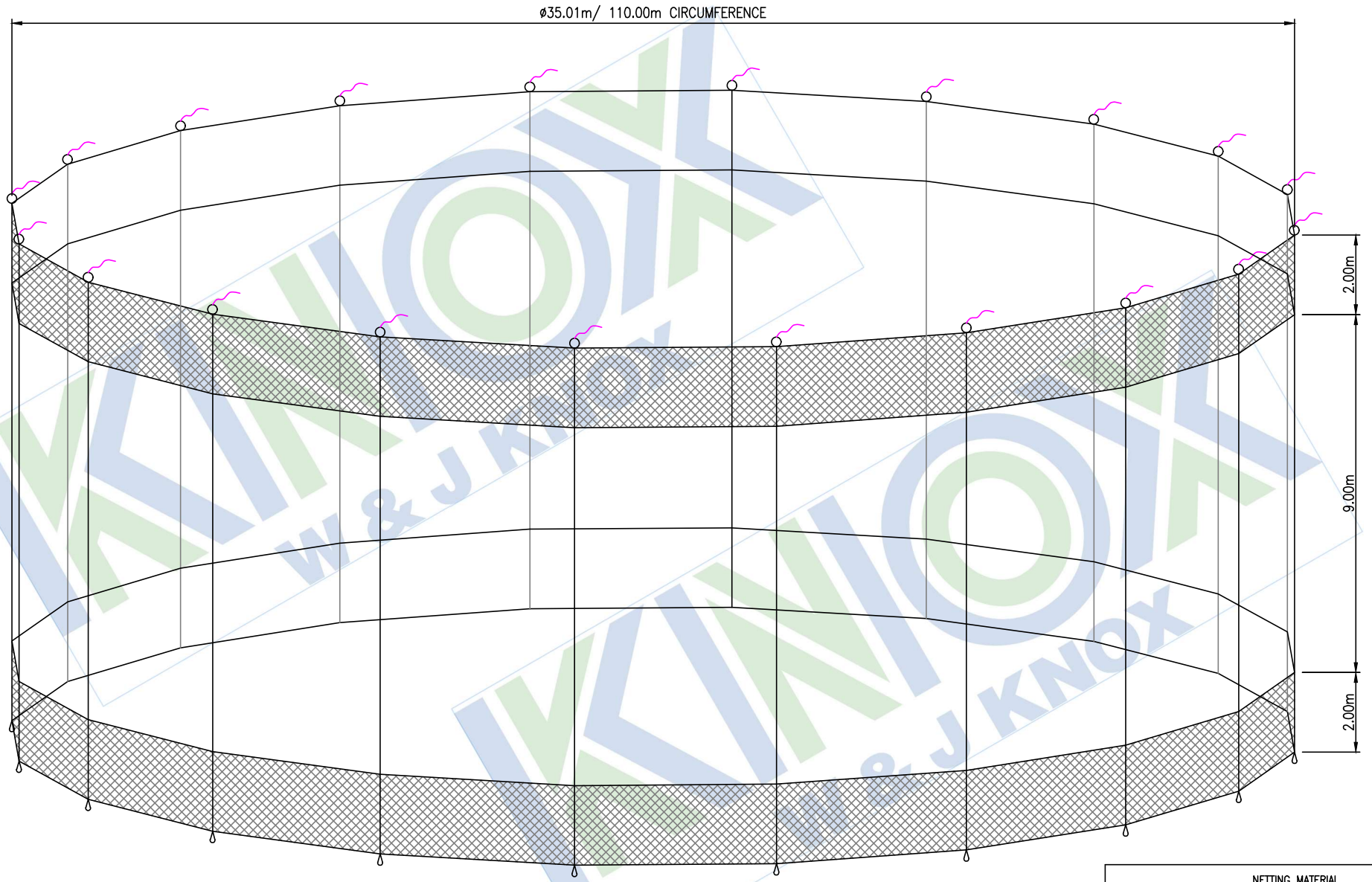


2. Simplified Underwater Site Profile Showing Full Mooring Extents (Not to Scale and Zoomed in)



CLP007/PPA Pen Profile
ND 30/10/23

LOCH DUART
UNRIVALLED SCOTTISH SALMON



ISOMETRIC

NETTING MATERIAL	
CENTRE PANEL	3.80mm KNOTTED HDPE, 200mm SQ.MESH
TOP & BOTTOM PANELS	2.60mm KNOTTED HDPE, 50mm APERTURE

REVISION HISTORY				
REV.	DATE	AMENDMENTS	DRAWN	APPROVED
0	20/06/2024	ORIGINAL DRAWING	CM	RE
1				
2				
3				

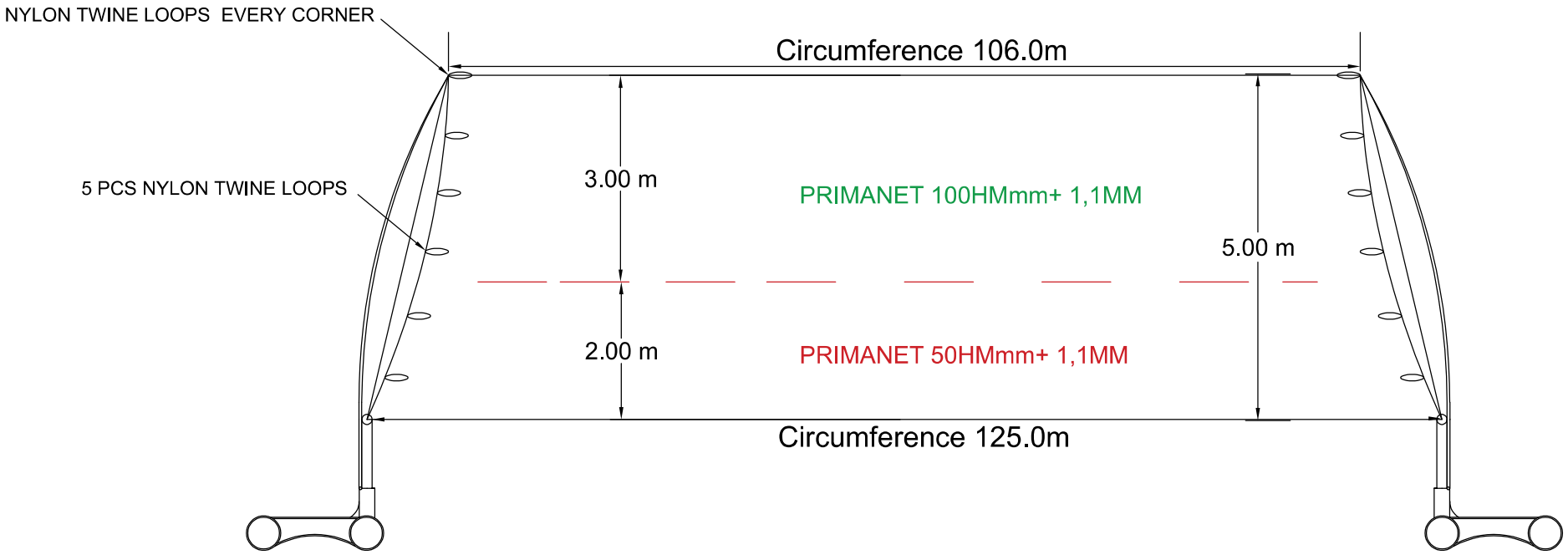
CUSTOMER: LOCH DUART
SITE: CAOLAS
DRAWING NUMBER: 03-1633 REV 0
STATUS: APPROVED
ORDER NUMBER: ORDER NUMBER
SCALE: 1:100 @ A3

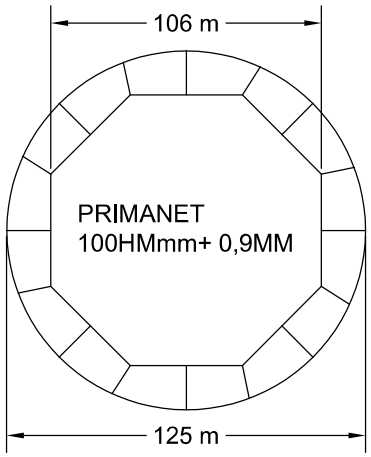
TITLE: PREADTOR NET PANEL (x4)
27.5m x 13m SEGMENTS
–

PROJECTION: THIRD ANGLE

KNOX W & J KNOX
MILL ROAD KILBIRNIE AYRSHIRE KA25 7DZ
WWW.WJKNOX.CO.UK 01505 682 511

SHEET: 1/1





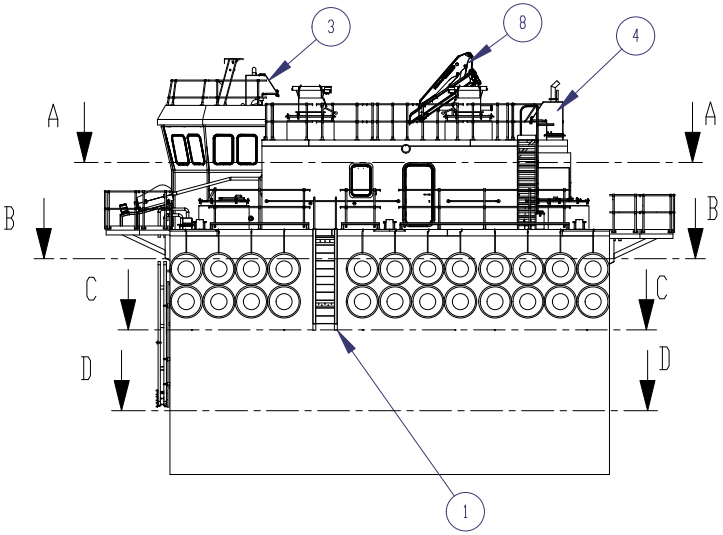
VÓNIN®

BIRD NET FOR 6 MTR POLE 125 / 106 m 125m/106 m W/5m wall

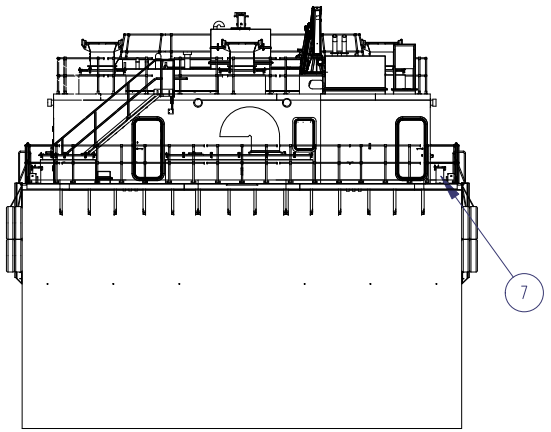
		Date	24.01.2024		

Roof Circumference		106,0 m		Netting	PRIMANET 100HMmm+ 0,9MM	
Wall		2,00 m / 3,00 m		Netting	PRIMANET 50HMmm+ 1,1MM	PRIMANET 100HMmm+ 1,1MM
Bottom Circumference		125,0 m		Netting	PRIMANET 100HMmm+ 0,9MM	
Ropes	14 mm Polysteel	Top rope	106,0 m	Side wall Netting from bottom pole to 2,00 mtr of height:		
Ropes	14 mm Polysteel	Bottom rope	125,0 m	Mesh size 50HMmm+ 1,1 MM		
Ropes	14 mm Polysteel	Side ropes	5,00 m	Side wall Netting remaining from to 3,00 mtr of height to full height:		
Loops	10mm Nylon twine			Mesh size 100HMmm + 1,1MM		

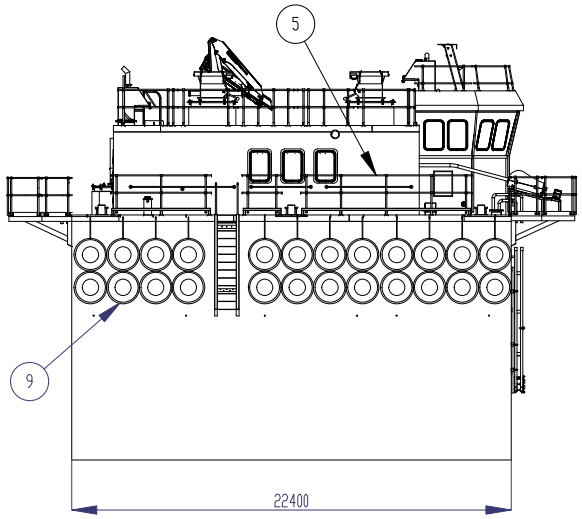
ITEM NO.	DESCRIPTION	QTY
1	LADDER	2
2	COOLING TUBES	2
3	INLET VENT	1
4	GENERATOR VENT	1
5	HANDRAILS	44
6	SELECTORS	4
7	FUEL INLET	1
8	PK 12500 CRANE	1
9	FENDERS	6
10	GREY WATER OUTLET	1
11	WHEELHOUSE HANDRAILS	5



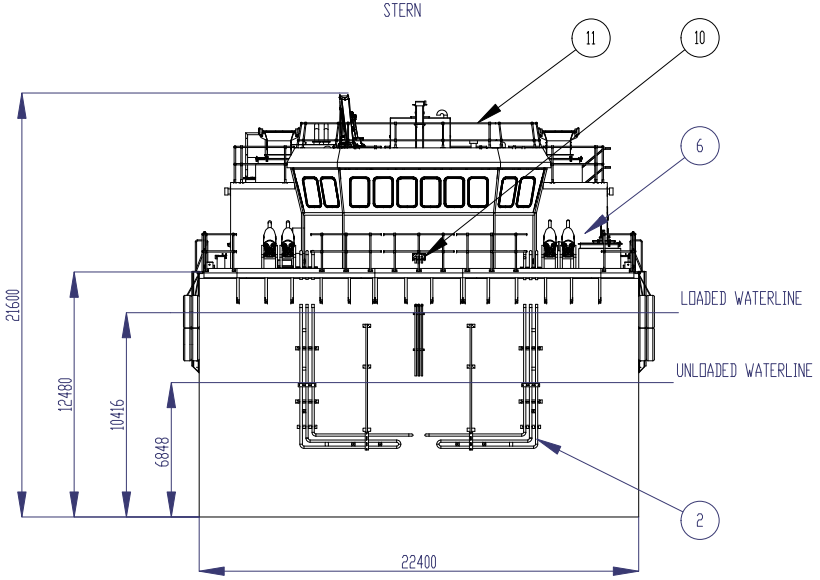
PORT



STERN



STARBOARD



BOW

REVISION HISTORY				
REV	DATE	COMMENT	DRAWN BY	APPV'D BY

	NAME	DATE
DRAWN	M. MACPHERSON	18/05/2023
CHK'D	S OFFORD	18/05/2023
APPV'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µm - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:160

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤4000mm ISO 2768-K-E; ≥4000mm DIN 7168-T

GEO-METR. TOL. ≤3000mm ISO 2768-K-E; ≥3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

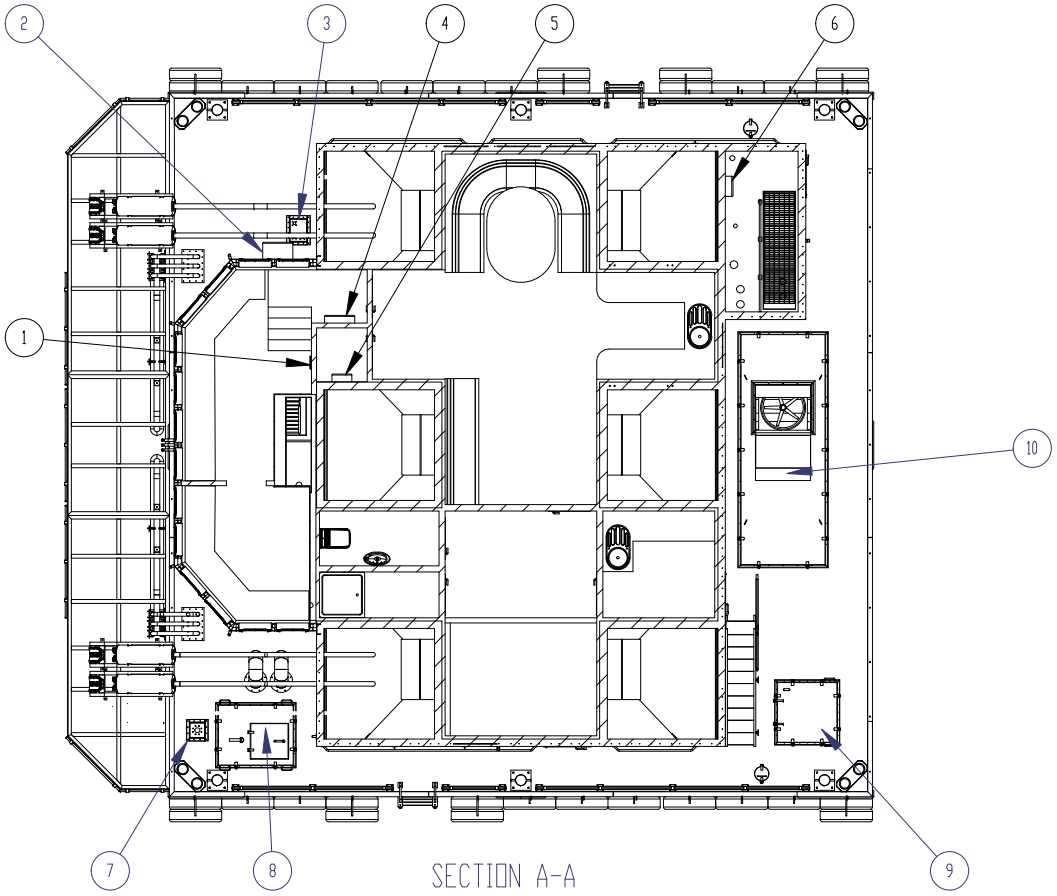
REVISION: A-01

SHEET: 1 OF 6

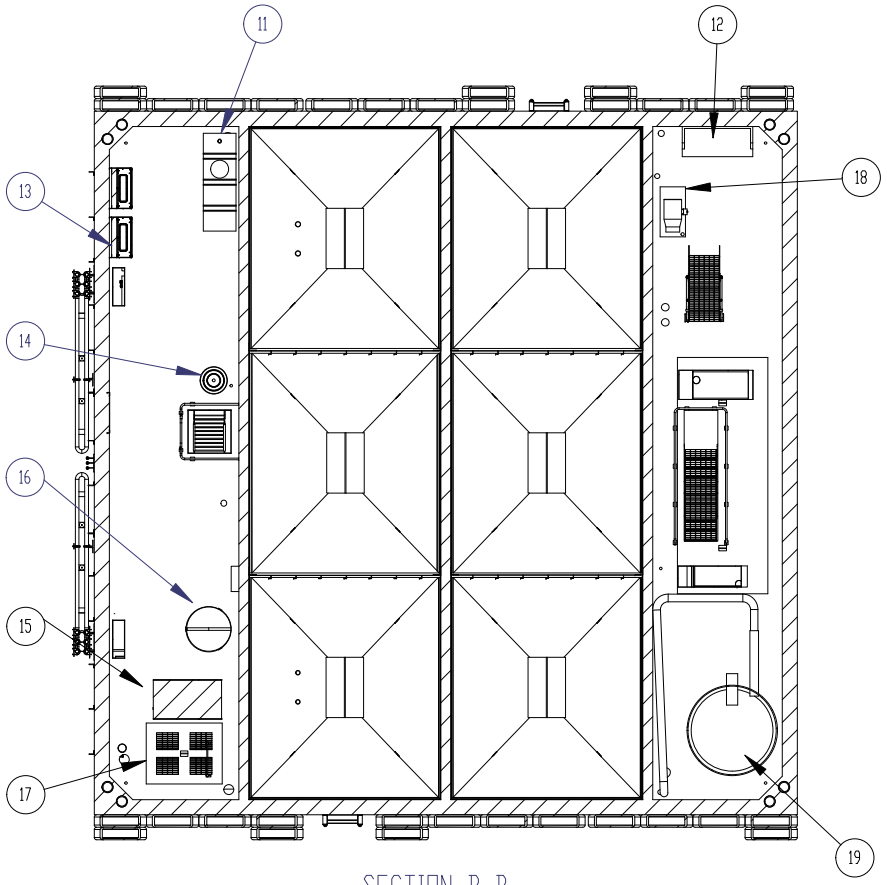
Gael Force Engineering
Gael Force Group
136 Anderson Street, Inverness, IV3 8DH
Tel: +44 (0)1463 716660 Fax: +44 (0)1463 715948
email: gfengineering@gaelforce.net
website: www.gaelforcegroup.com

ITEM NO.	DESCRIPTION	QTY
1	VHS RADIO	1
2	DB4 - CAGE LIGHTS	1
3	COMPRESSOR BOX CAP	1
4	DB3	1
5	SYNC REMOTE PANEL	1
6	ENSILOR PANEL	1
7	ENSILOR OUTLET	1
8	BLOWER HATCH	1
9	ENSILOR HATCH	1
10	GENERATOR HATCH	1

ITEM NO.	DESCRIPTION	QTY
11	WATER TANK	1
12	WORKBENCH	1
13	FEED PANEL	2
14	HOT WATER CYLINDER	1
15	COMPRESSOR	2
16	AIR RECIEVER	2
17	BLOWER HATCH COVER	1
18	CRANE PACK	1
19	ENSILOR MIXING TANK	1



SECTION A-A



SECTION B-B

REVISION HISTORY				
REV.	DATE	COMMENT	DRAWN BY	APPV'D BY

	NAME	DATE
DRAWN	M. MACPHERSON	18/05/2023
CHK'D	S OFFORD	18/05/2023
APPV'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µ m - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:100

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤ 4000mm ISO 2768-K-E
≥ 4000mm DIN 7168-T

GEO-METR. TOL. ≤ 3000mm ISO 2768-K-E
≥ 3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

REVISION: A-01

SHEET: 2 OF 6

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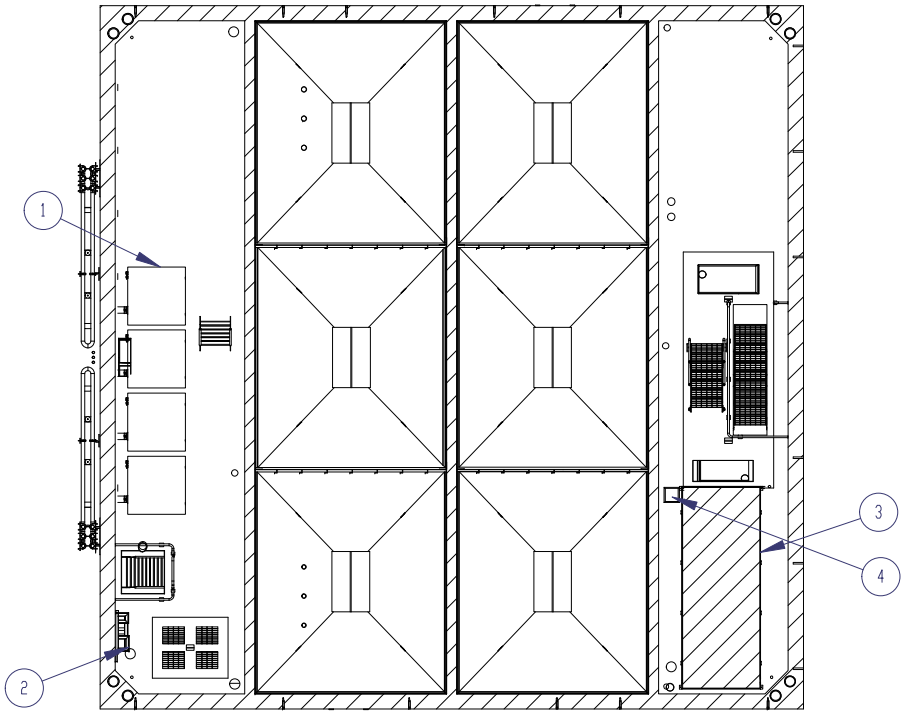
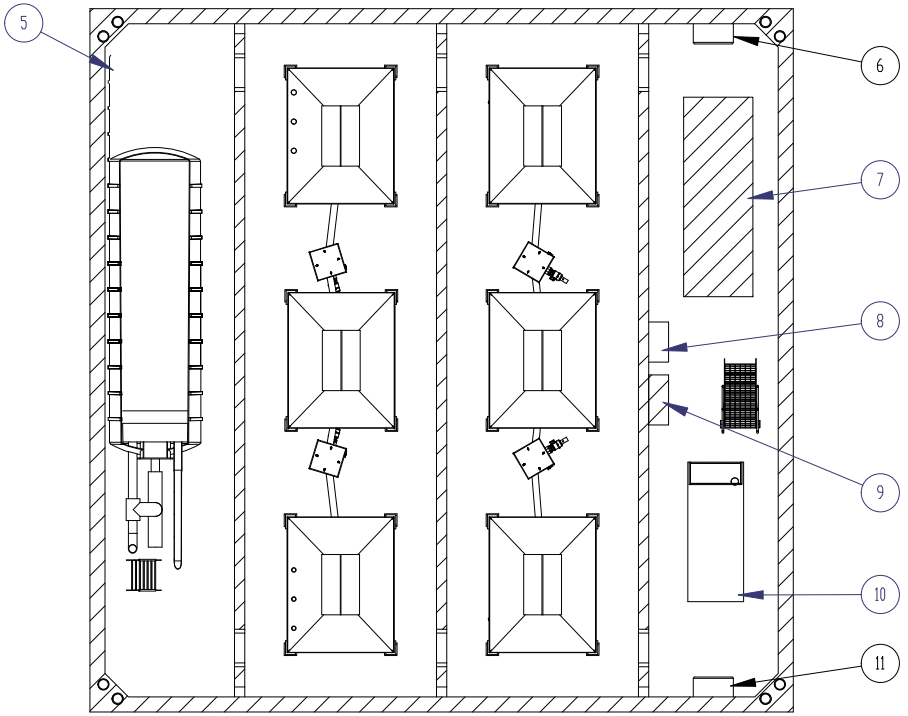
email: gfengineering@gaelforce.net
website: www.gaelforcegroup.com

ITEM	DESCRIPTION	QTY.
1	BLOWER	4
2	12v PANEL	1
3	10'000L FUEL TANK	1
4	FUEL PUMP	1
5	ENSILOR STORAGE TANK	1
6	DB1	1
7	200KVA GENERATOR	1
8	CHANGEOVER SWITCH	1
9	SYNC PANEL	1
10	150KVA GENERATOR	1
11	DB2	1



SECTION C-C



SECTION D-D

REVISION HISTORY				
REV.	DATE	COMMENT	DRAWN BY	APPV'D BY

	NAME	DATE
DRAWN	M. MACPHERSON	18/05/2023
CHK'D	S OFFORD	18/05/2023
APPV'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µ m - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:100

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤ 4000mm ISO 2768-K-E / ≥ 4000mm DIN 7168-T

GEO-METR. TOL. ≤ 3000mm ISO 2768-K-E / ≥ 3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

REVISION: A-01

SHEET: 3 OF 6

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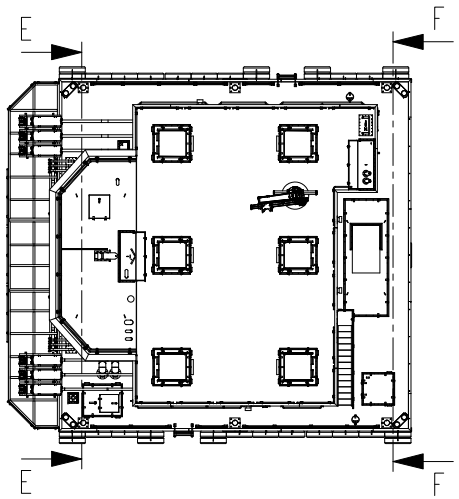
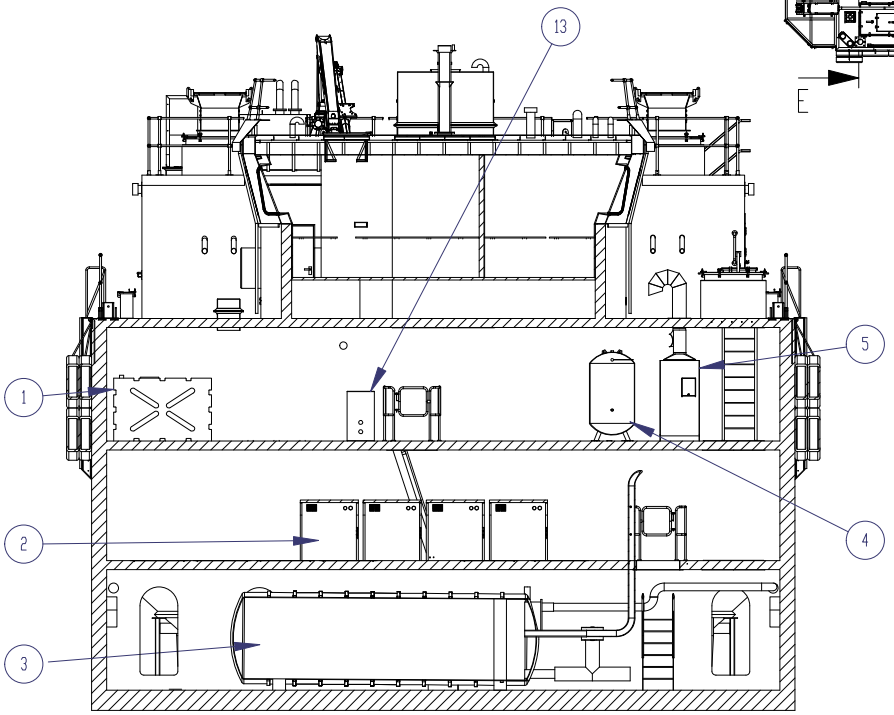
email: gfengineering@gaelforce.net
website: www.gaelforcegroup.com

ITEM NO.	DESCRIPTION	QTY.
1	WATER TANK	1
2	BLOWERS	4
3	ENSILOR STORAGE TANK	1
4	AIR RECIEVER TANK	2
5	COMPRESSOR	2
6	ENSILOR MIXING TANK	1
7	10'000L FUEL TANK	1
8	DB2	1
9	SYNC PANEL	1
10	CHANGEOVER SWITCH	1
11	DB1	1
12	200KVA GENERATOR	1
13	HOT WATER CYLINDER	1
14	WORK BENCH	1
15	CRANE PACK	1
16	150KVA GENERATOR	1





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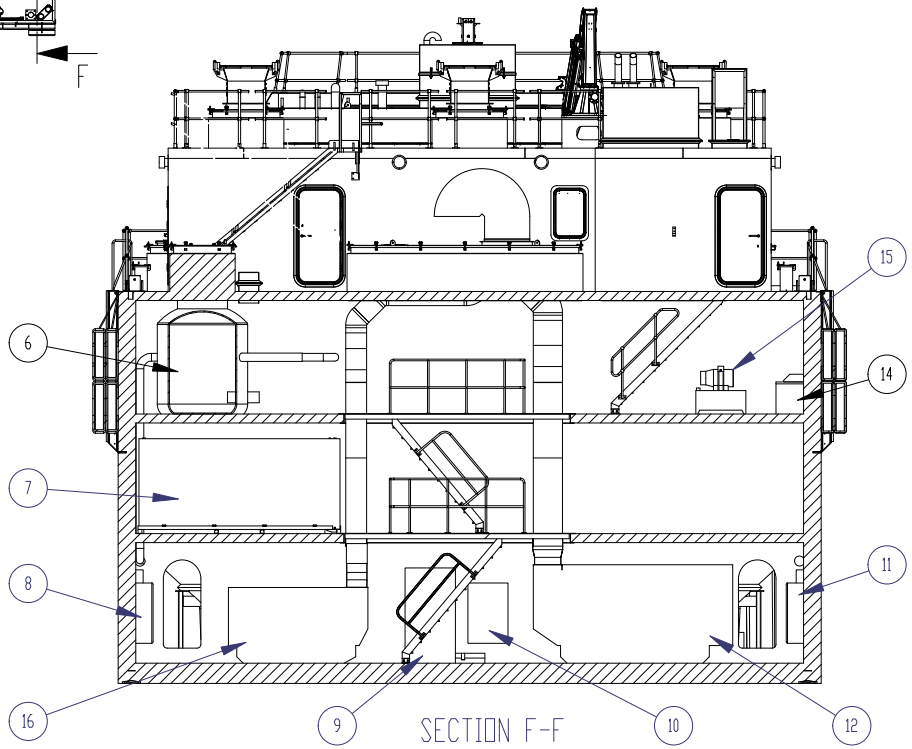

SECTION F-F

REVISION HISTORY				
REV.	DATE	COMMENT	DRAWN BY	APPV'D BY

	NAME	DATE
DRAWN	M. MACPHERSON	18/05/2023
CHK'D	S. OFFORD	18/05/2023
APPV'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µ m - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:200

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤ 4000mm ISO 2768-K-E / ≥ 4000mm DIN 7168-T

GEO-METR. TOL. ≤ 3000mm ISO 2768-K-E / ≥ 3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

REVISION: A-01

SHEET: 4 OF 6

Gael Force Engineering
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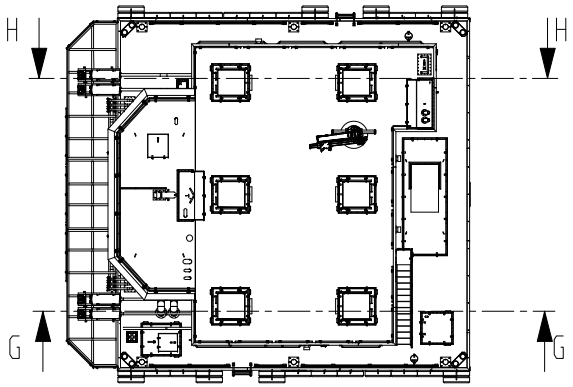
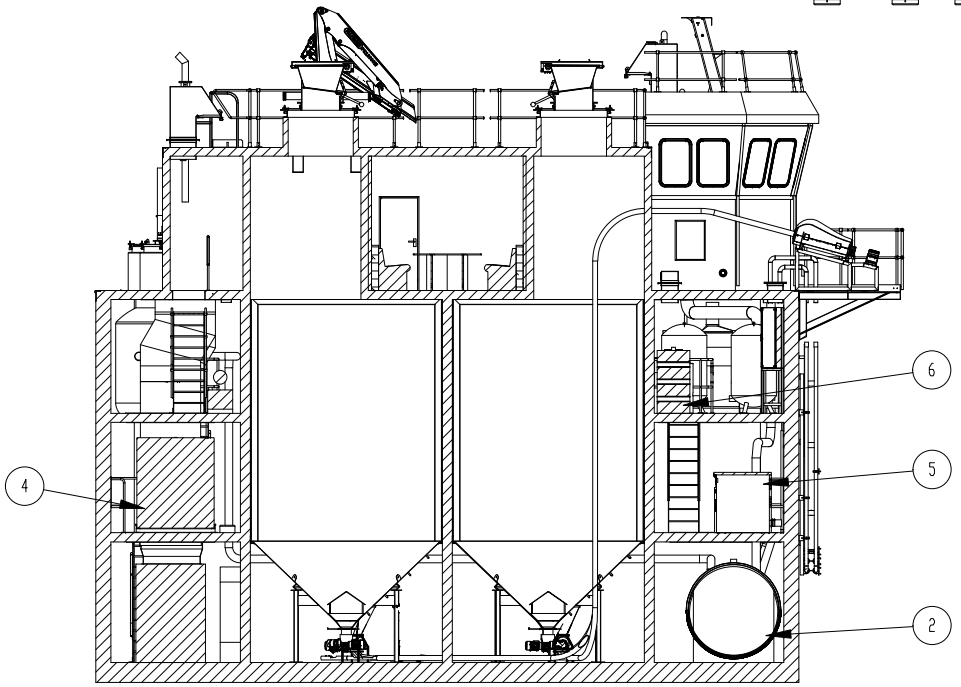
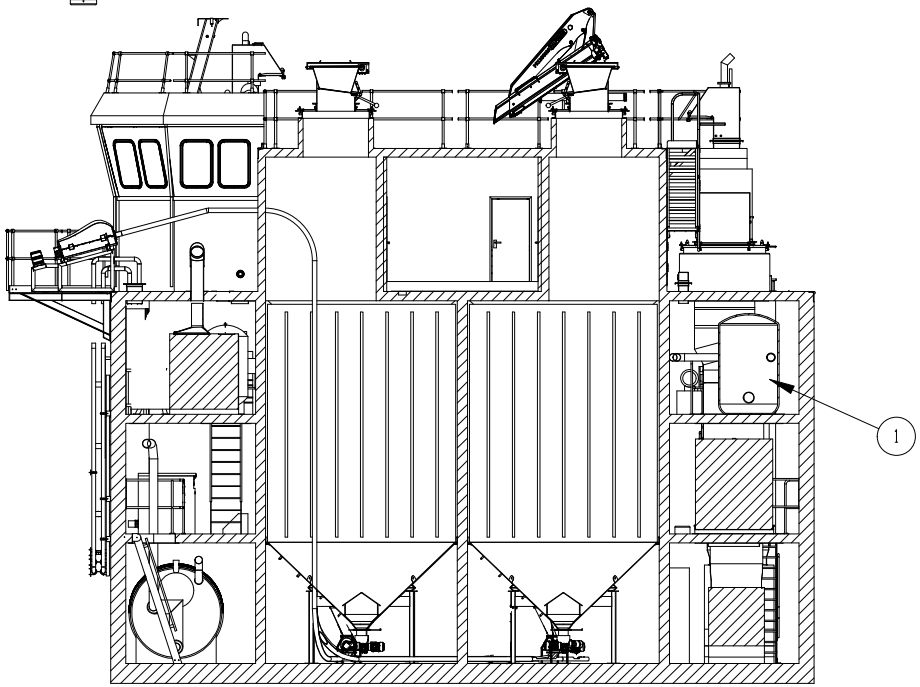
website: www.gaelforcegroup.com

ITEM	DESCRIPTION	QTY
1	ENSILOR MIXING TANK	1
2	ENSILOR STORAGE TANK	1
3	COMPRESSOR	2
4	10'000L FUEL TANK	1
5	BLOWERS	4
6	WATER TANK	1





SECTION H-H



SECTION G-G

REVISION HISTORY				
REV	DATE	COMMENT	DRAWN BY	APPV'D BY

	NAME	DATE
DRAWN	N. MACPHERSON	18/05/2023
CHK'D	S. OFFORD	18/05/2023
APPV'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µ m - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:200

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤ 4000mm ISO 2768-K-E; ≥ 4000mm DIN 7168-T

GEO-METR. TOL. ≤ 3000mm ISO 2768-K-E; ≥ 3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

REVISION: A-01

SHEET: 5 OF 6

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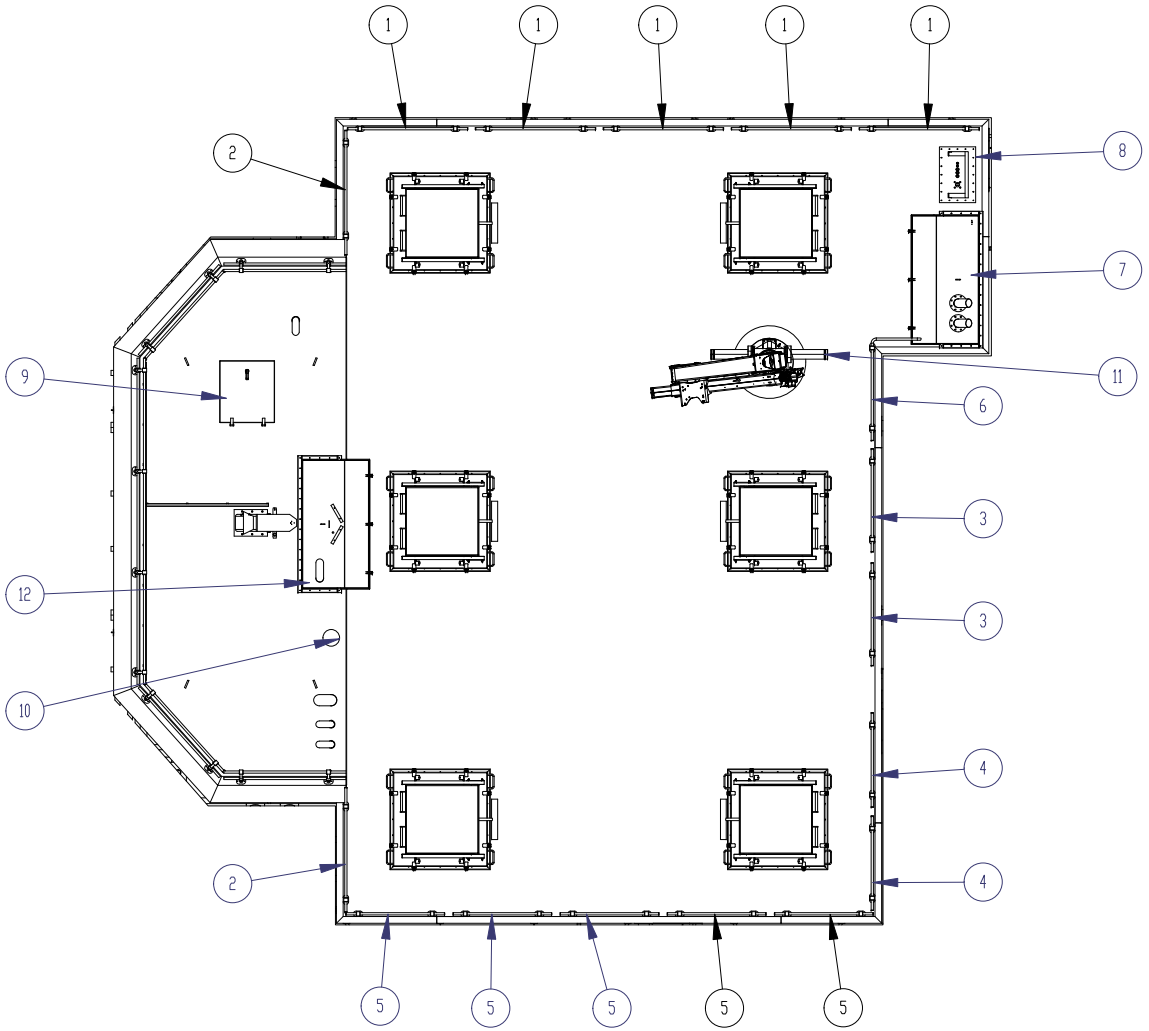

ITEM NO.	DESCRIPTION	QTY.
1	1800mm HANDRAIL ASSEMBLY (TOP DECK)	5
2	1852mm HANDRAIL ASSEMBLY (TOP DECK)	2
3	1530mm HANDRAIL ASSEMBLY (TOP DECK)	2
4	1402mm HANDRAIL ASSEMBLY (TOP DECK)	2
5	1466mm HANDRAIL ASSEMBLY (TOP DECK)	5
6	CORNER HANDRAIL	1
7	OUTLET VENT	1
8	TEMPORARY GENERATOR CONNECTION J/B	1
9	ESCAPE HATCH	1
10	VENT	1
11	CRANE	1
12	INLET VENT	1

REVISION HISTORY

REV.	DATE	COMMENT	DRAWN BY	APP'D BY

	NAME	DATE
DRAWN	M. MACPHERSON	18/05/2023
CHK'D	S OFFORD	18/05/2023
APP'V'D		

REFERENCED DOCUMENT (NO. / TITLE)

MATERIAL: SEE BOM

WEIGHT: Kg.

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS

FINISH: Ra in µm - ISO 1302
DEBURR & BREAK SHARP EDGES

SHEET SCALE: 1:75

SHEET SIZE: A3

3rd ANGLE PROJECTION

TOLERANCES (UOS):

DIM. ≤4000mm ISO 2768-K-E; ≥4000mm DIN 7168-T

GEO-METR. TOL. ≤3000mm ISO 2768-K-E; ≥3000mm DIN 7168-T

GEN. TOL. WELDED PARTS: ISO 13920-BF

CHAMFERS: ISO 13715 (DIN 6784)

DRG. NO: GFE_SM_400_0331_GA_00001

TITLE: GENERAL ARRANGEMENT

PROJECT: SEAMATE-98

SYSTEM: GENERAL ARRANGEMENT

RELEASE NOTE: DRAFT

REVISION: A-01

SHEET: 6 OF 6

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BATH TREATMENTS MODELLING REPORT

Caolas Finfish Pen Site, Loch Portain, North Uist

Prepared for

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Quality Assurance

The data presented within this document have undergone a quality assurance review which follows established TransTech Ltd procedures. The information and results presented herein constitute an accurate representation of these data.

Document Details

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PhD, BSc (hons)

Issue Date: 3 July 2023

Issue No: 2023v1

CONTENTS

List of Abbreviations

ADCP	Acoustic Doppler Current Profiler
CD	Chart Datum
EQS	Environmental Quality Standards
GMT	Greenwich Mean Time
mCD	Metres below Chart Datum
SEPA	Scottish Environment Protection Agency

EXECUTIVE SUMMARY

This report has been prepared to meet the requirements of the Scottish Environment Protection Agency (SEPA) for the consent to use chemical bath treatments against sea lice for salmonids held in marine pens. The modelling reported herein is for the proposed modification of the Caolas pen site (i.e., twelve 100 m circumference pens in a 60 m x 60 m mooring grid).

Bath Auto was used to determine the concentration of the chemicals Azamethiphos (Salmosan), Deltamethrin (Alphamax) and Cypermethrin (Excis) that can be used at the modified Caolas site.

The maximum permissible quantity of Azamethiphos that can be used in a 3 hour period was predicted to be 130.2 g, at a treatment regime of 1.0 pen in 3 hours, at a net depth of 1.70 m. However, the long term model did not iterate to a compliant pass and given that its results override those of the short term model in terms of the BathAuto predictions Azamethiphos cannot be used at the site.

The maximum quantity of Deltamethrin permissible in a 3 hour period was predicted to be 5.8 g at a treatment regime of 2.0 pens in 3 hours for a net depth of 1.85 m.

The maximum quantity of Cypermethrin permissible in a 3 hour period was predicted to be 15.6 g at a treatment regime of 2.0 pens in 3 hours for a net depth of 1.95 m.

1. INTRODUCTION

This report has been prepared to meet the specific requirements of SEPA for the assessment of applications for consent to use bath treatments against sea lice in marine salmonid farms. The bath treatments must comply with Environmental Quality Standards (EQS) that are in place to protect the marine environment.

Bath treatments, where the fish are physically immersed in a diluted solution of a particular chemical, require dispersion modelling (Bath Auto) to predict concentrations of the chemical in the water column at specified periods after the treatment has been completed.

The methods described in this report closely adhere to those set out in Annex G[1] of the SEPA Fish Farm Manual, and the results are reported to satisfy consent application requirements.

2. CAOLAS SITE INFORMATION

Site details

Site name:	Caolas	
Distance to shore:	0.098 km	(from pen edge to MLWS at closest point)
Width of straight:	0.416 km	(from pen edge to MLWS at narrowest point)
Distance to head:	2.339 km	(from pen edge to MLWS at shortest point)
Average water depth for 1 km^2 area:	15.73 mCD	(from previous BathAuto modelling at site)

Pen group details

Group centre position:	94829.2 E, 869326.4 N (as per NewDEPOMOD report for modified site)
Number of pens:	12
Pen group configuration:	2 x 6
Pen dimensions:	100 m circumference circle
Grid size (x by y):	60 m x 60 m grid
Working depth:	12.0 m
Peak biomass:	1720.0 tonnes
Peak stocking density:	15.01 kg/m^3
Pen group orientation:	138.0º

3. HYDROGRAPHIC DATA

The hydrographic data for the sub-surface cell are summarised below. The data were analysed using SEPA's HGdata_analysis_v7.xls (version 7.11) tool. Further details on the Acoustic Doppler Current Profiler (ADCP) deployments are available in reports previously submitted to SEPA, titled:

- "CLP_2023v1_Hydrographic_Report.pdf", dated 3 May 2023, and
- "CLP_2023v1_ND_Modelling_Method_Statement.pdf" also dated 3 May 2023.

Current meter position:	94747.2 E, 869226.7 N (weighted mean of deployments)
Distance from group centre:	129.1 m
Weighted mean depth for deployments:	27.87 mCD
Sub surface cell height above bed:	25.02 m
Duration of record:	90 days (22/11/22 16:11:57 to 20/02/23 16:11:57 GMT)
Mean speed	0.042 m/s
Residual parallel (U)	0.008 m/s
Residual normal (V)	-0.001 m/s (BathAuto requires entry as +ve number)
Tidal amplitude parallel (U)	0.053 m/s
Tidal amplitude normal (V)	0.044 m/s

4. BATH TREATMENT MODELLING

SHORT TERM MODEL

Using the results from the data analysis of the sub-surface current meter cell, the short term bath treatment model was run and the EQS compliance for the chemical treatments, Azamethiphos, Deltamethrin and Cypermethrin, were predicted.

Results of Short Term Model:

Treatment	Permissible quantity	Pen treatment depth*	% net depth	No. of Pens treatable
Azamethiphos in 3 hrs	130.2 g	1.70 m	14.2	1.0
Deltamethrin in 3 hrs	5.8 g	1.85 m	15.4	2.0
Cypermethrin in 3 hrs	15.6 g	1.95 m	16.3	2.0

* Treatment depth can be varied. The depths above show the number of pens treatable at an example net depth.

LONG TERM MODEL

For the purposes of the long term (72 hour) dispersion model for Azamethiphos, the receiving water was classified as a straight.

The results of the long term model override those of the short term and therefore in terms of the BathAuto predictions Azamethiphos cannot be used at the site.

The Bath Auto spreadsheet is provided along with this document and is also shown in appendix A.

FILES ACCOMPANYING THIS REPORT

- Model and results contained within:

  CLP_2023v1_BathAuto_v5.

FILES THAT HAVE BEEN PREVIOUSLY SUBMITTED TO SEPA

- Hydrographic report and associated SEPA validated datasets which were used for the modelling:

  CLP_2023v1_Hydrographic_Report.pdf, 3 May 2023.

  S - hgdata_analysis_v7.xls (90-day dataset).

- Method statement for TransTech's modelling of the Caolas site:

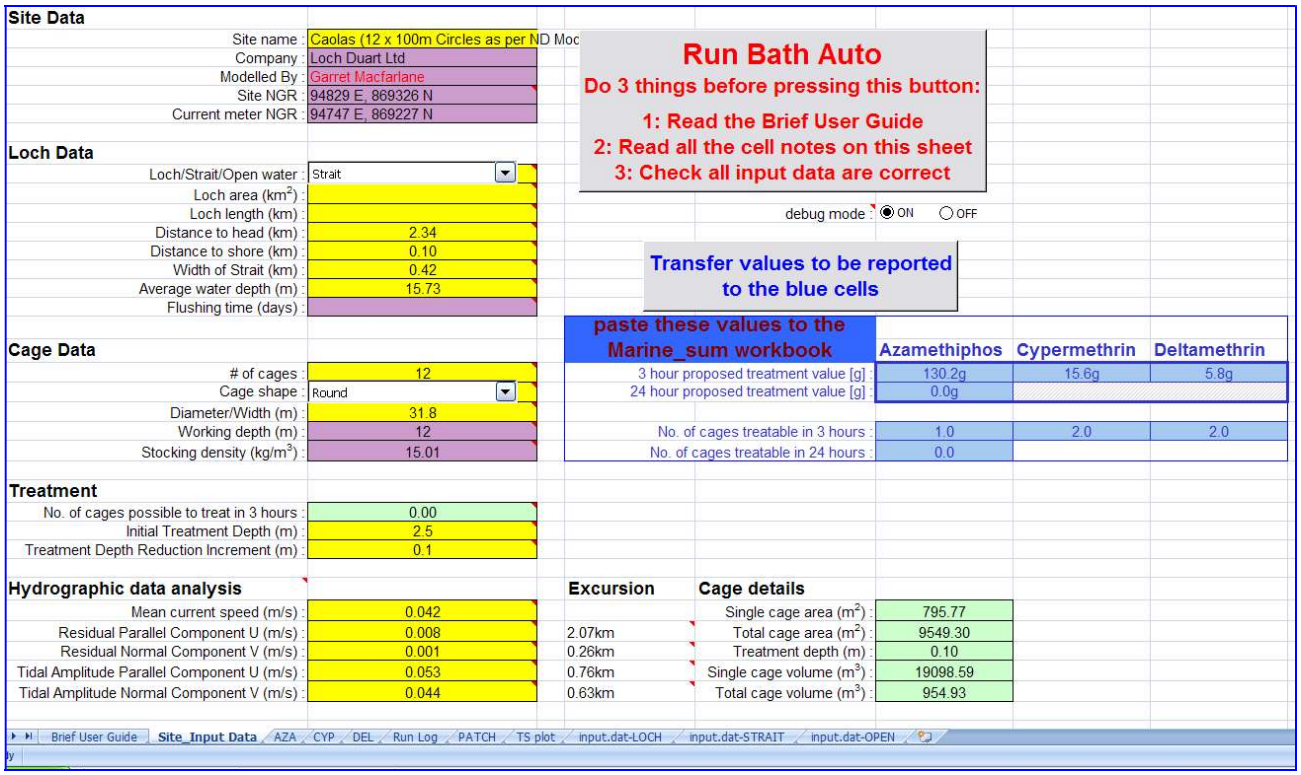
  CLP_2023v1_ND_Modelling_Method_Statement.pdf, 3 May 2023.

REFERENCES

(1) Annex G. Models for assessing the use of chemicals in bath treatments. v2.2. Scottish Environment Protection Agency. 31 October 2008.

APPENDIX A

CLP_2023v1_BathAuto_v5.xls (Version 5.1)



Site Data

Site name	Caolas (12 x 100m Circles as per ND Moc
Company	Loch Duart Ltd
Modelled By	Garret Macfarlane
Site NGR	94829 E, 869326 N
Current meter NGR	94747 E, 869227 N

Run Bath Auto

Do 3 things before pressing this button:

1: Read the Brief User Guide
2: Read all the cell notes on this sheet
3: Check all input data are correct

debug mode : ON OFF

Loch Data

Loch/Strait/Open water	Strait
Loch area (km^2)	
Loch length (km)	
Distance to head (km)	2.34
Distance to shore (km)	0.10
Width of Strait (km)	0.42
Average water depth (m)	15.73
Flushing time (days)	

Transfer values to be reported to the blue cells

Cage Data

# of cages	12
Cage shape	Round
Diameter/Width (m)	31.8
Working depth (m)	12
Stocking density (kg/m^3)	15.01

paste these values to the Marine_sum workbook

	Azamethiphos	Cypermethrin	Deltamethrin
3 hour proposed treatment value [g]	130.2g	15.6g	5.8g
24 hour proposed treatment value [g]	0.0g		
No. of cages treatable in 3 hours	1.0	2.0	2.0
No. of cages treatable in 24 hours	0.0		

Treatment

No. of cages possible to treat in 3 hours	0.00
Initial Treatment Depth (m)	2.5
Treatment Depth Reduction Increment (m)	0.1

Hydrographic data analysis

		Excursion
Mean current speed (m/s)	0.042	
Residual Parallel Component U (m/s)	0.008	2.07km
Residual Normal Component V (m/s)	0.001	0.26km
Tidal Amplitude Parallel Component U (m/s)	0.053	0.76km
Tidal Amplitude Normal Component V (m/s)	0.044	0.63km

Cage details

Single cage area (m^2)	795.77
Total cage area (m^2)	9549.30
Treatment depth (m)	0.10
Single cage volume (m^3)	19098.59
Total cage volume (m^3)	954.93

Brief User Guide | Site_Input Data | AZA | CYP | DEL | Run Log | PATCH | TS plot | input.dat-LOCH | input.dat-STRAIT | input.dat-OPEN

Attachment 18

Information to inform an HRA/AA of potential benthic impacts arising from the proposed re-development of Caolas Loch Portain

1. Introduction

The potential for the proposed re-development of the Caolas Loch Portain marine fish farm to impact benthic habitats and features with the Loch nam Madadh Special Area of Conservation (SAC) and Loch am Duin Site of Special Scientific Interest (SSSI) was raised by statutory consultees during the Comhairle nan Eilean Siar EIA Screening process. Table A1 provides a summary of the comments provided by the statutory consultees in relation to potential benthic impacts and signposts to where the detailed information requested is presented in this planning application (the full Screening Decision (23/00482/FFSCR) is provided in attachment 21).

Table A1. Summary of required information relevant to benthic impacts

Organisation	Summary of comment	Information provided
NatureScot	The proposal lies within Loch nam Madadh SAC. The site's status means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") apply. The proposal will result in a significantly larger biomass and cage surface area which will have a correspondingly larger depositional footprint on the seabed. We advise that significant effects are likely on new areas of seabed. These areas of seabed have the potential to support habitats of the Loch nam Madadh SAC. The designated marine features of the Loch an Duin SSSI are closely aligned with those of the Loch nam Madadh SAC. We advise that significant effects on the SSSI are likely.	**Attachment 14**: NewDepomod Modelling Report **Attachment 17**: Visual survey data characterising the benthic habitats in the vicinity of the proposal. **Attachment 18** (this document) Distribution of designated benthic marine features in relation to the predicted depositional footprint.
SEPA	The fish farm lies within Loch nam Madadh SAC, with reef features within vicinity of farm. From previous monitoring results, visual survey work and modelling results, we are satisfied that there is minimal increase in risk to the protected features from the proposed changes to the pen configuration. The final biomass and quantities of sealice medicines will be determined as part of the CAR application process. Based on the information submitted to us we consider that, with respect to interests relevant to our remit the proposed development is not likely to have a "significant effect" on the environment and therefore EIA is not required.	No additional information/data requested. Benthic impacts are regulated by SEPA under Controlled Activities Regulations (CAR) and a separate application to amend the existing CAR licence (CAR/L/1002994) for the proposed site will be submitted in due course.

Marine Directorate (Marine Scotland Science)	The proposal represents a significant modification to an existing site, therefore benthic impacts should be assessed. We would request that appropriate modelling is undertaken to demonstrate the acceptability of the proposal and that the report be submitted with any future planning application / Environmental Report.	**Attachment 14**: NewDepomod Modelling Report
Comhairle nan Eilean Siar	SAC reef features are understood to be close to the location of the site and visual survey information will be required to conclusively assess any direct effects on SAC features.	**Attachment 17**: Visual benthic survey report **Attachment 18** (this document) Distribution of designated benthic marine features in relation to the predicted depositional footprint.
	Taking account of the advice of SEPA and the mitigation options available, it is concluded that the proposed change is unlikely to result in significant adverse effects on benthic & water column impacts	No additional information/data requested
	Characteristics of potential impact: Risk to Benthic and SAC/SSSI features and habitats arising from increase in biomass at Caolas (transfer from nearby Ferramus) – shading from nets, smothering from deposition and disturbance when lifting and setting anchors, all of which will require further information and detailed assessment under HRA/AA if a significant effect on any of the protected features is likely.	**Attachment 13**: Hydrographic Report **Attachment 14**: NewDepomod Modelling Report **Attachment 17**: Visual benthic survey report **Attachment 18** (this document) Distribution of designated benthic marine features in relation to the predicted depositional footprint.

Source: Comhairle nan Eilean Siar EIA Screening Decision 23/00482/FFSCR (see attachment 21)

2. Data Overview

The following sections provide a high-level overview of the data referenced in Table A1 and should be read in conjunction with those documents. Section 2.1 describes the nature conservation designations and benthic habitats in the vicinity of the proposal, based on publicly available data and a visual benthic survey undertaken specifically to support this planning application. Section 2.2 provides further information regarding the potential risk to SAC/SSSI features arising from the deposition of particulate waste (section 2.2.2), shading from nets (section 2.2.3) and physical abrasion from anchors (section 2.2.4).

2.1 Benthic habitat baseline

2.1.1 Nature Conservation designations and qualifying features

Caolas is located within Loch nam Madadh SAC and adjacent to areas of the Loch an Duin SSSI (see Figure A1) as noted in NatureScot's screening comments. The qualifying features of these designations and their condition status is shown in Table A2.

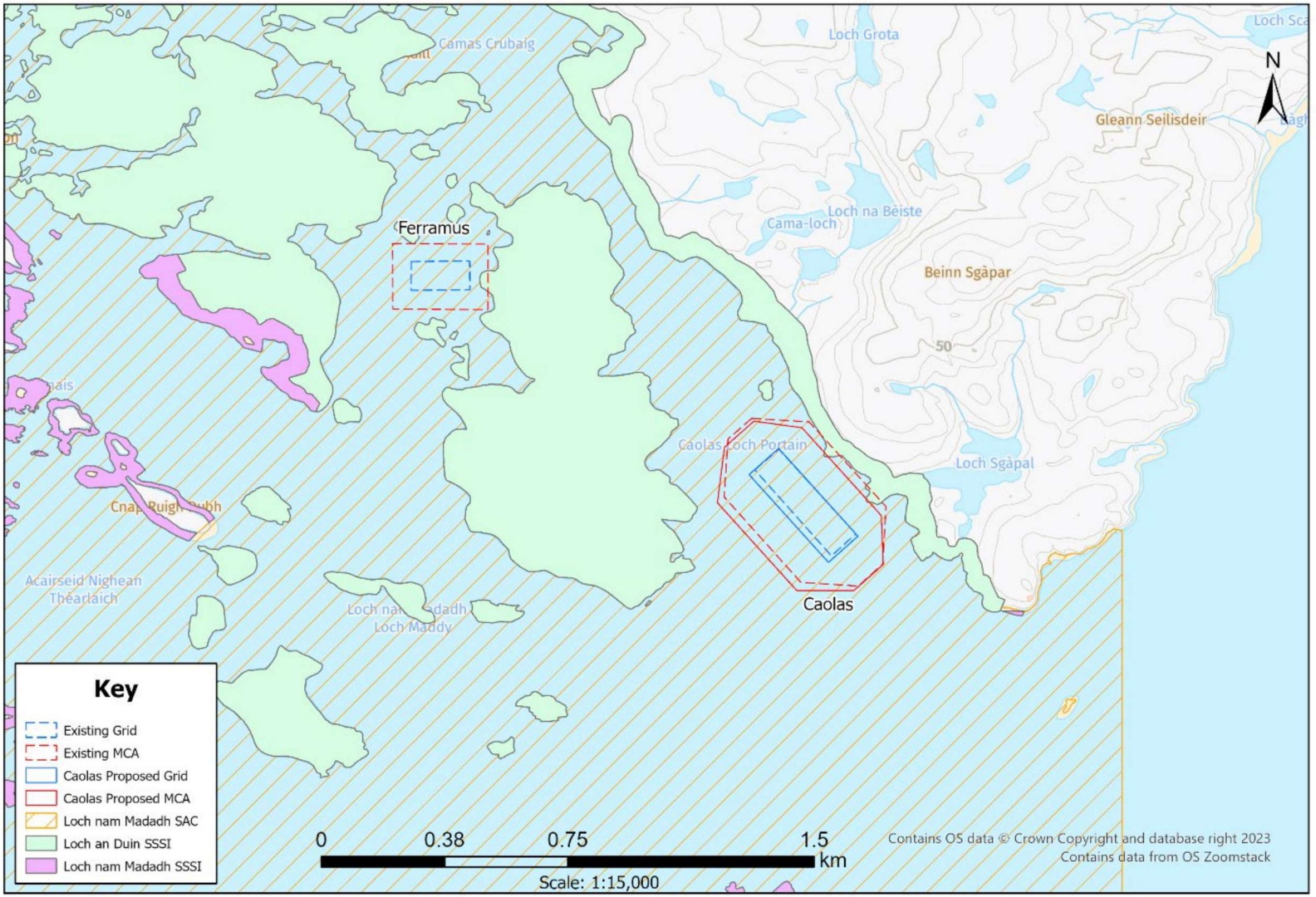


Figure A1 The location of the existing Ferramus and Caolas fish farms and the proposed Caolas site in relation to Loch nam Madadh SAC, Loch an Duin SSSI and Loch nam Madadh SSSI. Note other nature conservation designations are present in the area but not shown in this figure.

Table A2 Qualifying features of Loch nam Madadh SAC and Loch an Duin SSSI

Loch nam Madadh SAC	
Annex I habitats – primary reason for designation	**Condition**
Lagoons	Favourable maintained
Shallow inlets and bays	Favourable maintained
Annex I habitats - present (not primary reason for designation)	
Intertidal mudflats and sandflats,	Favourable maintained
Reefs	Favourable maintained
Subtidal sandbanks	Favourable maintained
Annex II species - primary reason for designation	
Otter (*Lutra lutra*)	Favourable maintained
Loch an Duin SSSI – Notified natural features	
Coastal Geomorphology of Scotland	-
Saline lagoons	Favourable maintained
Tidal rapids	Favourable maintained
Otter	Favourable maintained
Breeding bird assemblages	Favourable maintained
Brackish water cockle (*Cerastoderma glaucum*)	Favourable maintained

Source: JNCC[1]; NatureScot[2]; Scottish Natural Heritage (undated).

Figure A1 also illustrates the minimal change in the proposed site location and size. Compared to the existing site, the proposed mooring grid boundary extends approximately 21m further to the south-west and 8m to the south south-east, covering an area of approximately 8,200 m^2 (0.0082 km^2) of 'new' seabed (see also Table A4). The proposed MCA would be relocated approximately 30m in a south-west direction, with an increase in area of 788 m^2 (0.000788 km^2).

Figure A2 shows the location of the proposed Caolas site in relation to Annex I marine habitats and Priority Marine Features (PMFs) based on NatureScot's and JNCC's Geodatabase of Marine features adjacent to Scotland (GeMS) (data exported from the NMPi[3]).

The figure indicates that the proposed site is located predominately over subtidal sand, although it identifies reef habitat beneath the SE corner of the current and proposed mooring containment areas (MCAs). Additional areas of reef habitat are located to the north and north-west of the proposed site.

Table A3 lists the Annex I habitats and PMFs identified within 1 km of the proposed site centre, together with the straight-line distance from the nearest feature record to the proposed site.

Table A3 Annex I benthic habitats and PMFs within 1 km of the proposed site centre

Feature (type)	**Distance to proposed site**
Subtidal sandbank (Annex I habitat)	In infrastructure footprint
Reef (Annex I habitat)	In infrastructure footprint
Intertidal mudflat and sandflat (Annex I habitat)	0.61 km NW of proposed MCA boundary
Kelp bed (PMF)	In infrastructure footprint
Northern sea fan and sponge communities (PMF)	0.19 km S of proposed MCA boundary
Kelp and seaweed communities on sublittoral sediment (PMF)	0.23 km SE of proposed MCA boundary
Burrowed mud (PMF)	0.42 km SW of proposed MCA boundary
Maerl or coarse shell gravel with burrowing sea cucumbers (PMF)	0.38 km SW of proposed MCA boundary

[1] https://sac.jncc.gov.uk/site/UK0017070 [accessed 19/06/2024]
[2] https://sitelink.nature.scot/site/8301 [accessed 19/06/2024]
[3] https://marinescotland.atkinsgeospatial.com/nmpi/

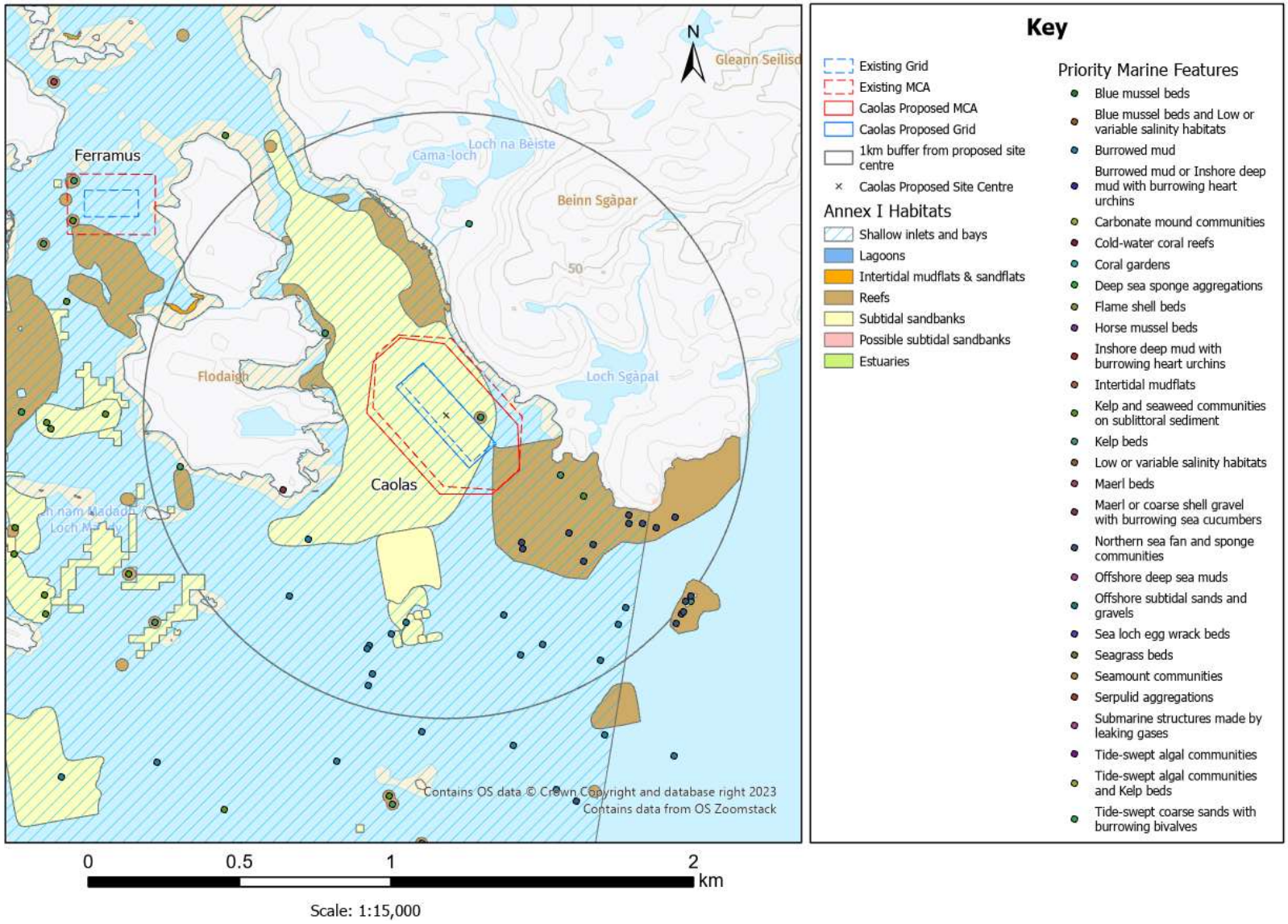


Figure A2 Annex I Habitats and Priority Marine Features in the vicinity of the proposed Caolas site

2.1.2 Benthic visual survey

A benthic visual survey of the seabed in the vicinity of the proposed site was undertaken in March 2022 by Anderson Marine Surveys on behalf of Loch Duart Ltd (LDL). The purpose of the survey was to characterise the benthic habitats (biotopes) in the vicinity of the proposal, and in-particular to assess the presence or absence of PMFs. The full survey report is provided in Attachment 17; an overview of the results is provided below.

Video and still images were taken at 94 survey stations across Loch Portain (see Figure 2, Attachment 17). A total of 14 benthic habitats (biotopes) were identified across the area surveyed (see Figure 5, page 16, Attachment 17). Three PMF habitats were identified within the survey area (listed below and noting the caveats stated in the survey report in Attachment 17) and these are shown in relation to the proposed site in Figure A3.

- **Burrowed Mud** - probably the component biotope 'Seapens and burrowing megafauna in circalittoral fine mud' (SS.SMu.CFiMu.SpnMeg), although seapens were rarely recorded in the deeper burrowed mud, and the *Virgularia* seapen population recorded in Loch Portain during the survey does not fit this PMF.
- **Kelp Beds** - probably the biotope type '*Laminaria hyperborea* and foliose red seaweeds on moderately exposed infralittoral rock (IR.MIR.KR.Lhyp), although this is somewhat subjective given the diversity of kelp bed biotopes.
- **Northern sea fan and sponge communities** - component biotope mixed turf of hydroids and large ascidians with *Swiftia pallida* and *Caryophyllia smithii* on weakly tide-swept circalittoral rock (CR.HCR.XFa.SwiLgAs).

The PMF species Burrowing sea anemone (*Arachnanthus sarsi*) was tentatively identified at the survey station LM94 (also shown in Figure A3 below).

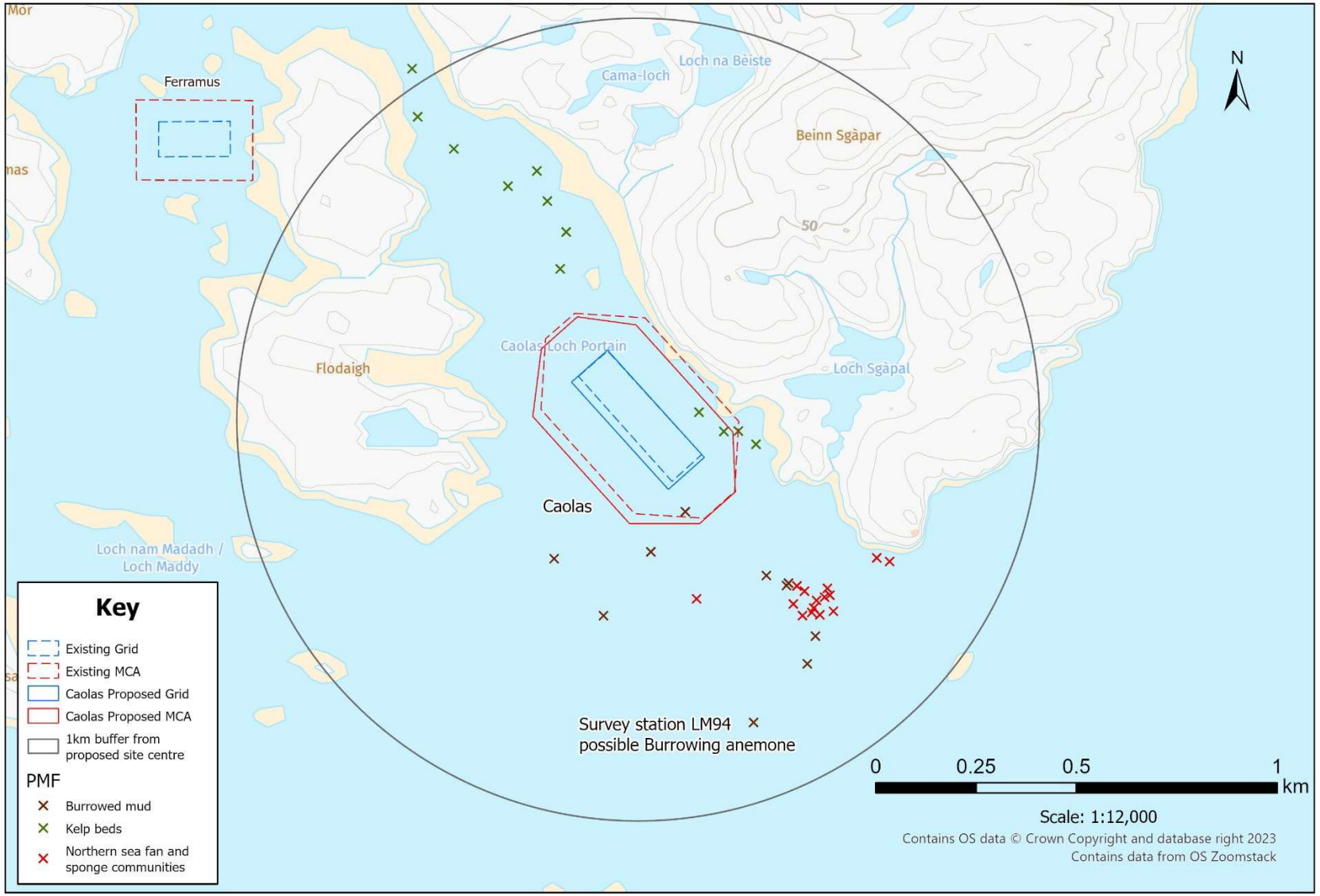


Figure A3. PMFs identified during the visual benthic survey in relation to the proposed site.

2.2 Potential benthic impacts of proposed site

2.2.1 Proposal description

The proposed redevelopment of Caolas Loch Portain comprises removing the existing 14 x 80m circumference circular pens and replacing them with 12 x 100m circumference circular pens and installing a higher capacity feed barge (400T compared to 90T currently) to the NW of the pen grid. The maximum stocked biomass at Caolas is proposed to increase to 1,720T compared to 1,060T currently. Table A4 summarises the proposed changes in equipment surface area and mooring containment area at the proposed Caolas site. It can be noted that the proposed mooring containment area (MCA) is only 0.45% larger than the MCA of the existing consented site.

Table A4 Proposed changes in farm infrastructure and biomass at Caolas

Equipment and max. biomass	Existing	Proposed	% change
Pen circumference size (m)	80	100	-
Number of pens	14	12	-
Pen configuration	1 group (2x7)	1 group (2x6)	-
Equipment surface area* (m^2)	7,200.2	9,675.24	34.37
Grid area (m^2)	35,000	43,200	23.43
MCA (m^2)	175,826.12	176,614.27	0.45
Maximum stocked biomass (T)	1,060	1,720	62.26
* Calculated as the total surface area of the pens and the feed barge			

It should be noted that, if the Caolas proposal is consented, the consented Ferramus fish farm will be decommissioned and the statutory consents relinquished. This would result in the permanent removal of consent for 3,119 m^2 of surface equipment and 57,875 m^2 of seabed within a mooring containment area (which will be allowed to recover naturally). Whilst the proposal is for an increase in tonnage at the Caolas production site, overall the farmed biomass will reduce by 10T in the Lochmaddy production area by relinquishing the Ferramus consent . Table A5 shows the total changes in the number of pens, surface equipment area, mooring containment area and maximum stocked biomass in the Lochmaddy production area if the proposal is consented.

Table A5 Overall changes in Lochmaddy production area if proposal consented

	No. pens	Equipment SA (m^2)	MCA (m^2)	Max biomass (T)
Existing equipment and biomass				
Caolas	14	7,200	175,826	1,060
Ferramus	8	3,119	57,875	670
Lochmaddy total	22	10,319	233,701	1,730
Proposed equipment and biomass				
Caolas	12	9,675	176,614	1,720
Ferramus	0	0	0	0
Lochmaddy total	12	9,675	176,614	1,720
% Change (proposed vs existing)	**-45%**	**-6%**	**-24%**	**-1%**
SA = Surface Area; MCA = Mooring Containment Area				

2.2.2 The predicted depositional footprint of the proposal

The primary benthic impacts associated with salmon farms are via the deposition of solid production wastes and chemical residues. Solid production wastes include fish faeces and waste feed which are both rich in carbon, and their deposition onto the seabed have the potential to alter faunal

communities within the receiving environment. Chemical waste products include medicinal chemotherapeutant residues. These benthic impacts are regulated by SEPA under the Controlled Activities Regulations (CAR).

The proposal has been through SEPA's Aquaculture Modelling Screening and Risk Identification process and an application to amend the existing Caolas Loch Portain site's CAR licence (CAR/L/1002994) will be submitted in due course. It can be noted that in the Screening Decision issued by Comhairle nan Eilean Siar, SEPA stated:

"From previous monitoring results, visual survey work and modelling results, we are satisfied that there is minimal increase in risk to the protected features from the proposed changes to the pen configuration. The final biomass and quantities of sealice medicines will be determined as part of the CAR application process. Based on the information submitted to us [as part of the SEPA Aquaculture Modelling Screening and Risk Identification process] we consider that, with respect to interests relevant to our remit ***the proposed development is not likely to have a "significant effect" on the environment*** *and therefore EIA is not required."*

Modelling of the predicted depositional footprint of the existing and proposed sites was undertaken using NewDepomod which simulates the release and deposition of waste feed and faecal particles in the context of the site-specific hydrographic and bathymetric characteristics. A fate assessment of exported material is produced in the form of a contour map of solids (particulate waste) deposition which is based on the worst-case tidal scenario and the final stocking density for the site.

The full NewDepomod Modelling report, which has been submitted to, and approved by SEPA as part of the SEPA Aquaculture Modelling Screening and Risk Identification process, is presented in Attachment 14. Table A6 presents a summary of the standard default NewDepomod model runs (i.e. using SEPA default settings) for the existing and proposed site. The modelling shows that although the proposed site is predicted to increase the intensity of waste deposition on the seabed in close proximity to the cage group, and increase the area of seabed where $\geq$ 250g/m^2 deposition is predicted, the proposal is compliant with SEPA requirements (for further details see full report in Attachment 14).

Table A6 Summary of results for existing and proposed site with SEPA default settings

NewDepomod modelling – SEPA default settings	**Existing site (1060T)**	**Proposed site (1,720 T)**
Mixing zone contour area (m^2)	133,185	142,729
Mixing zone average mean intensity (g/m^2)*	752.7	1474.6
Average of 250 g/m^2 mixing zone area (m^2)*	44,250	86,750
Average of 250 g/m^2 mixing zone areas as % of mixing zone contour area*	33.2	60.8
* Average of 5 model runs		

Source: NewDepomod Modelling Report, Attachment 14.

Figure A4 shows an example of a standard default model run for the existing and proposed sites (runs ES5 and MS4 on pages 10 and 12 respectively of Attachment 14). The figure shows the modelled 250 g/m^2 contour (within which deposition is predicted to be $\geq$250 g/m^2) in relation to Annex I marine habitats and PMFs (from publicly available records and the visual benthic survey, see Attachment 17). The figure indicates that the increase in the predicted 250 g/m^2 contour for the proposed site is mainly due to expansion of the depositional footprint into shallower water to the east of the site, with only a slight extension of the predicted footprint in a south-east direction.

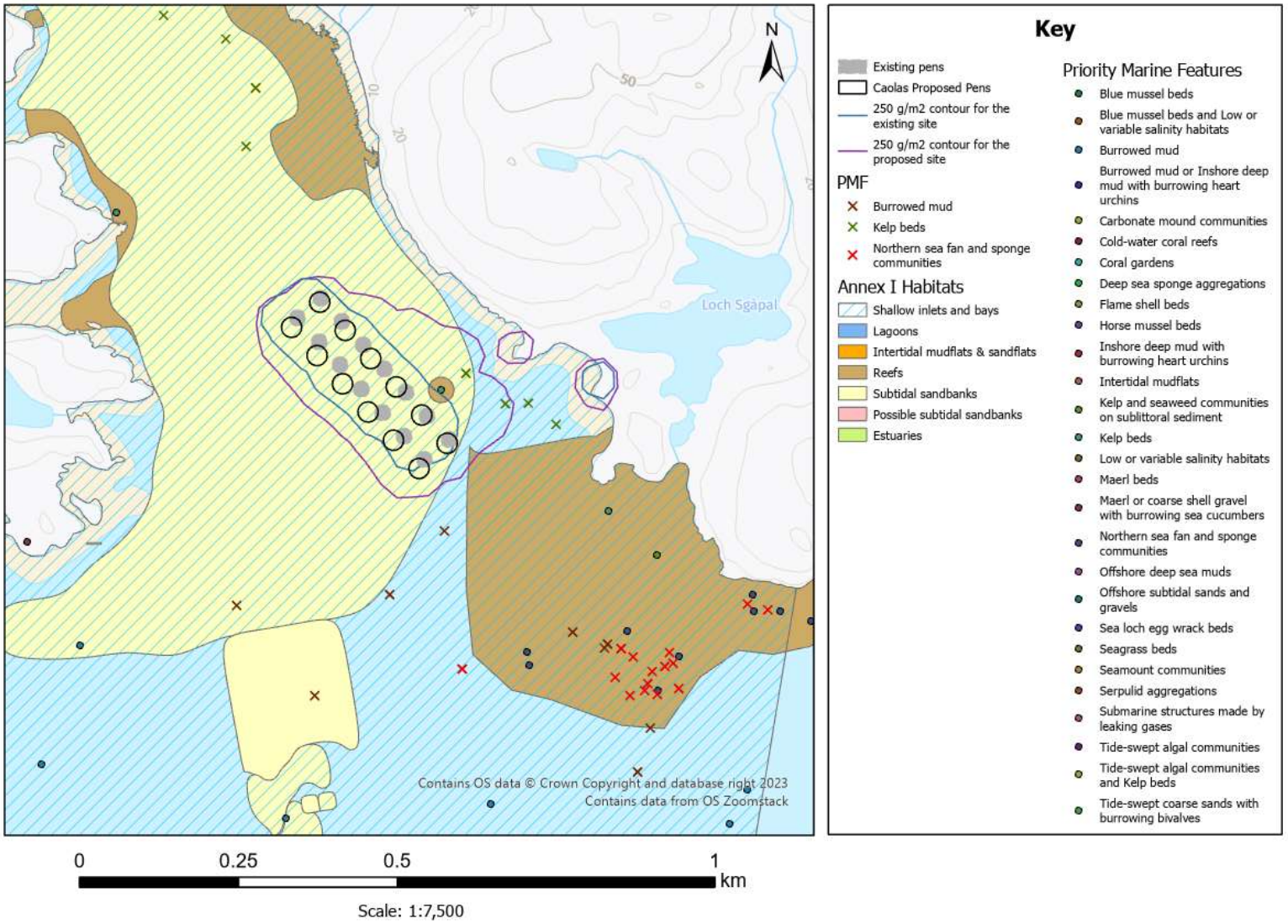


Figure A4. Example NewDepomod model runs (using SEPA default settings) showing the 250 g/m^2 contour for the current (blue line) and proposed (purple line) Caolas site (see NewDepomod Modelling report Attachment 14 for full details of the modelling results). PMF = priority marine features identified during the benthic visual survey.

The NewDepomod model was calibrated for the existing site using the Infaunal Quality Index (IQI) benthic monitoring results from the 2021/2022 production cycle (for full details see Attachment 14).

Figure A5 shows the modelled 250 g/m^2 contours from calibrated model runs for the existing and proposed site (runs ESC6 and MSC2 on pages 15 and 17 respectively in Attachment 14) in relation to Annex I marine habitats and PMFs.

The calibrated model predicted a higher mean intensity of deposition per m^2 within the 250 g/m^2 contour, and a larger area within the contour, for both the existing and proposed sites compared to the default setting model runs. However, the mean intensity values for the proposed site are still significantly lower than SEPA's EQS of 4,000 g/m^2, and the 250 g/m^2 deposition area for the existing and modified site do not exceed the 100 m mixing zone (latter not shown in figure A5).

As noted above, an application to amend the existing Caolas Loch Portain CAR licence (CAR/L/1002994) will be submitted in due course. If consented, the benthic environment will be monitored as per SEPA CAR licence conditions.

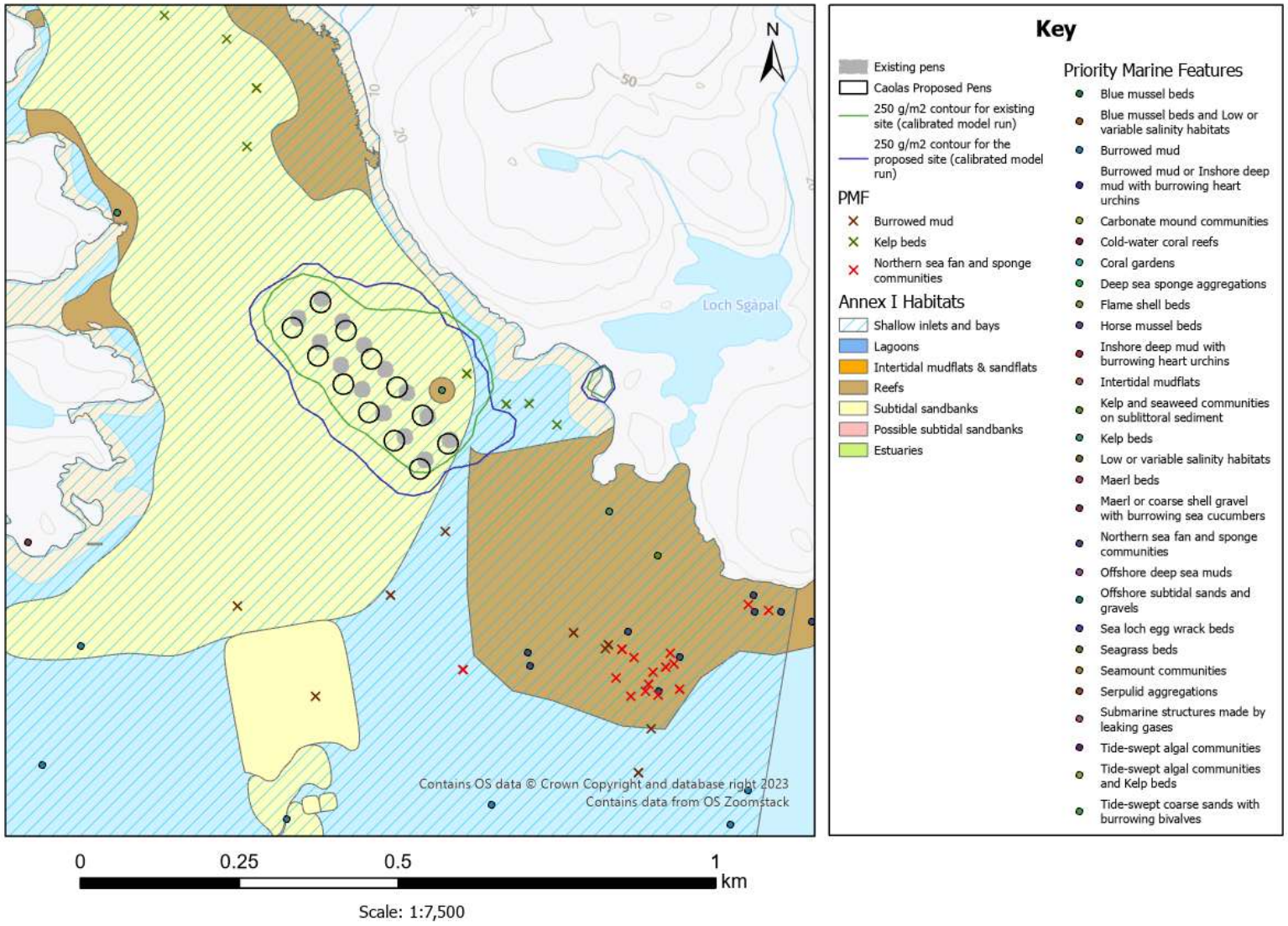


Figure A5. Example NewDepomod model runs (calibrated model) showing the 250 g/m^2 contour for the current (green line) and proposed (blue line) Caolas site. (see NewDepomod Modelling report Attachment 14 for full details of the modelling results). PMF = priority marine features identified during the benthic visual survey.

2.2.3 Shading of benthic habitats

A concern raised in the Screening Decision by the Local Planning Authority (LPA) related to potential shading of the seabed from the proposed pens. Table A7 compares the surface area occupied by the existing and proposed equipment and shows that there would be a 39% increase in equipment surface area at the proposed site.

Table A7 Equipment surface area of the existing and proposed site

Surface area	**Existing** (14 x 80m pens; 90T barge)	**Proposed** (12 x 100m pens; 400 T barge)
Individual pen (m^2)	509.29	795.77
All pens (m^2)	7130.14	9549.30
Barge (m^2)	93.53	501.76
Total (m^2)*	7223.67	10,051.06
Total (ha)*	**0.72**	**1.01**
% change		**39%**
* Calculated as the sum of all pens and barge surface area		

The grid area, in which all the surface equipment would be contained, is located entirely over sedimentary habitats (see Figure 5, page 16, Attachment 17) identified as infralittoral muddy sand (e.g. the biotope *Arenicola marina* in infralittoral fine sand or muddy sand) and circalittoral muddy sand, which are not considered sensitive to shading from light (e.g. see Tyler-Walters et al., 2023).

2.2.4 Physical abrasion of the seabed during construction activities

A further concern raised in the Screening Decision related to disturbance (physical abrasion) of the seabed during the setting of anchors.

The proposed mooring system for the site is to consist of 22 mooring lines which will terminate with a length of ground chain and an embedded anchor. The placement of the anchors and chains has the potential to physically damage habitats or species which are beneath the equipment as it is lowered to, and embeds in, the seabed. Once all of the moorings have been laid there will be no further disturbance for a period of approximately 5 years, which is the typical lifespan for a mooring grid.

The proposed MCA is located predominately over sedimentary habitat, although kelp on infralittoral rock was identified at the south-eastern end of the proposed MCA (see Figures A2 and A3 above). The biotope complexes (level 4 classification) and biotopes (level 5 classification) identified within the proposed MCA are listed below (assessed by visual inspection of figure 5, page 16 of the Visual Benthic Survey report, Attachment 17):

- *Arenicola marina* in infralittoral fine sand or muddy sand
- Circalittoral muddy sand
- Infralittoral sandy mud
- Circalittoral coarse sediment
- *Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (component of PMF Kelp beds)
- *Amphiura filiformis*, *Mysella bidentata* and *Abra nitida* in circalittoral sandy mud
- Circalittoral fine sand
- Seapens and burrowing megafauna in circalittoral fine mud (component of PMF Burrowed mud).

Where the habitats have been identified to biotope level, the sensitivity to physical abrasion could be assessed. Table A8 summarises the sensitivity of the biotopes identified in the survey (or a similar proxy biotope) to abrasion/disturbance of the seabed surface and the penetration/disturbance of the seabed sub-surface.

The visual benthic survey data identified the presence of PMFs at 3 survey stations within the proposed MCA (kelps beds at two locations and burrowed mud at one location). Table A8 shows that both of these features have medium sensitivity to abrasion/disturbance of the seabed surface whilst the biotope SS.SMu.CFiMu.SpnMeg (component of PMF burrowed mud) also has a high sensitivity to penetration or disturbance of the seabed sub-surface. If deemed necessary, LDL can use a ROV to investigate the seabed in these specific areas to enable micro-siting of the anchors to avoid the sensitive benthic habitats at those specific locations.

It can be noted that a third PMF (Northern sea fan and sponge communities component biotope: mixed turf of hydroids and large ascidians with *swiftia pallida* and *caryophyllia smithii* on weakly tide-swept circalittoral rock (CR.HCR.XFa.SwiLgAs) was identified during the visual benthic survey. However, this is located approximately 187m to the south of the proposed MCA, and hence no physical abrasion/disturbance pressures during construction activities are considered likely.

Table A8 Sensitivity of biotopes (or proxy biotopes) identified within the proposed MCA during the visual benthic survey

Biotope complex / biotope	Sensitivity to abrasion / disturbance of the surface of the substratum or seabed	Sensitivity to penetration or disturbance of the substratum subsurface	Source
Arenicola marina in infralittoral fine sand or muddy sand (SS.SSa.IMuSa.AreISa)	Not sensitive	Low	Tyler-Walters et al 2023
Amphiura filiformis, *Kurtiella bidentata* and *Abra nitida* in circalittoral sandy mud (SS.SMu.CSaMu.AfilKurAnit)*	Medium	Medium	De Basto et al., 2023
Seapens and burrowing megafauna in circalittoral fine mud (SS.SMu.CFiMu.SpnMeg)**	Medium	High	Hill et al., 2023
Laminaria hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.Lhyp.Ft)***	Medium	Not relevant	Stamp et al., 2023
* Not the specific biotope identified within the proposed MCA in the benthic visual survey, but a similar biotope included in the table to provide an indication of sensitivity to physical abrasion pressure; ** Component of PMF Burrowed mud; *** Component of PMF Kelp beds			

3. Summary

In response to comments from statutory consultees in the EIA Screening Decision, this attachment has collated and presented information on the predicted footprint of the proposed Caolas fish farm in relation to nature conservation designated sites and designated features and PMFs.

The existing fish farm at Caolas was consented in 1995 and has been operational in its existing format (14 x 80 m circular pens) since 2021. Although the proposal comprises a 34% increase in equipment surface area and a 62% increase in maximum stocked biomass, there would only be a 0.5% increase in the overall MCA and a minor adjustment of the MCA location (approximately 30m SW of the existing planning boundary). Furthermore, if consented, the nearby Ferramus fish farm will be relinquished, resulting in an overall reduction in farmed tonnage in the Lochmaddy production area.

A visual benthic survey conducted to support this application identified 3 benthic habitat PMFs (burrowed mud, kelp beds and northern seafan and sponge communities) within a 1km radius of the proposed site centre. A further PMF species (Burrowing anemone) was also tentatively identified. The majority of PMFs identified were outwith the proposed MCA. The three closest kelp bed features and the closest burrowed mud feature were recorded within the existing MCA. The proposal moves the MCA boundary approximately 30m away from (but not completely clear of) the kelp bed PMFs identified during the survey.

NewDepomod modelling was undertaken to assess the acceptability of the proposal in terms of the predicted depositional footprint of solid wastes in relation to SEPA EQS. The modelling, which has been submitted to and approved by SEPA as part of the SEPA Aquaculture Modelling Screening and Risk Identification process, indicates that the proposal is compliant with SEPA EQS. This is stated within the EIA Screening Decision response provided by SEPA (see table A1)

NewDepomod modelling for the proposed Caolas site has predicted that the proposal would increase the intensity of waste deposition on the seabed (but that this will not exceed the SEPA EQS threshold) in close proximity to the cage group. Plotting the predicted 250 g/m^2 contour in relation to the visual benthic survey results indicates that the contour would overlap with the nearest kelp bed/reef features to the east of the pens, but that the footprint is not anticipated to extend towards the kelp bed/reef features to the north-west of the site, or to the burrowed mud or northern seafan and sponge communities to the south-east.

As noted above, an application to amend the existing Caolas Loch Portain CAR licence (CAR/L/1002994) will be submitted in due course and if consented, the site will be subjected to statutory monitoring as per the conditions of the site's CAR licence.

4. References

De-Bastos, E.S.R., Hill, J.M. & Watson, A., 2023. Amphiura filiformis, Kurtiella bidentata and Abra nitida in circalittoral sandy mud. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/368 [accessed 24/06/2024].

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Stamp, T.E., Burdett, E.G., Tyler-Walters, H., & Lloyd, K.A., 2023. *Laminaria hyperborea* forest with dense foliose red seaweeds on exposed upper infralittoral rock. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available from: https://www.marlin.ac.uk/habitat/detail/192 [accessed 24/06/2024].

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Caolas, Loch Portain	OSGB		WGS 1984	
	Easting	Northing	Latitude	Longitude
MCA 1	94677.902	869582.52	57° 36.748' N	007° 06.881' W
MCA 2	94824.021	869562.5	57° 36.743' N	007° 06.734' W
MCA 3	95065.365	869295.38	57° 36.610' N	007° 06.472' W
MCA 4	95071.762	869146.6	57° 36.530' N	007° 06.454' W
MCA 5	94982.035	869066.92	57° 36.484' N	007° 06.538' W
MCA 6	94808.146	869066.96	57° 36.477' N	007° 06.712' W
MCA 7	94566.8	869334.08	57° 36.610' N	007° 06.974' W
MCA 8	94588.172	869502.84	57° 36.702' N	007° 06.965' W
Grid NE corner	94752.987	869499.42	57° 36.706' N	007° 06.800' W
Grid SE corner	94994.331	869232.3	57° 36.573' N	007° 06.538' W
Grid SW corner	94904.603	869152.62	57° 36.526' N	007° 06.622' W
Grid NW corner	94663.258	869419.74	57° 36.660' N	007° 06.884' W
Barge centre	94691.264	869477.49	57° 36.692' N	007° 06.860' W
Site Centre	94829.235	869326.4	57° 36.617' N	007° 06.711' W

Design Statement

Background Information

Loch Duart Ltd (LDL) are proposing to change the equipment on the existing marine fish farm Caolas LochPortain. The farm is located within Loch nam Madadh, North Uist (see Attachment 1, planning application 24/00251/FFPA) and has been consented for the rearing of Atlantic salmon since 1995. Historically, the site has undergone a number of modifications, including changing from square to circular pens, contributing to the ongoing success of the site and provision of long-term skilled job opportunities.

The existing site comprises one group of 14 circular pens of 80m circumference (positioned in 2 rows of 7) with an automated feed barge (90T capacity) moored to the north of the pens. The proposed change is to remove the existing pens and replace them with fewer but slightly larger pens (one group of 12 circular pens of 100m circumference; in 2 rows of 6) and a larger capacity feed barge (400T capacity) moored in the same location. It is proposed that production biomass will increase from 1060T to 1720T, allowing for the amalgamation of fish from the adjacent fish farm at Ferramus, which will then be relinquished. This would result in an overall reduction in the number of fish farms and maximum farmed biomass in the Lochmaddy Production Area.

The Comhairle nan Eilean Siar Screening Opinion (23/00482/FFSCR) stated that the visual impacts of the proposal would not be significantly different (from the existing fish farm) and there would be limited change to the appearance of the farm in the landscape. A Landscape and Visual Impact Assessment was not requested to accompany the planning application.

Site Description

The Caolas Loch Portain site lies within the South Lewis, Harris & North Uist National Scenic Area (NSA). The site has been consented since 1995 and historically has contributed to the provision of permanent highly skilled employment opportunities in Uist. The location is immediately adjacent to the shoreline of the Lochportain peninsula, to the east of the island of Flodaigh, and lies approximately 3km north-east of the settlement of Lochmaddy. The area is characterised by numerous islands and skerries within the inner part of Loch nam Madadh and rocky moorland coastline of the peninsula. The sea area in the outer part of Loch nam Madadh adjacent to the site is characterised by navigation marks associated with the working port area at Lochmaddy pier, which serves the Calmac ferry service between Uig and north Uist. The seabed over which the site is situated is owned by the Crown Estate.

Design Principles

The following policies, guidance and design principles have been taken into account in the proposed re-development design:

- Local Development Plans: The Outer Hebrides Local Development Plan - Adopted Plan and the Outer Hebrides Local Development Plan Supplementary Guidance - Marine Fish Farming

- NatureScot guidance: Guidance on Landscape/Seascape Capacity for Aquaculture; The Siting and Design of Aquaculture in the Landscape - Visual and Landscape Considerations; Visualisations for Aquaculture – Guidance Note; and Coastal Character Assessment
- Site-specific development requirements: Hydrographic report (see Attachment 13. CLP_Hydrographic Report in accompanying planning application 24/00251/FFPA)

Design Solution

Layout:

- The proposal maintains the existing site layout, albeit with new equipment including slightly larger but fewer pens and a higher capacity barge
- The current orientation of the site will be maintained with the pen group aligned with the coastal edge of the Loch Portain peninsula
- The location of the feed barge will be maintained. This is the optimal location to ensure equipment safety and good coverage of the site for feed pipe pathways. The location of the feed barge between the two rows of pens will help to minimise the visual scale of the site, particularly in relation to the channel of Caolas Loch Portain

Equipment design detail:

- The type and style of the proposed pens is similar in all aspects to the existing pens other than scale. However, the slightly larger pen circumference is considered unlikely to be discernible to observers on the shore
- The increase in pen size allows for a higher tonnage of fish at the site, including through the incorporation of tonnage from the adjacent Ferramus site, which will then be relinquished. The proposal results in an overall reduction in the number of pens and farm sites in the Lochmaddy production area
- All surface equipment will use dark muted colours for better absorption into the surrounding landscape, especially when viewed from a distance against the backdrop of the rocky shoreline with which it is aligned. The design and colouration of the barge is not dissimilar to other large marine traffic that may use the area

Access

- The site will continue to be serviced from the existing shorebase with workshop, storage yard and office facilities
- Whilst an increase in biomass is proposed, there is no anticipated increase in daily activity or boat traffic, achieved through the implementation of best practise site management in conjunction with the automated feed barge
- The site location and layout will maintain the existing orientation to the coastline and no obstruction of, or interference with, the ferry service is anticipated

For further information including location plans and scaled site and equipment plans, please see Attachments 1 to 8 in the accompanying planning application (24/00251/FFPA).

Attachment 12

Acoustic Deterrent Device - Additional Information

1. Introduction

Underwater sound generating devices known as Acoustic Deterrent Devices (ADDs) have historically been used on salmon farms to deter seals from depredating farmed stock. However, ADDs have the potential to affect non-target species such as cetaceans. As such, any aquaculture production business (APB) wishing to use ADDs must consult with the Marine Directorate and obtain any relevant consents (i.e. a European Protected Species (EPS) licence) or demonstrate to the Marine Directorate that the planned use of ADDs will not harm marine mammals.

The existing planning permission for Caolas Loch Portain (21/00416) allows for the use of ADDs at the site, subject to an EPS licence being obtained. However, Loch Duart Ltd (LDL) do not currently have an EPS licence for this site and no ADDs have been used at the existing site since 2022.

During the current (2023-2025) production cycle at the existing Caolas Loch Portain site, high levels of seal-related fish mortalities have been recorded despite a hierarchy of other anti-predation measures being deployed (see attachment 11 Wildlife Interaction plan). As such, Loch Duart Ltd (LDL) would like the potential to be able to deploy ADDs at the proposed Caolas site as part of their suite of anti-predator measures if the site is consented. This document provides information regarding the type of ADD that LDL would like to be able to deploy at the proposed Caolas site if required, subject to receiving the required consents (see section 3).

2. Screening comments

Table A1 provides a summary of the comments provided by the statutory consultees in relation to the potential use of ADDs at the proposed Caolas Loch Portain site (the full Screening Decision (23/00482/FFSCR) is provided in attachment 21).

Table A1. Summary of required information requested relating to potential use of ADDs

Organisation	Summary of comment	Information provided
NatureScot and Comhairle nan Eilean Siar	Should ADDs be in use or proposed at this site we advise that significant effects are likely on the harbour porpoise feature of the Inner Hebrides and the Minches SAC and also be capable of affecting, other than insignificantly, the minke whale feature of the Sea of the Hebrides NCMPA. Information will need to be supplied to enable an Appropriate Assessment	**Attachment 12** Acoustic Deterrent Device Additional Information (this document)
	No ADDs can be deployed until an application for an EPS licence has been determined by MD-LOT. As part of the EPS licence process MD-LOT will be required to carry out a HRA for harbour porpoise and an NCMPA appraisal for minke whale before issuing an EPS licence, unless they conclude that the deployment of ADDs is not capable of resulting in any disturbance of harbour porpoise or minke whale	An EPS licence will be applied for in the event that other predator control methods (see attachment 11) do not deter problematic seals. If/when an EPS application is submitted, the specific ADD to be used will be confirmed and all relevant information submitted to MD-LOT to enable an HRA and NCMPA appraisal to be conducted

3. Additional information

As raised by statutory consultee comments in Table A1, ADDs have the potential to affect non-target species such as cetaceans. The proposed Caolas Loch Portain marine fish farm lies within 3km of the Inner Hebrides and the Minches Special Area of Conservation (SAC), designated for harbour porpoise, and the Sea of the Hebrides Marine Protected Area (MPA) designated for features including Minke whale.

In response to the statutory consultee and Local Planning Authority (LPA) comments, this document provides the following information:

- Baseline information on:
    - The designated features and conservation objectives for the nature conservation designations cited by the statutory consultees in the Screening Decision (section 3.1.1)
    - Cetacean distribution in the area based on the latest SCANS IV data (section 3.1.2)
- The technical specification of the ADD devices that are likely to be used at the proposed site (if the need arises and all required consents are obtained; see below) (section 3.2)
- A quantitative assessment of the risks of impacts to cetaceans from the use of ADDs at Caolas Loch Portain (section 3.3)

The Marine Directorate Licencing Operations Team (MD-LOT) considers that all commercially available ADDs have the potential to disturb cetaceans. Hence it is important to note that should the proposed Caolas site be consented, a European Protected Species (EPS) Licence from MD-LOT is likely to be required before any ADD system can be deployed. In order to obtain an EPS licence (or to prove the proposed site is exempt from an EPS licence), detailed information on cetacean abundance and distribution, as well as underwater noise propagation modelling would be required to be submitted to MD-LOT. As such, the use of ADDs is strictly controlled by MD-LOT.

3.1 Baseline

3.1.1 Nature conservation designated sites, qualifying features and conservation objectives

As noted in NatureScot's Screening comments, the proposal lies within 3km of the Inner Hebrides and the Minches Special Area of Conservation (SAC), designated for Harbour porpoise, and the Sea of the Hebrides Marine Protected Area (MPA) designated for the features minke whale, basking shark, fronts and seabed geomorphology (see figure A1). The qualifying features of these designations, and the feature condition, are shown in Table A2.

Table A2 Qualifying features of Inner Hebrides and Minches SAC and Sea of the Hebrides MPA

Qualifying features	**Feature condition (assessment date)**
Inner Hebrides and Minches SAC	
Harbour porpoise *Phocoena Phocoena* (Annex II species; primary reason for site selection)	Favourable (2018)
Sea of the Hebrides MPA	
Minke whale *Balaenoptera acutorostrata*	Favourable (2019)
Basking shark *Cetorhinus maximus*	Favourable (2019)
Fronts*	Favourable (2019)
Marine Geomorphology of the Scottish Shelf Seabed*	Favourable (2019)
* Note these qualifying features are not relevant to this assessment and will not be referred to further	

Source: NatureScot (2020a; 2020b)

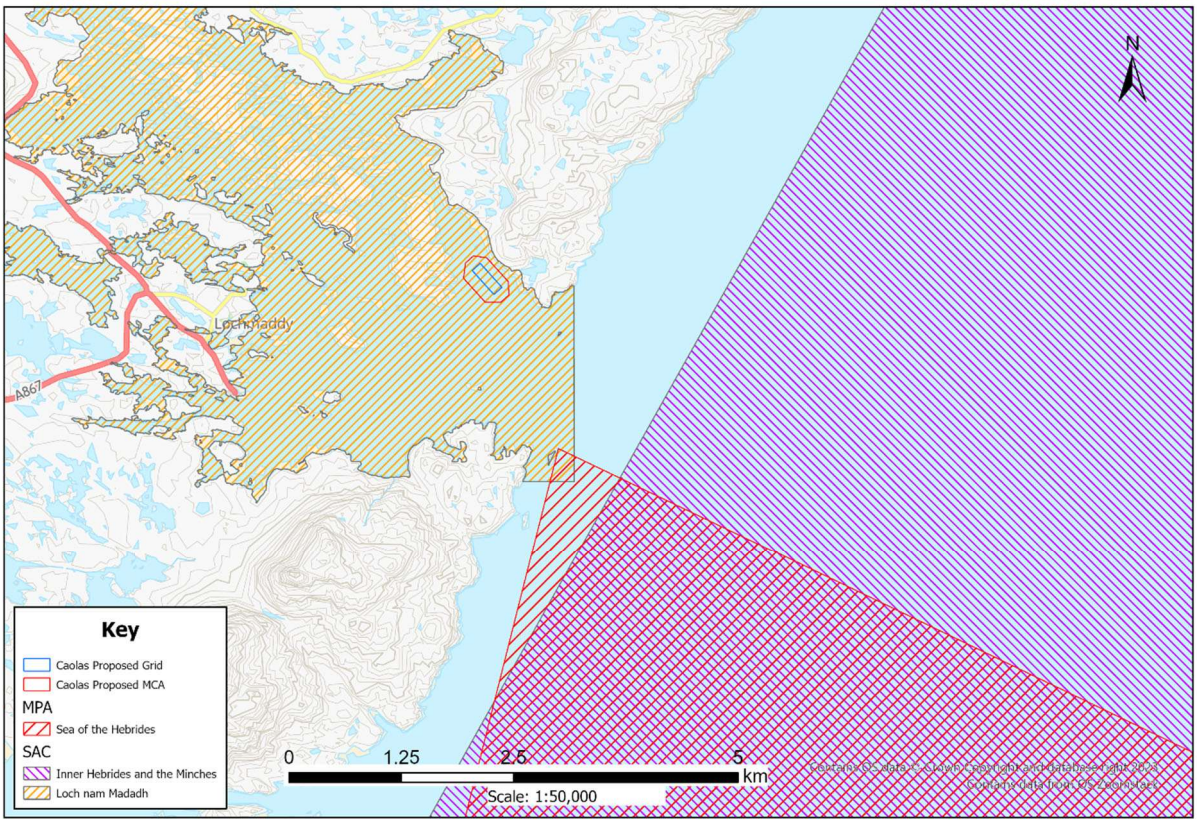

Figure A1 Proposed Caolas Loch Portain site in relation to the Inner Hebrides and Minches SAC and the Sea of the Hebrides MPA, both designated for features including cetaceans. Note, Loch nam Madadh SAC (shown in figure) is not designated for cetaceans (for details on Loch nam Madadh SAC qualifying features see attachment 18).

The **Conservation Objectives for the Inner Hebrides and Minches SAC qualifying interests** (Harbour porpoise (*Phocoena phocoena*)) are shown below (source: NatureScot, 2020a):

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:
    a. Harbour porpoise within the Inner Hebrides and the Minches are not at significant risk from injury or killing
    b. The distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance
    c. The condition of supporting habitats and the availability of prey for harbour porpoise are maintained

The **Conservation Objectives of the Sea of the Hebrides MPA**, are that the protected features (source: NatureScot, 2020b):

- So far as already in favourable condition, remain in such condition; and
- So far as not already in favourable condition, be brought into such condition, and remain in such condition

"Favourable condition", with respect to a mobile species of marine fauna, means that:

a) The species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the MPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds
b) The extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; and
c) The structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating

Site specific advice on the 'species is conserved' element of the Conservation Objectives for the qualifying feature Basking shark are:

- Basking shark within the Sea of the Hebrides MPA are not at significant risk from injury or killing
- Conserve the access to resources provided by the MPA for feeding, courtship like behaviour and breeding and
- Conserve the distribution of basking shark within the site by avoiding significant disturbance
- Conserve the extent and distribution of any supporting feature upon which basking are dependent and
- Conserve the structure and function of supporting features, including processes to ensure basking shark are healthy and not deteriorating

Site specific advice on the 'species is conserved' element of the Conservation Objectives for the qualifying feature Minke whale are:

- Minke whale in the Sea of the Hebrides MPA are not at significant risk from injury or killing
- Conserve the access to resources (e.g. for feeding) provided by the MPA for various stages of the minke whale life cycle and
- Conserve the distribution of minke whale within the site by avoiding significant disturbance
- Conserve the extent and distribution of any supporting feature upon which minke whale is dependent and
- Conserve the structure and function of supporting features, including processes to ensure minke whale are healthy and not deteriorating

Although basking shark is a qualifying feature of the Sea of the Hebrides MPA, the remainder of this document focusses on the cetacean species Harbour porpoise and Minke whale as per NatureScot's comments in the EIA Screening Decision.

3.1.2 Cetacean distribution in the wider area

Information on the presence, density and abundance of cetaceans in the wider area has been obtained from the most recent SCANS report (SCANS-IV; Gilles et al. 2023). The SCANS-IV data has been used to identify which species potentially occur in the area and to provide density and abundance estimates for those species. In the absence of localised site-specific data, these are regarded as the best available data for the quantitative assessment of potential impacts on cetaceans. The relevant SCANS-IV survey block for the Caolas Loch Portain marine farm site is Block CS-H (Minch) (formerly Block I in SCANS-III). The survey block area is 13,985km^2 relative to the proposed farm area of 0.17km^2 (based on the proposed mooring containment area).

Given the proposed Caolas site location is close to shore at an active marine farm, it is possible that actual cetacean densities in this area would be lower than that estimated for Block CS-H. The use of the SCANS-IV data in the assessment is therefore likely to represent a conservative worst-case scenario. Although the Screening Decision comments only referred to the qualifying features of the Inner Hebrides and Minch SAC (Harbour porpoise) and the Sea of the Hebrides MPA (minke whale) the full range of cetacean species reported in the SCANS IV report for the Block CS-H (Minch) have been included for completeness. The estimated marine mammal densities (animals/km^2) and abundance of eight cetacean species/groups within this block are shown in Table A3.

Table A3 Density of cetacean species in SCANS IV Block CS-H (Minch)

Species	Density (animals/km^2)	Abundance
Minke whale *Balaenoptera acutorostrata*	0.0353	493
Beaked whales (all species) *Ziphiidae*	0.0034	47
Harbour porpoise *Phocoena phocoena*	0.3911	5,470
Bottlenose dolphin *Tursiops truncatus*	0.3421	4,784
Risso Dolphin *Grampus griseus*	0.0244	341
Common dolphin *Delphinus delphis*	0.9266	12,958
White-beaked dolphin *Lagenorhynchus albirostris*	0.138	1,930
White-sided dolphin *Lagenorhynchus acutus*	0.0279	390

Source: Gillies et al., 2023

3.2 Acoustic Deterrent Device (ADD)

3.2.1 Technical specifications

The ADD which is likely to be used at the Caolas Loch Portain site (if the site is consented and ADD use is indicated, see section 3.2.2) is the Ace Aquatech US3 mid frequency acoustic device. The technical specifications of the device are presented in Table A4. It should be noted that if/when an EPS application is submitted, the specific ADD to be used will be confirmed and all relevant information submitted to MD-LOT to enable a Habitats Regulation Assessment (HRA) and NCMPA appraisal to be conducted during the EPS licencing process itself.

Table A4 US3 Technical specifications

ADD model	Ace Aquatec US3
Type of ADD	Acoustic startle response
Frequency range	8-11 kHz
Sound Level (average within a transmission)	181 dB re 1µPa rms @ 1m
Duty cycle* (min/max)	0.9 to 10% (12-144 sounding events per hour)
Tone profile	9x short duration randomised pulses of sound that avoids habituation and hearing loss
* Duty cycle = the proportion of time that sound is being emitted. This is adjustable for the US3 device, ranging from 0.9% to 10% (note 5% has been used for the acoustic modelling in section 3.3). An automatic Ramp-Down function, which ensures the reduction of the duty cycle back to zero after a period of use when predatory seal behaviour has ceased, can also be utilised together with asynchronous controls to prevent multiple units sounding simultaneously.	

3.2.2 ADD Deployment Plan

An indicative ADD deployment plan is shown in Figure A2 (noting the deployment plan will be finalised if/when an EPS licence application is made). The plan indicates a total of eight US3 ADD units attached to eight of the twelve pens. Power to the ADDs would be supplied via the feed barge. The ADDs would

only be activated when certain criteria are met in relation to predatory seal activity around the site as described below.

Site staff maintain daily walkway records of seal presence in the vicinity of the site and the scale and nature of interactions with the pens/fish including details of:

- Number and species of seals being observed within eyesight (50m) without visual aids (i.e. without binoculars) and the approximate distance from pens. Seals within 50m of the site reflects the distance to which the ADD deterrent systems deter seal interaction therefore suggesting intention of interaction
- Types of seal interactions with equipment (e.g. hauling out on walkways, getting access to pens via top nets etc.)
- Encircling of pens (in the water) by one/multiple seals
- Particular focus of seal activity at one/multiple pens
- Seals diving into sides of nets (viewed on underwater cameras used during feeding)

Seal activity is perceived to be predatory and would trigger the use of ADDs (if consented) when the following are observed:

- Direct interaction with the pens becomes more apparent
- Salmon exhibit stress behaviours due to the presence of seals in the vicinity of the pens (as observed by personnel trained to document salmon welfare indicators)
- The above, coupled with the recovery of morts with physical injuries attributable to seals

Maintenance of the ADDs will be via routine checks by site staff, which are recorded on walkway data sheets, and regular site visits and remote monitoring by the manufacturer Ace Aquatec. Details of any ADD use will be logged via the remote monitoring system provided by Ace Aquatec as well as by staff on the site walkway datasheets, which is then entered into the farm database system.

ADDs would be deactivated in the following circumstances:

- The site is fallow
- No predatory seal activity is evident as defined by:
    - No seal activity/presence within 50m of the site is noted on a daily walkway checks for a week
    - Fish stress symptoms and direct attacks have significantly reduced or stopped for a minimum of a week
    - No fish mortality attributable to seal predation is recorded
- Cetacean presence is observed in the immediate area (defined as within eyesight, without binoculars) during daily walkway checks
- In the event of a seal becoming trapped within a pen with fish
- Evidence that devices have reduced efficacy in preventing seal interaction with the farm demonstrated by:
    - Continued, consistent, seal-related fish mortalities being recovered from a pen(s) on a daily basis
    - Seal(s) continuing to be in the immediate area of the site (within 50m)
    - Seal(s) encircling pens and fish continuing to display evidence stress symptoms from being present

Seal predation and anti-predation measures, including the use of any acoustic devices, are reviewed on a weekly and monthly basis, and tracked as a Key Performance Indicator. A review is also performed

at the end of each farming cycle to evaluate the effectiveness of anti-predation measures and establish any changes proposed.

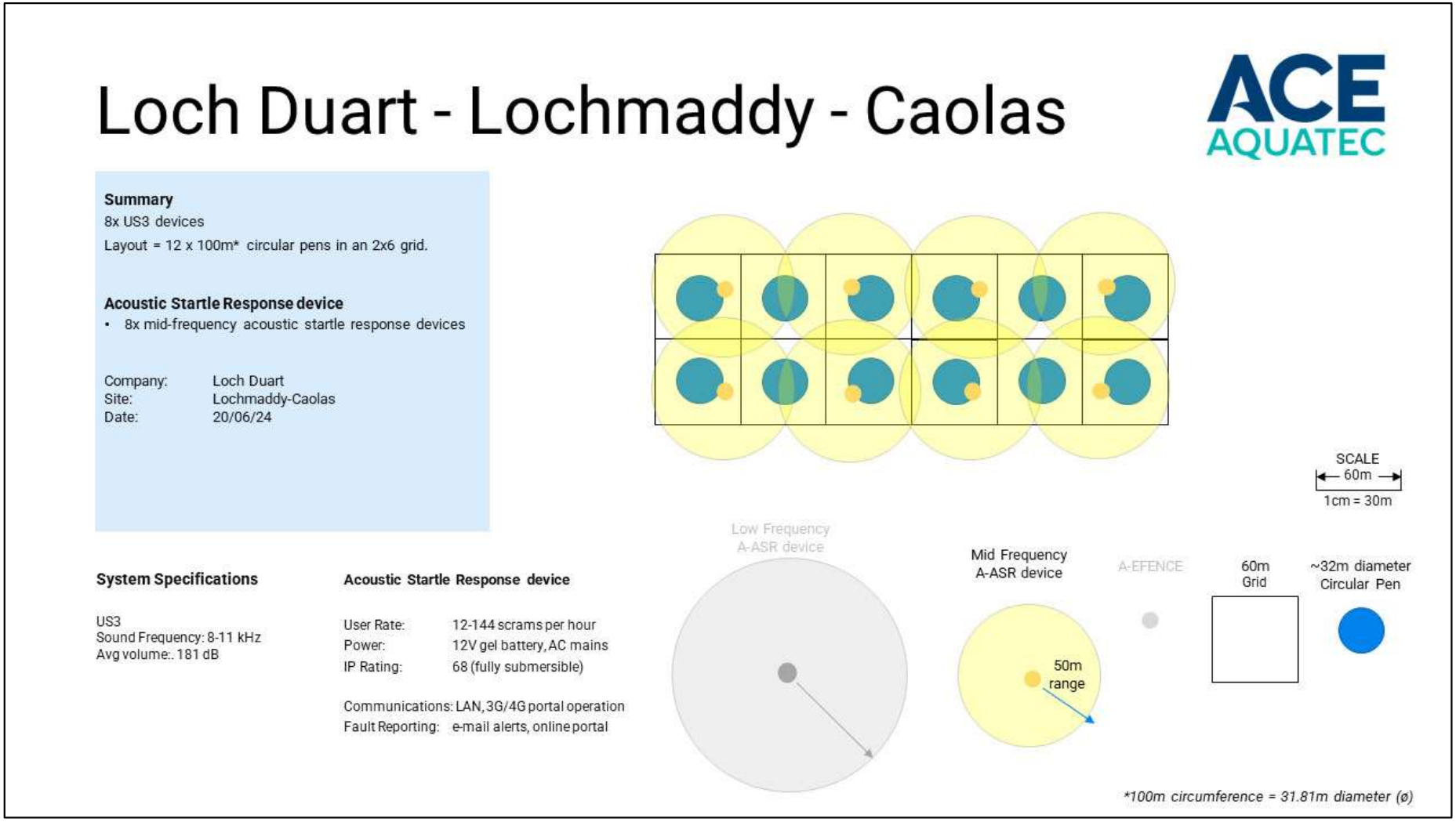

Figure A2 Indicative deployment plan for Ace Aquatech US3 devices at Caolas Loch Portain

3.3 Quantitative site-specific assessment of implication for harbour porpoise and minke whale

Based on the data relating to cetacean distribution in the SCANS-IV CS-H (Minch) area, and the proposed ADD specifications and deployment plan, a quantitative assessment has been completed for the Caolas Loch Portain site in relation to potential disturbance and hearing injury (cumulative permanent threshold shift (PTS)) of eight cetacean species including harbour porpoise and minke whale. This assessment follows the example method for determining cetacean disturbance and injury presented in the MS guidance document (Marine Scotland, 2021), with expert input from Dr Jeff Lines (Silsoe Livestock Systems Ltd).

Version 4.3 of the ADD Sounds Zone model developed by Dr Jeff Lines to determine disturbance/injury threshold distances has been populated with the details of the proposed setup for the Caolas Loch Portain site. The assessment has been completed for the Ace Aquatec US3 acoustic device, based on the specific source level, frequency, maximum duty cycle and number of units described in section 3.2.2 and the relevant cetacean hearing sensitivities (based on Table 1 in Marine Scotland (2021)). Disturbance has been calculated based on determining the radius within which a 120dB threshold is exceeded for the device-type setup proposed. PTS threshold radii have been calculated for each relevant Functional Hearing Group (porpoise: Very High Frequency; dolphins: High Frequency; whales: Low frequency), adding together the sound energy from the individual sound-producing units proposed for the US3 setup (see appendix 1; original spreadsheet available on request).

The modelling results, with respect to the area of potential disturbance and injury for Harbour porpoise and Minke whale are summarised in Table A5. The results predict there is a disturbance threshold distance of 2,154 m and a PTS in hearing at distances of 379 m for harbour porpoise and 25m minke whale respectively. Figure A3 below illustrates the sea area affected by the specified disturbance threshold of 120 dB and the area of potential PTS injury to harbour porpoise. Where the disturbance/PTS distances overlap with land, these areas have been subtracted and a simple representation of the sound shadow has been applied in relation to the coastline features. The area of potential PTS injury to Minke whale (threshold distance of 25m) is not shown in Figure A3 however the affected sea area (0.002 km^2) would essentially be contained within the proposed MCA.

Table A5 Disturbance and injury potential of the proposed US3 deployment on Harbour porpoise and Minke whale

Assessment	Distance (m)	Sea area (km2)
Area of potential disturbance (120dB threshold radius of US3 device)	2,154	5.60
Area of potential PTS injury – Harbour porpoise	379	0.39
Area of potential PTS injury – Minke whale	25	0.002

Source: see Cage group calculation, appendix 1 for full details

Figure A3 Sea area that lies within the disturbance threshold radius (2,154m from the site centre; red line). The orange line represents the sea area within the PTS threshold radius (379m) for cetacean species with very high frequency hearing range (i.e. harbour porpoise). The PTS threshold for cetaceans with high frequency (dolphins) and low frequency (whales) hearing ranges are 24m and 25m respectively and are not shown on the figure. Blue marker = proposed site centre.

Table A6 presents the modelled estimates of the sea area, number of individuals and percentage of the population in SCANS-IV Block CS-H that would be subject to disturbance or PTS injury based on the US3 technical specifications and proposed deployment plan at the Caolas Loch Portain site. These results indicate that less than one individual of minke whale would be disturbed by the use of US3 ADDs as proposed. However, the results do indicate that over 1 individual of Harbour porpoise, Bottlenose dolphin and Common dolphin could be disturbed, indicating that if the site is consented and LDL wish to deploy the specified devices as proposed, it is anticipated that an EPS licence would be required. If/when such an EPS licence application is made, a further modelling assessment will be undertaken using a finalised ADD deployment plan (i.e. confirming the model, technical specification and number of the ADDs to be used), any new SCANS data available and incorporating any new guidance on ADD modelling from the Marine Directorate. The EPS licence application would also include a cumulative impact assessment (CIA) of ADD use, taking into consideration the use of ADDs

at other marine fish farm sites in SCANS-IV Block CS-H and the predicted number of cetaceans expected to be impacted by those ADDs. The ability to conduct a CIA will be dependent on having access to the modelled (predicted) impacts of other ADDs in use in SCANS IV Block CS-H. Whilst details of commercial EPS licences are available on the Marine Directorate database, to the best of our knowledge, details of EPS licences granted for research purposes are not available. If/when an EPS licence application is made, LDL will consult further with the Marine Directorate, LPA and NatureScot to assess how a CIA of ADD impacts can be undertaken if relevant data is not publicly available due to confidentiality issues.

Table A6 Predicted disturbance and PTS range and number of individual cetaceans and percentage of population in SCANS-IV Block CS-H affected by the use of US3 ADDs (as per the proposed deployment plan) at Caolas Loch Portain.

	Disturbance			PTS		
Species	**Affected area km²**	**# individuals**	**% Pop'n***	**Affected area km²**	**# individuals**	**% Pop'n***
Minke whale (LF)	5.6	0.2	0.0401	0.001976	0.00007	0.00001
Beaked whales (LF)	5.6	0.0	0.0405	0.001976	0.00001	0.00001
Harbour porpoise (VHF)	5.6	2.2	0.0401	0.389891	0.15249	0.00279
Bottlenose dolphin (HF)	5.6	1.9	0.0401	0.001759	0.00060	0.00001
Risso Dolphin (HF)	5.6	0.1	0.0401	0.001759	0.00004	0.00001
Common Dolphin (HF)	5.6	5.2	0.0401	0.001759	0.00163	0.00001
White-sided Dolphin (HF)	5.6	0.8	0.0401	0.001759	0.00024	0.00001
White-beaked dolphin (HF)	5.6	0.2	0.0401	0.001759	0.00005	0.00001
Total		**10.6**			**0.15513**	

Marine Mammal Hearing Group (based on Table 1, Marine Scotland 2021): LF=Low Frequency; HF = High Frequency; VHF = Very High Frequency. PTS = Permanent Threshold Shift.
* Calculated from the # individuals in this table and the estimated abundance in SCANS-IV Block CS-H in Table A3

Source: derived following the example method in the MS guidance document, using data from SCANS-IV zone CS-H (Minch). For further details see appendix 1.

4. Conclusion

Based on the quantitative assessment carried out for Caolas Loch Portain, the number of individual cetaceans at risk of PTS is predicted to be less than 1 for all species assessed. With respect to disturbance, the modelling predicts up to 2.2 individual Harbour porpoise, 1.9 Bottlenose dolphin and 5.2 Common dolphin may be disturbed, which equates to 0.0401% of the estimated population of those species within SCANS-IV, Block CS-H (Minch). Disturbance of minke whale (qualifying cetacean feature of the Sea of the Hebrides MPA) is predicted to be less than one individual.

It is important to note a worst-case scenario has been adopted for the purposes of this assessment, in keeping with the precautionary principle, as described below:

- When considering onset of PTS, exposure has been calculated for a 24hr period. However, as cetaceans are highly mobile species and the distances associated with PTS are relatively small (25 – 379m for the proposed 8 US3 systems) it is unlikely that a mobile cetacean would remain within such a small radius of a device for a whole 24hr period
- In both the PTS and disturbance assessments the worst-case in terms of the device sound level (181dB) has been assumed, together with a duty cycle of 5%. In practice the sound level and duty cycle could be reduced and the ADDs can be set to 'ramp down' automatically (to a duty cycle of zero) if there is no predatory seal activity at the site. Furthermore there will be periods when the system is not in use (i.e., fallow periods or device not switched on due to absence of criteria for triggering ADD use).

5. References

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NatureScot (2020a). NatureScot Conservation and Management Advice: Inner Hebrides and the Minches SAC. 2020. Available online: https://apps.snh.gov.uk/sitelink-api/v1/sites/10508/documents/59 [accessed 26/06/2024]

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Appendix 1

Quantitative risk assessment model

ADD Sounds Zones V4.3 – Cage Group Calculation

(Original spreadsheet available on request)

Calculation Instructions

ADD sound zones V4.3

only cells in green can be altered

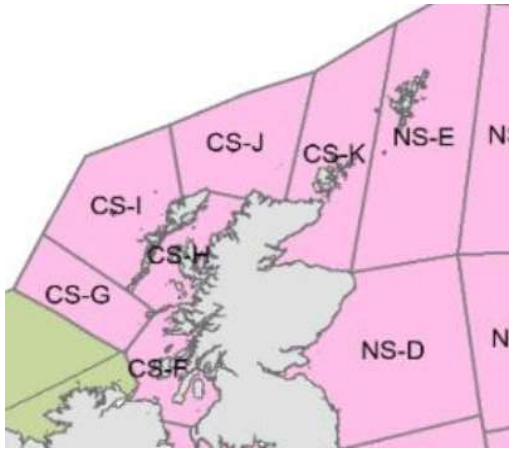
cells in red contain key model outputs

Alternative ADD data in the yellow cells is generated by adding new ADD data in sheet "Source data"

This alternative ADD data can be used in the yellow cells or copied into available green cells using paste special - values

1. Enter the site name and location using the Scans IV code (eg CS-I)
2. Check that all the required ADD devices are shown column A, lines 27-36.
   (Characteristics of all commercial devices should be verified against test information)
3. Use "Source data" sheet to create data for alternative devices. This appears in the yellow cells
4. If more than one additional device is needed then copy the values from the yellow cells into green cells using paste special - values
5. Enter the numbers of each type of ADD device on a farm site in column B
6. If multple ADDs can fire simultaniously set simultaneous to YES otherwise NO
   (example: if there are 6 RT1 units on site of which 2 fire simultaneously create two RT1 lines one with 4 units and one with 2 simultaneous units)
7. If the maximum SPL or SEL can be limited then an adjustment can be made in the "adjutments" column eg -3 for a 3dB reduction
8. Using a site map determine the area of land within the threshold radius and enter the value in the green cells
9. Where applications are made for multiple adjacent cage groups, plot the ***disturbance*** threshold circles on a map and report the total sea area enclosed within the envelope. Neglect significant sound shadow zones caused by the coast shape but not by small rock outcrops
10. Do not combine or discount PTS (injury) zones for different sites even if they seem to overlap

Scans IV zones



potential disturbance and injury calculation

farm name and cage group	cage group 1 Caolas Loch Portain	
farm location	CS-H	Minch

ADD devices in use	number	simultaneous	Adjustment SPL	Adjustment SEL	Single ADD level (disturbance) & weighted SEL (PTS injury) Disturbance	PTS: LF	PTS: HF	PTS: VHF
ADD1	0	NO	0	0	195.0	233.3	218.3	212.6
ADD2	0	NO	0	0	198.0	242.4	241.4	238.6
ADD3	0	NO	0	0	198.0	245.4	244.4	241.6
ADD4	0	NO	0	0	189.0	231.4	230.5	227.7
ADD5	0	NO	0	0	165.0	201.9	201.0	198.2
ADD6	0	NO	0	0	180.0	215.3	187.6	179.5
Ace Aquatec RT1 flex (S1)	0	NO	0	0	182.0	218.3	191.2	183.0
Ace Aquatec RT1 ring (S2)	0	NO	0	0	180.0	216.3	192.8	185.2
Ace Aquatec US3	8	NO	0	0	181.0	215.6	214.1	211.2
Ace Aquatec other	0	NO	0	0	182.0	216.4	215.4	212.5
other calculated values	0	NO			182.0	216.0	215.8	213.5
total SPL or weighted SEL (dB)					181	225	223	220
threshold radius (m)					2154	25	24	379
area of which is land or sound shadow (sq km)					9.0	0.0	0.0	0.1
affected area (sq km)					5.60	0.00	0.00	0.39
percentage of zone area					0.04%	0.000%	0.000%	0.003%

mammals potentially affected	Disturbance	PTS injury
Minke whale (LF)	0.2	0.00007
Beaked whales (LF)	0.0	0.00001
Pilot Whale (LF)	0.0	0.00000
Harbour porpoise (VHF)	2.2	0.15249
Bottlenose dolphin (HF)	1.9	0.00060
Risso Dolphin (HF)	0.1	0.00004
Common Dolphin (HF)	5.2	0.00163
White-sided Dolphin (HF)	0.8	0.00024
White-beaked Dolphin (HF)	0.2	0.00005
TOTALs	**10.6**	**0.15513**

ASSESSMENT OF EQUILIBRIUM CONCENTRATION ENHANCEMENT

Caolas Loch Portain Finfish Pen Site, Lochmaddy

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Quality Assurance

The data used in this document and their input and reporting have undergone a quality assurance review which follows established TransTech Ltd procedures. The information and results presented herein constitute an accurate representation of the data collected.

Document Details

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PhD, BSc (hons)

Issue Date: 4 June 2024

Issue No: 2024v1

1. EXECUTIVE SUMMARY

This report contains an assessment of equilibrium concentration enhancement (ECE) for nitrogen for the modification of Loch Duart Ltd's Caolas Loch Portain pen site on Loch Portain from 14 x 80 m circumference circular pens to 12 x 100 m circumference circular pens.

Along with the change to the equipment production at the site will increase from a maximum standing biomass of 1,060 tonnes to 1,720 tonnes. The proposal is to decommission Loch Duart's, Ferramus site should the modification to the Caolas Loch Portain site be consented. This will result in an overall decrease of 10 tonnes in the maximum biomass in the Lochmaddy Production Area. Nevertheless, Ferramus has been included in the calculations as it is currently an active site.

The calculations reported within this document indicate that the proposed increase in biomass at the Caolas Loch Portain site is not predicted to significantly change the nutrient enhancement index of the Lochmaddy water body i.e., enhancement will rise from a maximum of 0.23 to 0.31 µmol N l^{-1} which, although borderline, remains close to the 0.3 µmol N l^{-1} upper limit of index 1. Thus, only marginal change to the water body's nutrient enhancement index is predicted.

The water body is predicted to remain within OSPAR and UKTAG threshold levels even when seasonal variation (as observed on other Scottish sea lochs, voes and bays) is taken into account as the ECE value for Caolas Loch Portain and Ferramus is estimated to be a maximum of 2.6% of the background level for coastal waters.

2. INTRODUCTION

The Lochmaddy production area, which includes Loch Portain, is not catergorised in the Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters(1). As Loch Duart will increase the biomass at the Caolas pen site there is a requirement for additional supporting information on the resulting increase in nutrient loading.

Within the Lochmaddy production area there are two CAR licenced seawater finfish farms i.e., the subject Caolas Loch Portain site and Ferramus (figure 1), albeit the latter will be decommissioned should the modification to the Caolas Loch Portain site be consented. However, Ferramus has been included in the calculations as it is currently an active site.

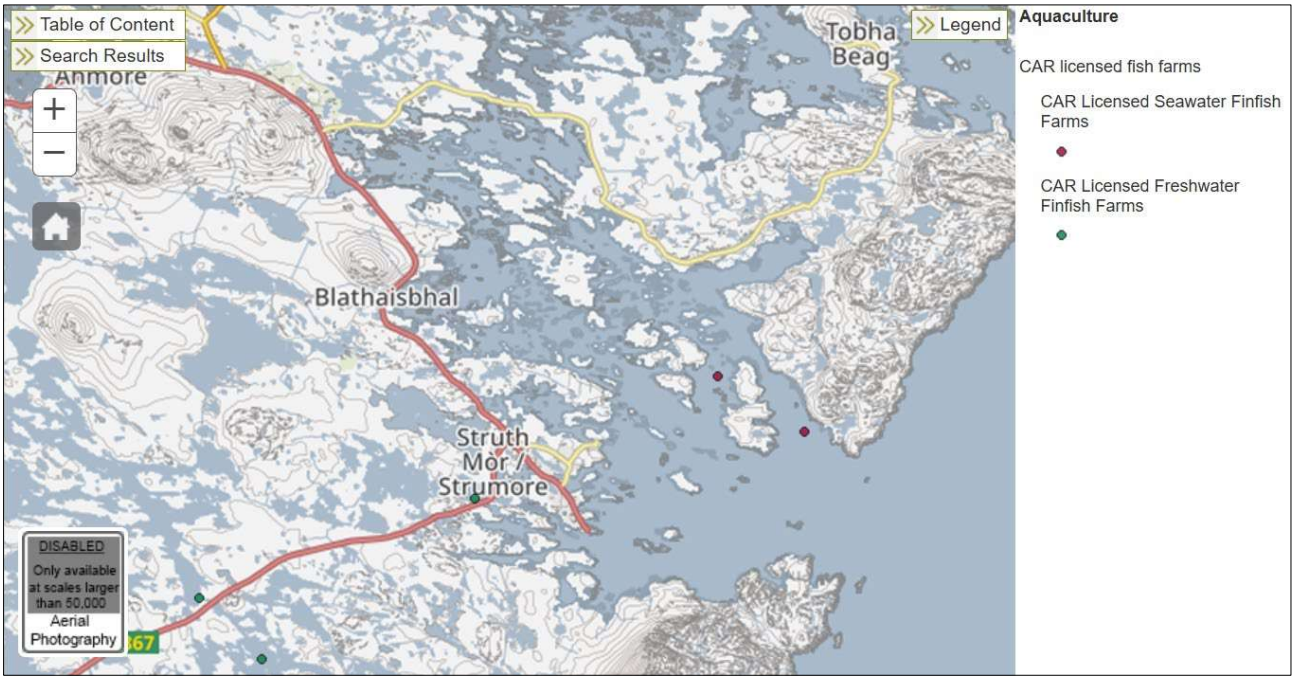


Figure 1. CAR licenced seawater finfish farms within the Lochmaddy production area.
(Source: http://aquaculture.scotland.gov.uk/map/map.aspx)

Table 1. CAR licenced seawater finfish farms within the study area.
(Source: http://aquaculture.scotland.gov.uk/map/map.aspx)

#	Farm name	Operator	Active Licence No.
1	Caolas Loch Portain	Loch Duart	CAR/L/1002994
2	Ferramus	Loch Duart	CAR/L/1003024

3. NUTRIENT ENHANCEMENT CALCULATIONS

Nutrient enhancement calculations were carried out for the modified Caolas Loch Portain and the Ferramus sites by applying the same methodology as that used by Marine Scotland Science in their Locational Guidelines[1] for other sea lochs.

Through the discharge of nutrients and chemicals, finfish production may have adverse, though currently poorly understood, effects on the plankton and bacterial populations of sea lochs and coastal waters.

Farmed salmonids excrete soluble nitrogen (in the form of ammonia) into the water column as a by-product of metabolism. The quantity emitted by each fish varies due to a number of factors, including food composition, fish age and size, and water temperature. The total quantity of ammonia emitted from a finfish farm then depends on the level of production and the stage of the production cycle. In order to estimate correctly the effects of nutrient emissions on the local ecosystem, it is imperative to have an accurate assessment of the quantities of nutrients being released.

To determine the enhancement of dissolved nitrogen above background levels within the Lochmaddy production area a box model was used.

3.1. Loch area and volume

The area and volume of Lochmaddy is not listed in the Locational Guidelines[1], the Scottish Sea Lochs Catalogue[2] or, as far as we can determine, any other source.

Therefore, to derive area, the Mean Low Water Springs (MLWS) contour was obtained from Ordnance Survey OS Terrain® 50 data (https://osdatahub.os.uk/downloads/open/Terrain50), see figure 2. This lies at -1.87 m Ordnance Datum Newlyn (ODN) which when converted to Chart Datum (CD) is 0.72 m above CD. This is calculated by subtracting -1.87 m from 2.59 m which is the ODN conversion for Lochmaddy[3].

To determine volume, an OceanWise MT Digital Elevation Model (DEM) to 1-arc second resolution tiles was purchased from the Emapsite (https://marine.emapsite.com/landing-page?guid=8c2483f4-b924-437c-b8db-2ec9f861b529) and clipped in GIS to lie within the extents of the surface water area.

However, as shown in figure 3, bathymetric data does not exist for much of the water body. Indeed, when investigating other sources of data, that from OceanWise appears to be the best available. Thus, to derive a volume for the water body the area within the MLWS contour that contains depth measurements was delineated. This is 10,131,395 m^2 and the remaining un-surveyed area within the MLWS contour is 2,941,141 m^2 (see figure 4)

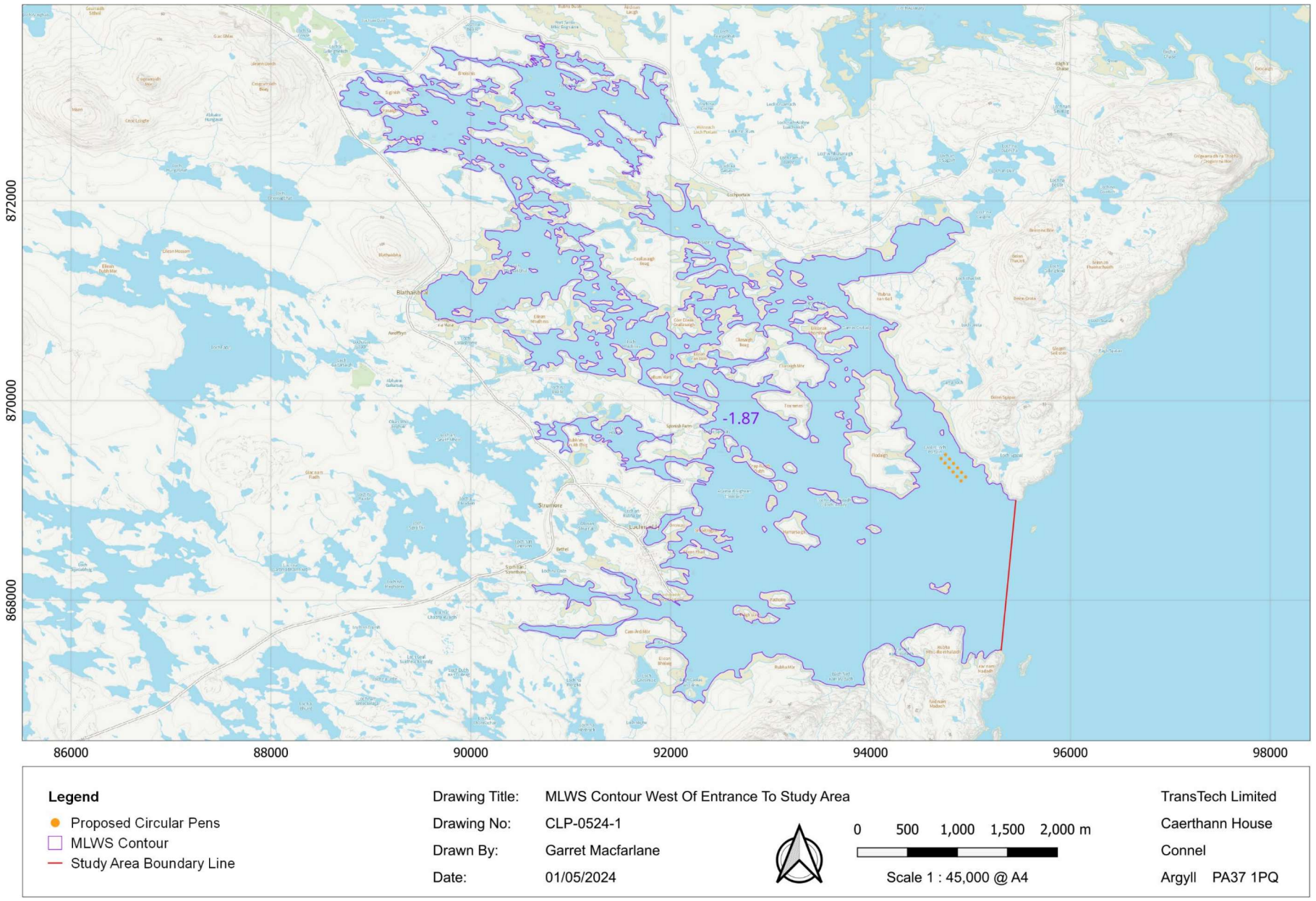


Figure 2. MLWS contour within study area.

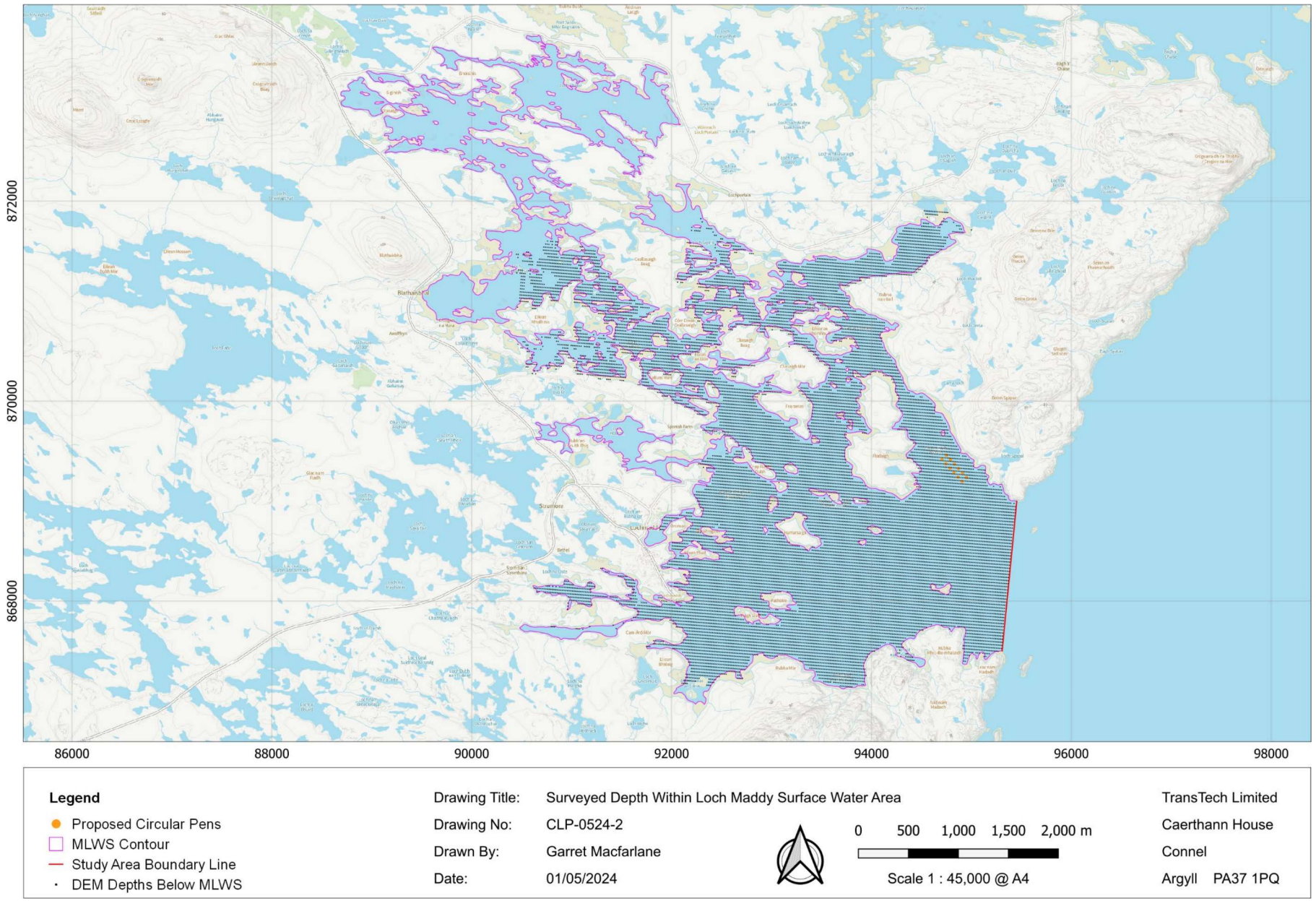


Figure 3. Depth locations within the study area.

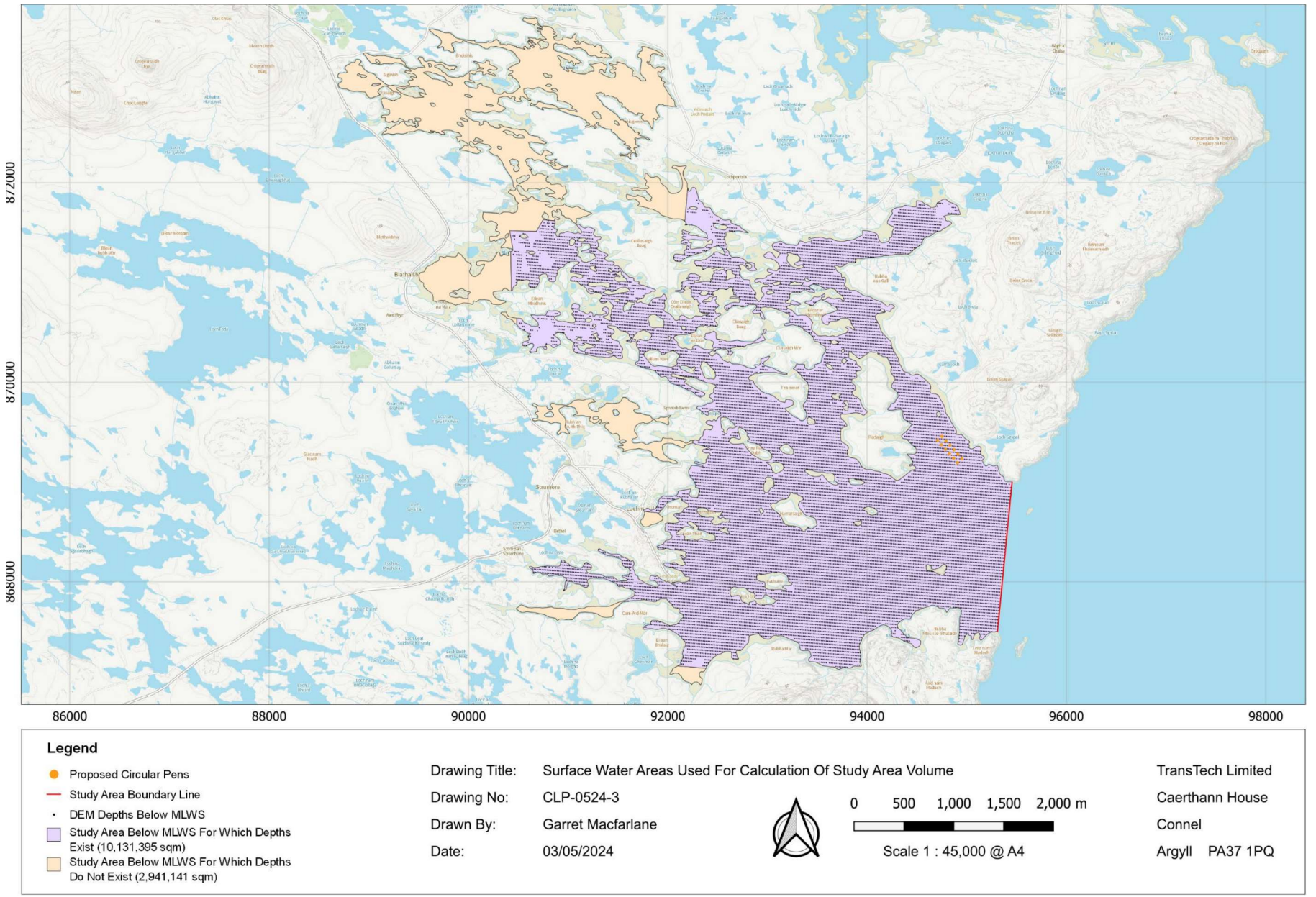


Figure 4. Surface water areas used in the calculation of volume.

3.1.1. Volume within study area that has depth soundings

GIS was used to clip all DEM depths below 0.72 m above CD i.e., those within the MLWS contour. Within this area there are 17,245 depth readings. Average depth was determined from the attribute table for the depths. This is 9.33747 m and multiplying this by 10,131,395 m^2 gives a volume of 94,601,597 m^3.

3.1.2. Volume within study area that does not have depth soundings

Given that average depth below MLWS within the remaining un-surveyed area is unknown, what is deemed to be a conservatively low value of 2 m was applied. Thus, for the un-surveyed area (2,941,141 m^2) the volume is 5,882,282 m^3. It should be noted here that it is water body area rather than volume that affects the ECE value.

3.1.3. Total volume of study area

Adding 94,601,597 m^3 to 5,882,282 m^3 gives a volume for the whole study area of 100,483,879 m^3.

3.2. Calculation of flushing time and flushing rate

(source: http://www.scotland.gov.uk/Uploads/Documents/Report63.pdf)

The predominant exchange mechanism is assumed to be the semi-diurnal tide. The flushing time of the study area can be calculated by assuming that the water volume is replaced by the volume of water entering and leaving on each tide (the "tidal prism", see Gillibrand *et al*, 2002[4]) giving:

$$\mathrm{TF} = \frac{0.52 * \mathrm{V}}{0.7 * \mathrm{A} * \mathrm{R}}$$

Where:

TF is the Flushing Time (days)
V is the volume of the marine system basin (m^3)
A is the surface area of the marine system (m^2)
R is the spring tidal range (m)

The factor 0.52 is the number of days per tidal cycle (1 tidal cycle = 12.4 hours = 0.52 days), and the factor 0.7 approximates the mean tidal range from the spring tidal range (see Gillibrand *et al*, 2002[4]).

Using the above equation TF for the study area was calculated as follows:

A = 13,072,536 m^2	(MLWS area derived as per the methodology described in §3.1)
V = 100,483,879 m^3	(MLWS volume derived as per the methodology described in §3.1)
R = 4.08 m	(Tidal range between the MLWS (-1.87 m) and MHWS (2.21 m) OS contours)

Calculation:

$$\mathrm{TF} = \frac{0.52 * 100{,}483{,}879}{0.7 * 13{,}072{,}536 * 4.08}$$

$$= 1.399528304 \text{ days}$$

The tidal prism method of calculating flushing times is known to overestimate the exchange of water and therefore under predict the flushing time[4, 5, 6]. The exchange rate of sea lochs, voes and bays can also be affected by wind strength and direction, and fluctuations in river flow. However, these variations are difficult to predict and vary from system to system. Tidal exchange is a steady and persistent process, not subject to meteorological fluctuations, and therefore forms the core exchange mechanism of these systems. The tidal prism method, therefore, while not complete, forms the best available method for estimating the flushing of marine systems.

The nutrient enhancement is strongly dependent on the flushing rate, Q (m^3 y^{-1}), of the marine system, which is given by:

$$Q = \frac{365 * V}{TF}$$

where the factor 365 converts the units from m^3 d^{-1} to m^3 y^{-1}. The flushing rate, then, is the total quantity of water that is exchanged over a year.

Calculation:

$$Q = \frac{365 * 100{,}483{,}879}{1.399528304}$$

$$= 26{,}206{,}412{,}361 \text{ m}^3 \text{ y}^{-1}$$

3.3. Nutrient model parameters and calculated equilibrium concentration enhancement for current and proposed maximum biomass

The maximum biomass that could be held within the Lochmaddy production area pre and post modification of the Caolas Loch Portain site is 1,730 tonnes and 2,390 tonnes respectively, albeit Ferramus will be decommissioned should the modification to the Caolas Loch Portain site be consented. A breakdown of these figures is provided in table 2.

Table 2. Maximum biomass at each farm within study area (current and proposed*).

#	Farm name	CURRENT Maximum biomass (tonnes)	PROPOSED* Maximum biomass (tonnes)	PROPOSED** Maximum biomass (tonnes)
1	Caolas Loch Portain	1,060	1,720	1,720
2	Ferramus	670	670	0
	TOTALS:	**1,730**	**2,390**	**1,720**

Notes for table 2:

* This includes Ferramus which will be decommissioned post consent of the modification to Caolas Loch Portain.
** This excludes Ferramus post consent of the modification to Caolas Loch Portain.

The parameters required by the model were defined as follows (table 3):

Table 3. Model parameters.

Parameter	CURRENT	PROPOSED (including Ferramus)	PROPOSED (excluding Ferramus)
M (Tonnes)	1,730	2,390	1,720
S (kgN/T/year)	48.2*		
Q (m^3/year)	26,206,412,361		
ECE (kg N m^{-3})	3.18189 x 10^{-6}	4.39579 x 10^{-6}	3.16350 x 10^{-6}
ECE (µmol N l^{-1})	0.23	0.31	0.23

Notes for table 3:

* This value has been obtained from Gillibrand *et al*, 2002[4] and assumes a feed wastage of 5%, 90% digestibility of the diet and a mean feed nitrogen content of 7.2% (wet weight). The figures were derived in 2002. Feed wastage and digestibility has improved since the Gillibrand *et al* study was undertaken and due to advances in the composition of fish

feeds the nitrogen content has reduced from a mean of 7.2% to a current mean of approximately 6.5%. The nitrogen enhancement calculated above is therefore likely to overestimate what will occur in reality.

To be robust we have also performed the calculations for the 10,131,395 m^2 area of the loch (94,601,597 m^3 volume) within which there are depth soundings. These are given in table 4.

Table 4. Model parameters.

Parameter	CURRENT	PROPOSED (including Ferramus)	PROPOSED (excluding Ferramus)
M (Tonnes)	1,730	2,390	1,720
S (kgN/T/year)	48.2		
Q (m^3/year)	20,310,329,623		
ECE (kg N m^{-3})	4.10560 x 10^{-6}	5.67189 x 10^{-6}	4.08186 x 10^{-6}
ECE (µmol N l^{-1})	0.29	0.40	0.29

The above calculations reveal that the enhancement of dissolved nitrogen above background levels as a result of the current finfish farming operations is currently 0.23 to 0.29 µmol N l^{-1} for the whole study area and that which only has depth soundings respectively.

For the modified Caolas Loch Portain site there will be an overall increase in maximum biomass of 660.0 tonnes, albeit Ferramus will be decommissioned post consent of modification to the Caolas Loch Portain site. For the 660.0 tonnes increase in maximum biomass ECE is predicted to rise slightly from 0.31 to 0.40 µmol N l^{-1} for the whole study area and that which only has depth soundings respectively.

The index of nutrient enhancement using the model described by Marine Scotland Science is given in table 5.

The results of this assessment for Lochmaddy (i.e., the whole study area) indicate that it is currently within nutrient enhancement index 1 and the development proposal will cause it to marginally move into index 2 (i.e., a rise from 0.23 to 0.31 µmol N l^{-1}). The volume of the study area that contains depth soundings has a nutrient enhancement index that is marginally below 2 i.e., 0.29 µmol N l^{-1}) and the proposal will also fall within nutrient enhancement index 2 (i.e., 0.40 µmol N l^{-1}).

Table 5. Index of nutrient enhancement.

Predicted ECE for nitrogenous nutrients arising from finfish farming (µmol l^{-1})	Nutrient enhancement index
> 10	5
3 – 10	4
1 – 3	3
0.3 – 1	2
<0.3	1
0	0

Thus, the rise in ECE from the proposal (including Ferramus) causes a borderline change in the nutrient enhancement index categorisation.

4. NITROGEN INPUT ASSESSMENT AGAINST OSPAR & UKTAG THRESHOLD LEVEL

In Scottish sea lochs, voes and bays, under most conditions, algal growth is limited by dissolved nitrogen availability and the influence of phosphorus can safely be discounted[7].

Nitrogen inputs are assessed against OSPAR and UKTAG background levels. The calculated ECE from all fish farms in the water body is then added onto the background level for that water body and the result is then assessed as to whether it breaches the threshold, which is 50% above the background value (i.e., 252 µg N l^{-1}).

The enhancement of dissolved nitrogen above the background level as a result of the Ferramus and proposed Caolas Loch Portain finfish farming operations within the whole study area is predicted to be a maximum of 0.31 µmol N l^{-1} (4.40 µg N l^{-1}).

The background value for coastal waters is 168 µg N l^{-1}, adding the calculated ECE onto this value gives 172.4 µg N l^{-1}, which is below the 252 µg N l^{-1} threshold.

The ECE value does not account for nitrification and other removal mechanisms but is a maximum of 2.6% of the 168 µg N l^{-1} background level. This means that the study area will comfortably remain within threshold levels even when seasonal variation (as observed on other Scottish sea lochs, voes and bays) is taken into account.

It is therefore concluded that nutrient enrichment associated with the increase in biomass at the Caolas Loch Portain site is unlikely to make a significant contribution to nutrient enhancement and consequently primary productivity.

5. MITIGATION

The particulate component of waste from finfish farms includes both uneaten feed and faeces. Fish feed is expensive, and it is therefore in Loch Duart's best interests to minimise waste. Feed wastage will be optimised by feeding fish to 80% satiation and monitored daily by surface appetite scoring. By optimising feeding less nitrogen derived from pellet waste will enter the water column.

6. CONCLUSIONS

In terms of the Locational Guidelines[1] the loch is unclassified.

The modification of the Caolas Loch Portain site, when Ferramus is included, in an overall increase in maximum biomass of 660 tonnes within the study area.

The modification is not predicted to significantly change the nutrient enhancement index of the Lochmaddy water body i.e., enhancement will rise from a maximum of 0.23 to 0.31 µmol N l^{-1} which, although borderline, remains close to the 0.3 µmol N l^{-1} upper limit of index 1. Thus, only marginal change to the water body's nutrient enhancement index is predicted.

The water body will also remain within OSPAR and UKTAG threshold levels even when seasonal variation (as observed on other Scottish sea lochs, voes and bays) is taken into account as the ECE value is predicted to be a maximum of 2.6% of the background level for coastal waters.

REFERENCES

(1) Locational Guidelines for the Authorisation of Marine Fish Farms in Scottish Waters. Marine Scotland Science. March 2024 (last updated 17 April 2024).

(2) Edwards, A. and Sharples, F. 1986. Scottish sea lochs: a catalogue. Published by the Scottish Marine Biological Association/Nature Conservancy Council.

(3) Admiralty Tide Tables. Admiralty Charts and Publications. Volume 1. NP 201-10. 2010.

(4) Gillibrand, P.A., Gubbins, M.J., Greathead, C. and Davies, I.M. 2002. Scottish Executive locational guidelines for fish farming: Predicted levels of nutrient enhancement and benthic impact. Scottish Fisheries Research Report Number 63 / 2002. Fisheries Research Services, Marine Laboratory, Aberdeen.

(5) Gillibrand, P.A. and Turrell, W.R. 1997. The use of simple models in the regulation of the impact of fish farms on water quality in Scottish sea lochs. Aquaculture, 159, 33-46.

(6) Gillibrand, P.A. 2001. Calculating exchange times in a Scottish fjord using a two-dimensional, laterally integrated numerical model. Est. Coast. Shelf Sci., 53, 437-449.

(7) Tett, P. and Edwards, V. 2002. Review of Harmful Algal Blooms in Scottish Coastal Waters. Phase 1. Direct Effects of Nutrients on Phytoplankton. Report to SEPA.

Letter of Attestation

Date: 17th June 2024

For the Attention of; Loch Duart Salmon Ltd

This is to confirm that Gael Force Group Ltd, at the request of Loch Duart Salmon Ltd, will be designing and specifying a Triton 450 Pens and HDPE Nets for their Caolas North Uist site.

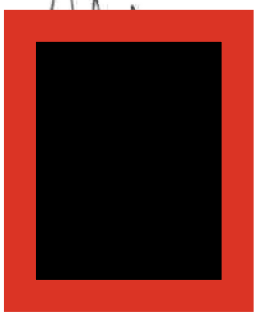
We, Gael Force Group Ltd confirm that, if purchased in full from us, the specification, design equipment and documents supplied and prepared by us are based on Loch Duart Salmon Ltd own environmental site data, will conform to, and be in line with Industry Standards, and has been manufactured from certified components from approved suppliers, and constructed by fully trained and qualified Gael Force Group Ltd employees, in accordance with our quality management system.

Approved By

Jamie Young

Group Sales Director

17/06/2024



Gael Force
MARINE EQUIPMENT

Date: 11th October 2023

For the attention of; Hazel Wade

Letter of Attestation

This is to confirm that Gael Force Marine Equipment Ltd, at the request of Loch Duart, have designed and specified a mooring system for their Coalas site on the 11th October 2023, and as detailed in our Order Reference Number 867363 and Revision A.

We, Gael Force Marine Equipment Ltd confirm that, the specification, design, equipment and documents supplied and prepared by us are based on Loch Duart's own environmental site data, provided to us on the 3rd October 2023, conforms to, is in line with Industry Standards, and will be manufactured from certified components from approved suppliers, and constructed by fully trained and qualified Gael Force Marine Equipment Ltd employees, in accordance with our quality management system.

Prepared By:

Alexis Chatterton

Moorings Manager

11th October 2023

[redacted]

Approved By:

Jamie Young

Sales Director

11th October 2023

[redacted]

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14th June 2024

Dr Caroline Roberts
Environmental Analyst
Loch Duart Ltd
c/o The Old Ticket Office
Lochmaddy
North Uist
HS6 5AA

Dear Caroline

CAOLAS SITE, NORTH UIST: 100m x 12m+1.3m, 7m Cone Base

KNOTTED CFR NETS WITH JUMP FENCES

This is to confirm that W&J Knox Ltd is a BSI registered company satisfying the standard of BS EN ISO 9001:2015.

The staff employed in the design and construction of our nets are all fully trained and experienced in their roles. We also source the finest raw materials from companies operating within similar quality schemes.

The design of nets supplied to Loch Duart Salmon are beyond the criteria of the Scottish Technical Standard. With regular inspection and servicing they will be able to withstand the environmental conditions at your proposed sites.

With proper care, maintenance and inspection, these nets should remain fit for purpose throughout their working lives. If using a 'Lift-Up' style air lift system or similar, care must be taken to secure the cone to the centre of the base of the net and to ensure that there is enough depth to operate safely, considering tidal rise and fall and significant wave heights.

Care should be taken during in-situ net washing operations. If the washing machine snags and cannot be lifted with a force of less than the weight of the machine in water + 50% of the original breaking strain of the netting, then the machine should be safely recovered with the assistance of a diver.

If I can be of any further help, please do not hesitate to contact me.

Kind Regards,

Cameron Maxwell
FEA Engineer

NET INFORMATION:

	Walls	***Base***
Circumference	*102.00m*	*100.00m*
Depth	*12+ 1.3m*	*7.00m*
Base Angle	*n/a*	*23°*
Material	*Knotted HDPE CFR*	*Knotted HDPE CFR*
Twine Size	*1.5mm*	*1.5mm*
Mesh Size	*15mm Aperture*	*15mm Aperture*
Minimum Mesh Break	*95 kg*	*95 kg*
Standard required	*66 kg Minimum*	*66 kg Minimum*
Vertical Rope Spacings	*2.55m*	*2.50m between span ropes*
Drawing Number	*xxxxxx*	

HYDROGRAPHIC REPORT

Caolas Loch Portain Finfish Pen Site, Loch Portain, North Uist

Prepared for

Loch Duart Ltd

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Quality Assurance

The data presented within this document have undergone a quality assurance review which follows established TransTech Ltd procedures. The information and results presented herein constitute an accurate representation of these data.

Document Details

Author: [redacted]

Garret Macfarlane
PhD, BSc (hons)

Issue Date: 3 May 2023

Issue No: 2023v1

CONTENTS

List of Figures

List of Tables

List of Abbreviations

ADCP	Acoustic Doppler Current Profiler
ATT	Admiralty Total Tide
BGS	British Geological Survey
CD	Chart Datum
GMT	Greenwich Mean Time
GPS	Global Positioning System
LST	Lowest Spring Tide
MSL	Mean Sea Level
OS	Ordnance Survey
OSGB36	Ordnance Survey Great Britain 1936
SEPA	Scottish Environment Protection Agency

1. INTRODUCTION

This report has been prepared by TransTech for current meter data collected by Loch Duart at their Caolas Loch Portain site in North Uist. Three consecutive deployments were performed in order to obtain 90 days of data for use in NewDEPOMOD modelling of a modification to the site.

2. HYDROGRAPHIC SURVEY DETAILS

2.1 ADCP Deployments

A 300 kHz Teledyne RDI Workhorse was used for all three deployments (serial number: 11132). This was mounted in a gimballed seabed frame and deployed using a single-point mooring arrangement (figure 1). The mooring was positioned where local topographic features and other features such as mooring lines would not cause spurious data collection. For each deployment the transducer head was located 0.60 m from the base of the seabed frame.

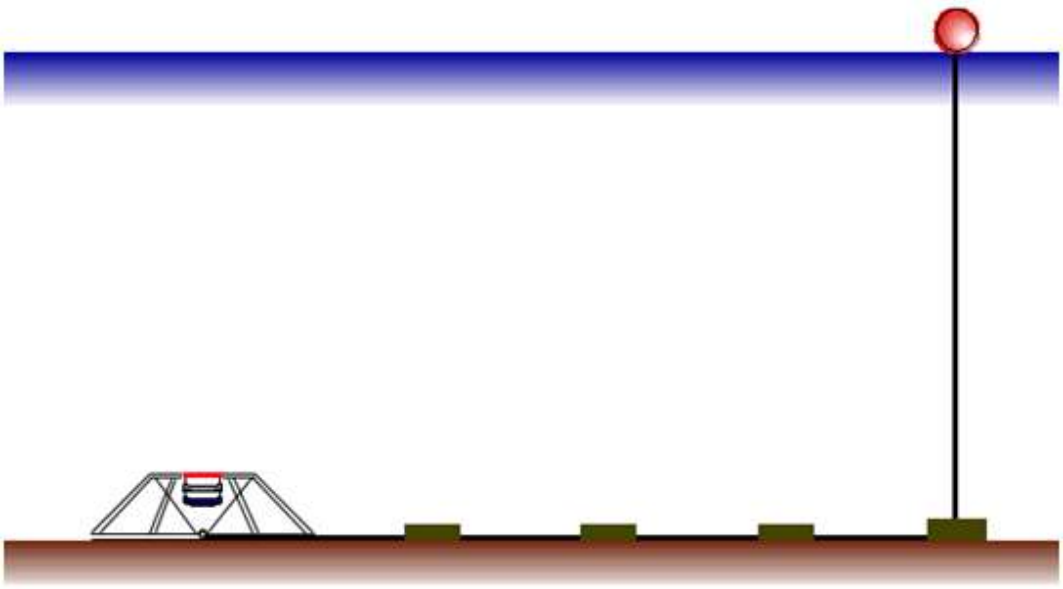

Figure 1. Schematic diagram of mooring array.

The instrument was set-up and deployed as described in Tables 1 and 2 respectively. Ensemble length was 1200 seconds (i.e., 20 minutes).

Table 1. Set-up details of the ADCP used during the survey.

Start of Reported Dataset (time in GMT)	End of Reported Dataset (time in GMT)	Pings/Ensemble	Bin Size (m)	Total No. Bins	Standard Deviation (cm/s)
22/11/22 16:11:57	21/12/22 09:31:57	700	1.0	34	0.516 (Sub-Surface Bin) 0.526 (Net-Bottom Bin) 0.524 (Near-Bed Bin)
21/12/22 13:44:29	01/02/23 08:24:29	700	1.0	34	0.519 (Sub-Surface Bin) 0.526 (Net-Bottom Bin) 0.525 (Near-Bed Bin)
01/02/23 12:02:24	13/03/23 12:42:24	700	1.0	34	0.525 (Sub-Surface Bin) 0.522 (Net-Bottom Bin) 0.507 (Near-Bed Bin)

Table 2. Deployment details of the ADCP used during the survey.

Position of reported bins (m above seabed)		ADCP Deployment Position*	Start of Reported Dataset (time in GMT)	End of Reported Dataset (time in GMT)	No. of 20 minute Ensembles	Depth** (mCD)†
Sub-Surface: Net-Bottom: Near-Bed:	22.85 17.85 2.85	94756 E, 869232 N (N 57.609389°, W 07.112956°)	22/11/22 16:11:57	21/12/22 09:31:57	2069	27.9 *(29.1)*
			"gap" in dataset patched to stitch 90 dataset (see §3.2)		12	
Sub-Surface: Net-Bottom: Near-Bed:	22.86 17.86 2.86	94738 E, 869223 N (N 57.609304°, W 07.113229°)	21/12/22 13:44:29	01/02/23 08:24:29	3009	28.0 *(28.9)*
			"gap" in dataset patched to stitch 90 dataset (see §3.2)		10	
Sub-Surface: Net-Bottom: Near-Bed:	22.85 17.85 2.85	94754 E, 869227 N (N 57.609346°, W 07.112986°)	01/02/23 12:02:24	13/03/23 12:42:24	1381	27.8 *(28.4)*

* Positions recorded relative to WGS84 datum. OS GridInquest was used to convert the WGS84 coordinates to OSGB36.
** A large vessel was used for deployment and recovery and it was therefore difficult to get a precise depth at the deployment location using the on-board sounder or a handheld unit. As such, the ADCP's pressure sensor results are deemed to be more accurate and it is these that have been used for bin height determination (NB: the depths in brackets are the mean of depth soundings at deployment and recovery).
† Correction is from Admiralty Total Tide predicted tidal amplitude at Loch Maddy.

2.2 GPS Calibration

Positions were recorded relative to WGS84 datum using a Garmin GPSMap 78s. Prior to its use on each deployment/recovery it was checked against a second Garmin GPSMap 78s to ensure that it was functioning correctly.

During the deployments these positions were recorded when the ADCP's frame landed on the seabed immediately prior to the tension on the winch cable being slackened. At recovery it was taken as soon as the winch cable was observed to begin lifting the frame. These waypoints were taken at the winch cable i.e., directly above the gimbal.

The displayed accuracy of the GPS for each deployment/recovery was ≤±3 m.

Table 3 gives deployment distances from the existing group centre.

Table 3. Deployment distances from group centre.

Proposed Group Centre Position with Approximate Existing in Brackets	ADCP Deployment Position (Mean of Deployment & Recovery)	Start of Reported Dataset* (time in GMT)	End of Reported Dataset* (time in GMT)	Distance from Proposed (m)
94829 E, 869326 N (94824E, 869346 N)	94756 E, 869232 N	22/11/22 16:11:57	21/12/22 09:31:57	119.0
	94738 E, 869223 N	21/12/22 13:44:29	01/02/23 08:24:29	137.4
	94754 E, 869227 N	01/02/23 12:02:24	13/03/23 12:42:24	124.2

2.3 Pitch, Roll and Heading

The changes in pitch, roll and heading during the deployments are shown in Table 4. These were <10° which are well within the ADCP's tolerances for auto-correction of the data and significantly below SEPA's maximum of 20°[(1)].

Table 4. Set-up and deployment details of the ADCP used during survey.

Start of Reported Dataset (time in GMT)	End of Reported Dataset (time in GMT)	Maximum Pitch (degrees)	Maximum Roll (degrees)	Maximum Change in Heading (degrees)
22/11/22 16:11:57	21/12/22 09:31:57	1.70	4.55	16.12
21/12/22 13:44:29	01/02/23 08:24:29	5.80	4.16	1.74
01/02/23 12:02:24	13/03/23 12:42:24	5.53	6.51	9.62

3. DATA PROCESSING

3.1 Magnetic North to Grid North Conversion

Current direction was collected in degrees Magnetic North and is reported in this document relative to Grid North.

During the deployment magnetic north was approximately 1º 10' (1.1667º) east of Grid North (obtained from Grid Magnetic Angle Calculator Results (bgs.ac.uk), figure 2). The hydrographic data were corrected from Magnetic North to Grid North by adding 0.2833º to the magnetic north direction data using SEPA's HG_data_analysis_v7.11.xls tool (rev 12).

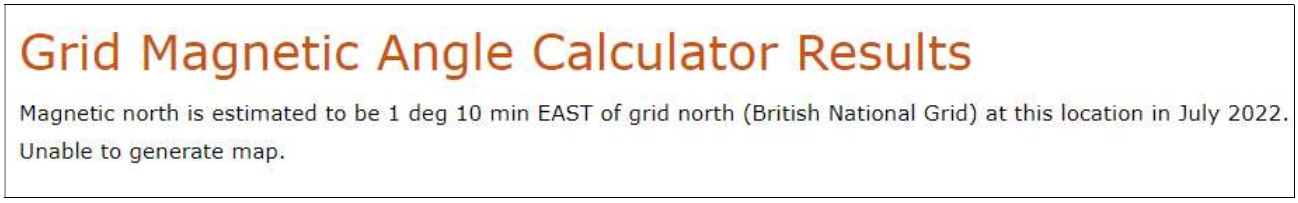

Figure 2. BGS Magnetic North to Grid North conversion.

3.2 Speed and Direction Data Patching

On 21/12/22 and 01/02/23 the ADCP was recovered and the data downloaded by Loch Duart Ltd to ensure that the ADCP was operating as intended. This was found to be the case and on both occasions the ADCP was redeployed after a battery change. The recoveries and redeployments resulted in gaps in valid data of 4 hours (12 ensembles) and 3 hours 20 minutes (10 ensembles) and 26 hours (78 ensembles) respectively.

The gaps in the data were patched using speeds and directions for which data was gathered at the same times in the tidal cycle.

SEPA will have the worksheet used to patch the data as this was previously provided in a spreadsheet titled Stitching of Deployments A,B & C.xlsx in a directory named A., B. & C. CAOLAS DEPLOYMENTS COMBINED.

3.3 90 Day Dataset

The following pages contain tabulated and graphic outputs for the selected sub-surface, net-bottom and near-bed bins for the 90-day dataset. This data was previously provided to SEPA in spreadsheets named: B - hgdata_analysis_v7.xls, M - hgdata_analysis_v7.xls and S - hgdata_analysis_v7.xls within a directory named A., B. & C. CAOLAS DEPLOYMENTS COMBINED.

Table 5 provides mean speed, ranked percentage of the mean current speed and ≤0.095 m/s as a ranked percentage within the current speed record for the sub-surface, net-bottom and near-bed bins.

Table 6 shows the tidal ellipse major axis used; the decomposition of easterly and northerly vector components relative to the tidal ellipse major axis; and the tidal current amplitude relative to the tidal ellipse major axis.

With respect to table 5 below note that according to Admiralty Total Tide (ATT) the Mean Sea Level (MSL) at Caolas Loch Portain is 2.75 m above Chart Datum (based on Loch Maddy, the nearest location for which this data is available) and that the lowest measured deployment depth (i.e., lowest spring tide) for the pressure sensor + frame during the 90 day dataset was 28.306 m.

Table 5. Current speed during the 90-day period.

Bin	Mean speed (m/s)	Percentage ≤0.095 m/s	Amplitude anisotropy	Residual speed (m/s)	Residual Direction (°Grid N)
Sub-Surface 1st dataset: 5.45 m below LST 2nd dataset: 5.44 m below LST 3rd dataset: 5.45 m below LST	0.04	95%	1.20	0.01	186
Net-Bottom 1st dataset: 12.80 m below MSL 2nd dataset: 12.89 m below MSL 3rd dataset: 12.70 m below MSL	0.04	99%	1.13	0.01	307
Near-Bed	0.04	93%	1.24	0.01	22

Table 6. Summary data for the 3 bins during the 90-day period.

Bin	Tidal ellipse major axis	Components of current residual (m/s)		Components of tidal current amplitude (m/s)	
	Bearing (°Grid N)	Parallel (U)	Normal (V)	Parallel (U)	Normal (V)
Sub-Surface	195	0.008	-0.001	0.053	0.044
Net-Bottom	360	0.003	-0.005	0.042	0.037
Near-Bed	85	0.004	-0.009	0.057	0.046

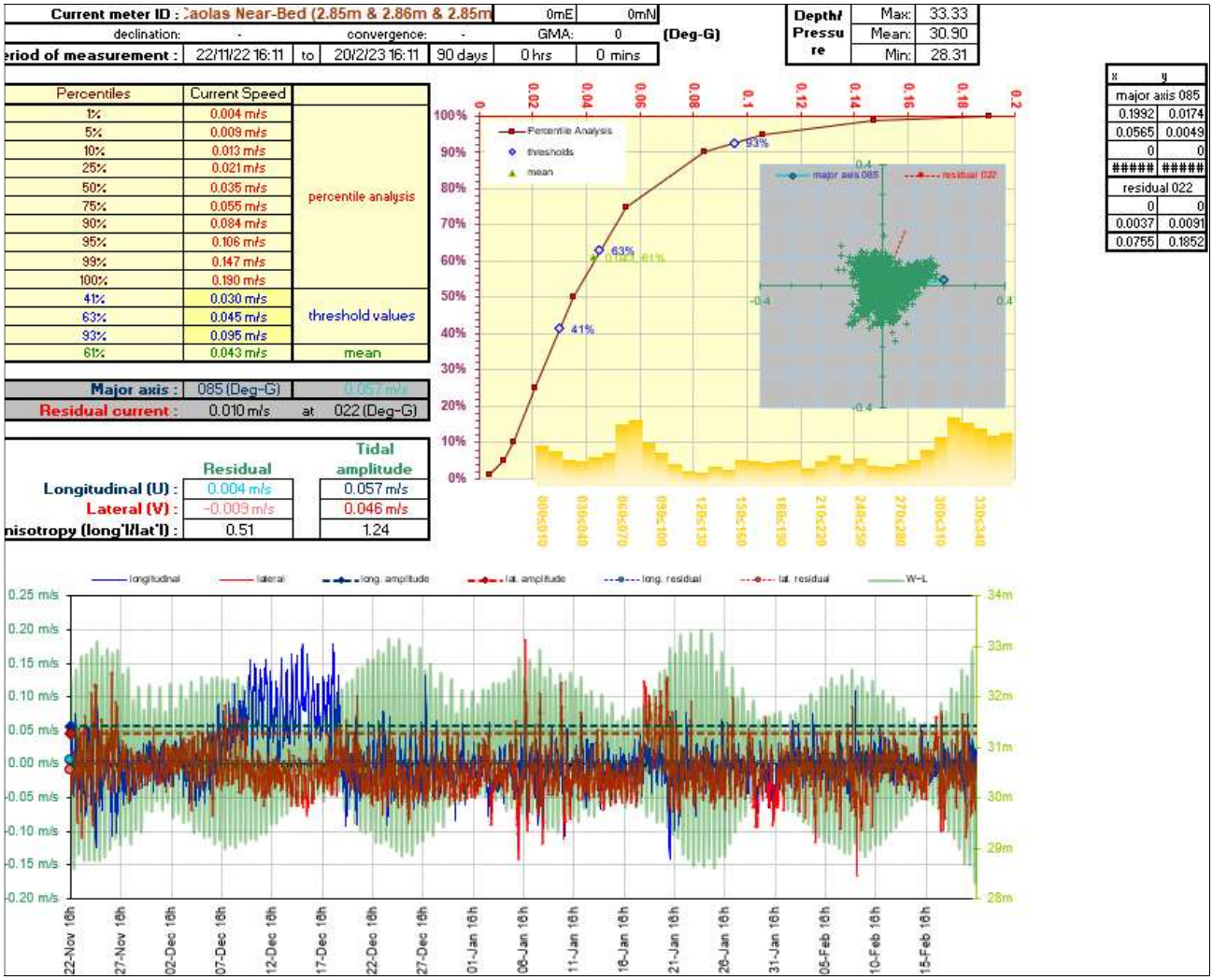

Figure 3. Summary data for sub-surface bin during the 90-day period.

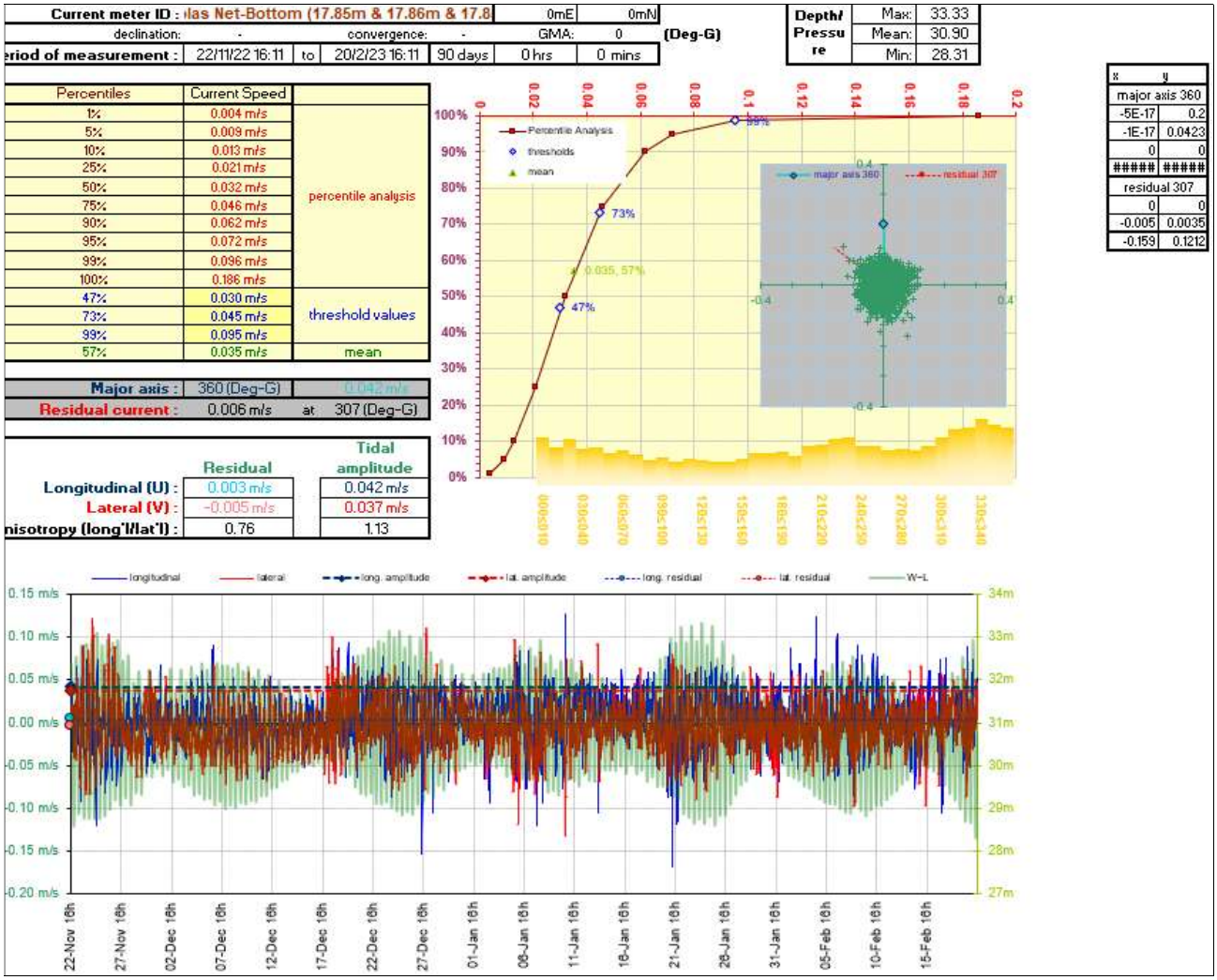

Figure 4. Summary data for net-bottom bin during the 90-day period.

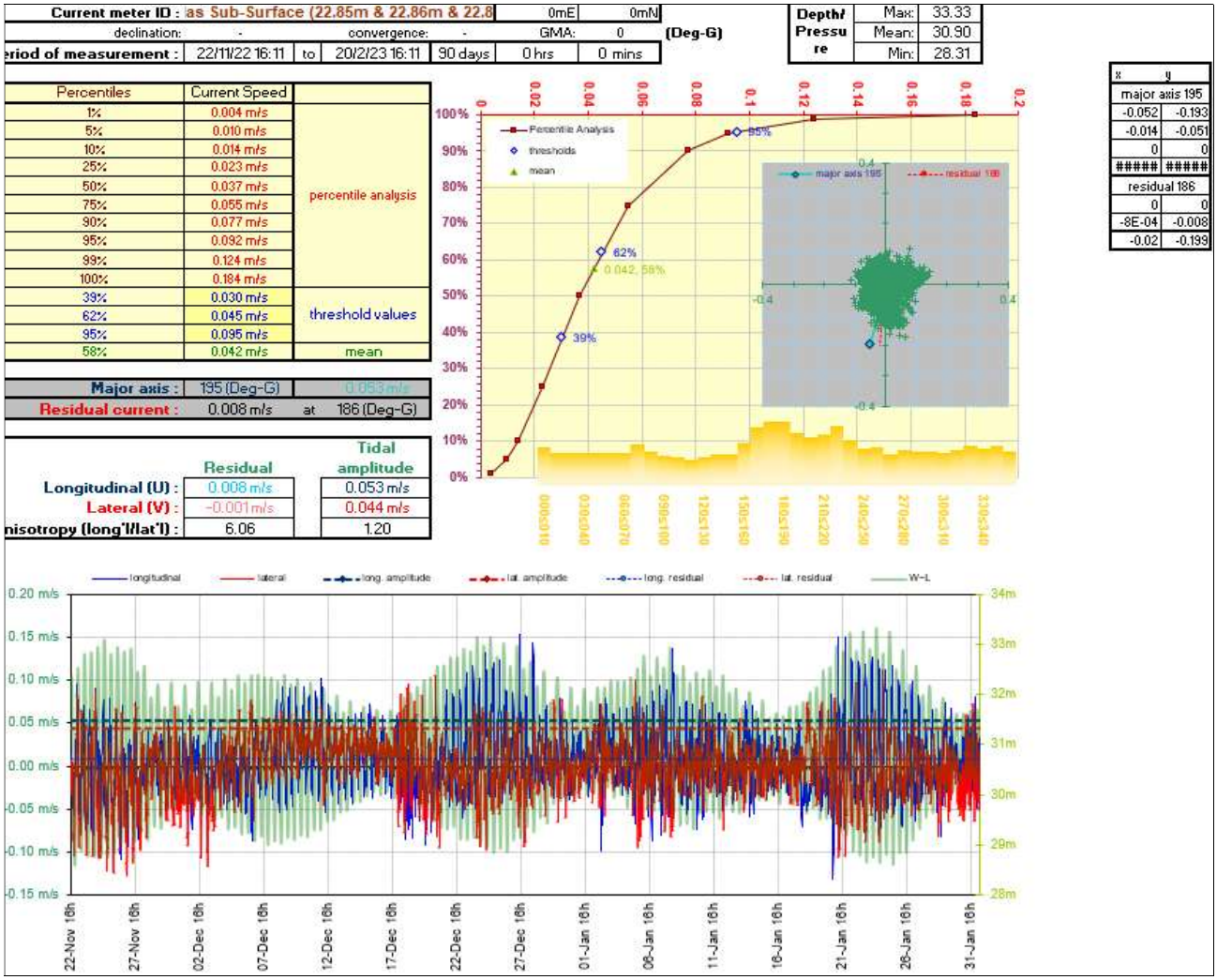

Figure 5. Summary data for near-bed bin during the 90-day period.

4. DISCUSSION & CONCULSIONS

The pressure sensor's depth record indicates that the ADCP remained undisturbed. There were some short-term changes in pitch, roll and heading during the 90-day dataset but these were minor and well within the ADCP's tolerances for auto-correction of the data.

The sub-surface and net-bottom bin heights reported in this document meet the criteria specified in Hydrographic Data for Aquaculture Application[(1)] i.e., ≤±1 m from the bottom of the nets at MSL and circa 5 m below LST during the deployment for the sub-surface bin. Note that it is proposed to "weight" the bin heights and deployment depth for NewDEPOMOD modelling as described in the accompanying document CLP_2023v1_ND_Modelling_Method_Statement.pdf.

The site and hydrographic survey reported in this document is considered to comply with the requirements of SEPA's guidelines[(1)] and the 90-day current speed and direction data are considered representative of conditions at the Caolas Loch Portain site.

REFERENCES

(1) Hydrographic Data for Aquaculture Applications. Scottish Environment Protection Agency. September 2022.

APPPENDIX A - LOCATIONS OF ADCP DEPLOYMENTS

NewDEPOMOD MODELLING REPORT

Caolas Finfish Pen Site, Loch Portain, North Uist

Prepared for

Loch Duart Ltd

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Quality Assurance

The data presented within this document have undergone a quality assurance review which follows established TransTech Ltd procedures. The information and results presented herein constitute an accurate representation of these data.

Document Details

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Issue Date: 27 June 2023

Issue No: 2023v1

CONTENTS

List of Figures

List of Tables

List of Abbreviations

ADCP	Acoustic Doppler Current Profiler	IQI	Infaunal Quality Index
CD	Chart Datum	MZ	Mixing Zone
CLP	Caolas Loch Portain	OSGB36	Ordnance Survey Great Britain 1936
EMBZ	Emamectin Benzoate	SEPA	Scottish Environment Protection Agency
EQS	Environmental Quality Standard	UI	User Interface
GMT	Greenwich Mean Time	vdsp	Resuspension dispersion coefficient Z

EXECUTIVE SUMMARY

This report has been prepared to meet the requirements of SEPA for assessing an application to modify the Caolas pen site.

The proposal is to replace all 14 of the existing 80 m circumference pens with twelve 100 m circles in a 60 m x 60 m mooring grid. This will result in an increase in biomass from the currently consented 1,060.0 tonnes to 1,720.0 tonnes.

The solids modelling for the existing and modified site has been undertaken using the NewDEPOMOD User Interface (v1.4.2-snapshot 8.5 (36) 2023-05-23 11:12:30 [SEPA]).

Five SEPA default runs with a resuspension dispersion coefficient Z of 0.003310 were performed pre and post modification.

Given the site's location the Wave Exposure Index (WEI) is >2.8 and therefore the permitted mean intensity is ≤4,000 g/m^2. For the pre and post modification runs mean intensity was 752.7 and 1,474.6 g/m^2 respectively. However, the model appears to be underpredicting the size of the 0.64 Infaunal Quality Index (IQI) footprint i.e., for the existing site the surveyed footprint is c. 64,000 m^2 whereas the model prediction is c. 44,250 m^2.

It is appreciated that SEPA often prefers the use of default settings to assess mean intensity compliance. However, to be robust, the model was calibrated against IQI benthic survey data to replicate as closely as possible the 250 g/m^2 (0.64 IQI) footprint. For what is deemed to be appropriate calibration settings mean intensity at the existing site rose by approximately 23.9% to 932.3 g/m^2 and for the modified site there was an approximate 69.7% increase to 2,501.8 g/m^2. These values are still significantly lower than SEPA's 4,000 g/m^2 threshold, even when not considering the additional ≤15% that is permitted for the modification of an existing site, such as Caolas, that has good benthic survey results.

250 g/m^2 deposition for the existing and modified site does not exceed the 100 m mixing zone Indeed, for the modified site, after calibration, this was 62.3%.

Therefore, in conclusion, although the proposed modification is predicted to increase the intensity of waste on the seabed in close proximity to the cage group, the proposal is considered compliant with SEPA requirements.

SEPA's interim[(1)] Emamectin benzoate (EMBZ) Environmental Quality Standard (EQS) requires the area which exceeds 136 ng/kg (0.136 µg/kg) not to exceed the 100 m mixing zone area. As per SEPA requirements, the model was run for 118 days. However, a useable pass was not achieved for mean deposition after 116-118 days. Thus, EMBZ has been scoped out of this document.

1. INTRODUCTION

This report has been prepared to meet the specific requirements of the Scottish Environment Protection Agency for the assessment of applications for biomass consent. These must comply with the Environmental Quality Standards that are in place to protect the marine environment.

All hydrographic data used for the modelling was collected by Loch Duart and has been validated by SEPA for NewDEPOMOD modelling.

The methods described in this report closely adhere to those set out in SEPA's NewDEPOMOD modelling guidance for the aquaculture sector[2], and the results are reported to satisfy consent application requirements.

Information on the existing Caolas site and its proposed modification is given below.

Pen group details pre and post modification

	Pre modification	Post modification
Biomax:	1,060.0 tonnes	1,720.0 tonnes
NE pen centre position:	94739.0353 E, 869468.4823 N	94751.1600 E, 869457.9434 N
Group centre position:	94829.6125 E, 869346.3317 N	94829.2352 E, 869326.3978 N
Number of pens (for production):	14	12
Pen group configuration:	2 x 7	2 x 6
Pen dimensions:	80 m circle	100 m circle
Working depth:	12.0 m	12.0 m
Maximum stocking density:	12.388721029781 kg/m^3	15.0098315671512 kg/m^3
Grid size (x by y):	50 m x 50 m	60 m x 60 m
Pen group orientation:	133.98º	138.00º

Hydrographic data

Please refer to report previously submitted to SEPA, entitled "CLP_2023v1_Hydrographic_Report.pdf", dated 3 May 2023.

Wave exposure index[3]

3.22 and 3.29 at north and south ends respectively of modified pen group.

Given that the WEI exceeds 2.8, the site is considered to be moderately exposed and therefore, the permitted mean intensity is 4,000 g/m^2.

2. NEWDEPOMOD MODELLING

2.1 Project set-up

For the modelling of the existing and modified site, projects were named 2023v1_CLP_Existing and 2023v1_CLP_Modified. Calibration runs were also performed and for these projects the file names were followed by _Calib.

For both pen layouts, the relevant files were set up in their respective directories with the bathymetry, pen information and flowmetry entered for each project as described below.

2.2 Flowmetry

The Acoustic Doppler Current Profiler (ADCP) bin heights used in the modelling and a summary of the data for these are provided in table 1.

Table 1. Current meter data summary.

Period Used in Model	Bin Height (above seabed)	Mean speed (m/s)	Residual speed (m/s)	Residual direction (°Grid N)
22/11/2022 16:11:57 GMT to 20/02/2023 16:11:57 GMT (6481 20 minute records)	Sub-Surface	0.0420	0.0084	185.6
	Net-Bottom	0.0351	0.0058	307.3
	Near-Bed	0.0428	0.0098	22.2

As per TransTech's "CLP_2023v1_ND_Modelling_Method_Statement.pdf" dated 3 May 2023, the depth for the ADCP deployments has been entered into the depomodflowmetryproperties file as -27.87 and the bin heights were at meter depths of -25.02, -10.02 and -5.02.

Where sites have significant residual current speeds greater than 35-40% of the mean flow speed, particularly at the bed, material can move beyond the model boundaries. In this case SEPA requires the risk to be mitigated. One approach is to subtract the residual *u* and *v* components from the *u* and *v* components of each individual flow record in the dataset.

However, for Caolas, the residual flow (0.0098 m/s) for the bottom bin during 15-day current meter dataset is 22.9% of the mean speed (0.0428 m/s). As such, there was no need to process the data to remove the residual *u* and *v* components from the *u* and *v* components of each individual flow record in the dataset.

The model was run with the residual and a resuspension dispersion coefficient Z (vdsp) calculated from the mean speed of 0.003310.

2.3 Bathymetry/grid generation

A depomodbathymetryproperties file at a grid of 80 x 80 elements, georeferenced to OSGB36 datum, was used in the modelling, with a uniform depth of 27.87 m to represent that at which the ADCP was deployed. The 2 km^2 bathymetry file covered an area 93810 E to 95810 E and 868360 N to 870360 N.

2.4 Pen input

The pen locations and orientations were provided by Loch Duart and set-up in the UI from which the depomodcagesxml file was generated. These were then checked by looking at their profile/coordinates in the UI and GIS to ensure that they were in the correct position.

The UI pen layout plots are provided in figures 1 and 2.

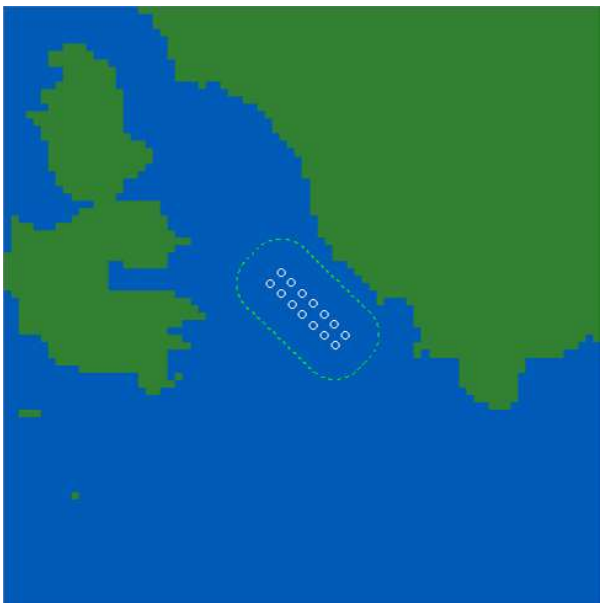


Figure 1. Pre modification pen layout.

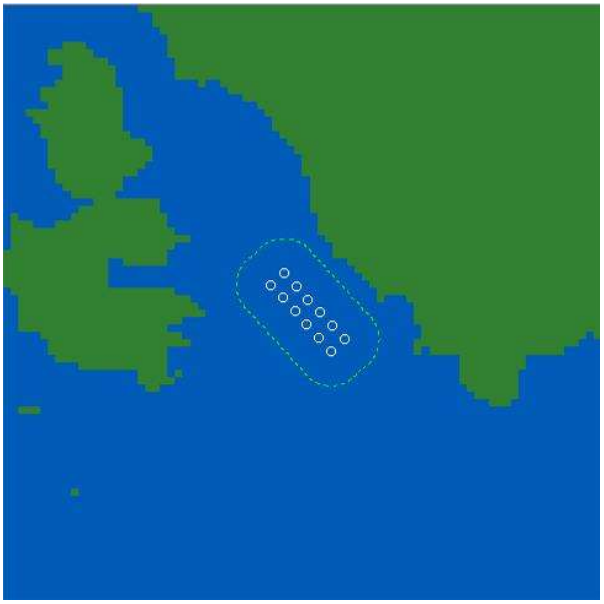


Figure 2. Post modification pen layout.

2.5 Location of Caolas site

A location plan of the existing and proposed modified Caolas site is provided in figure 3 below.

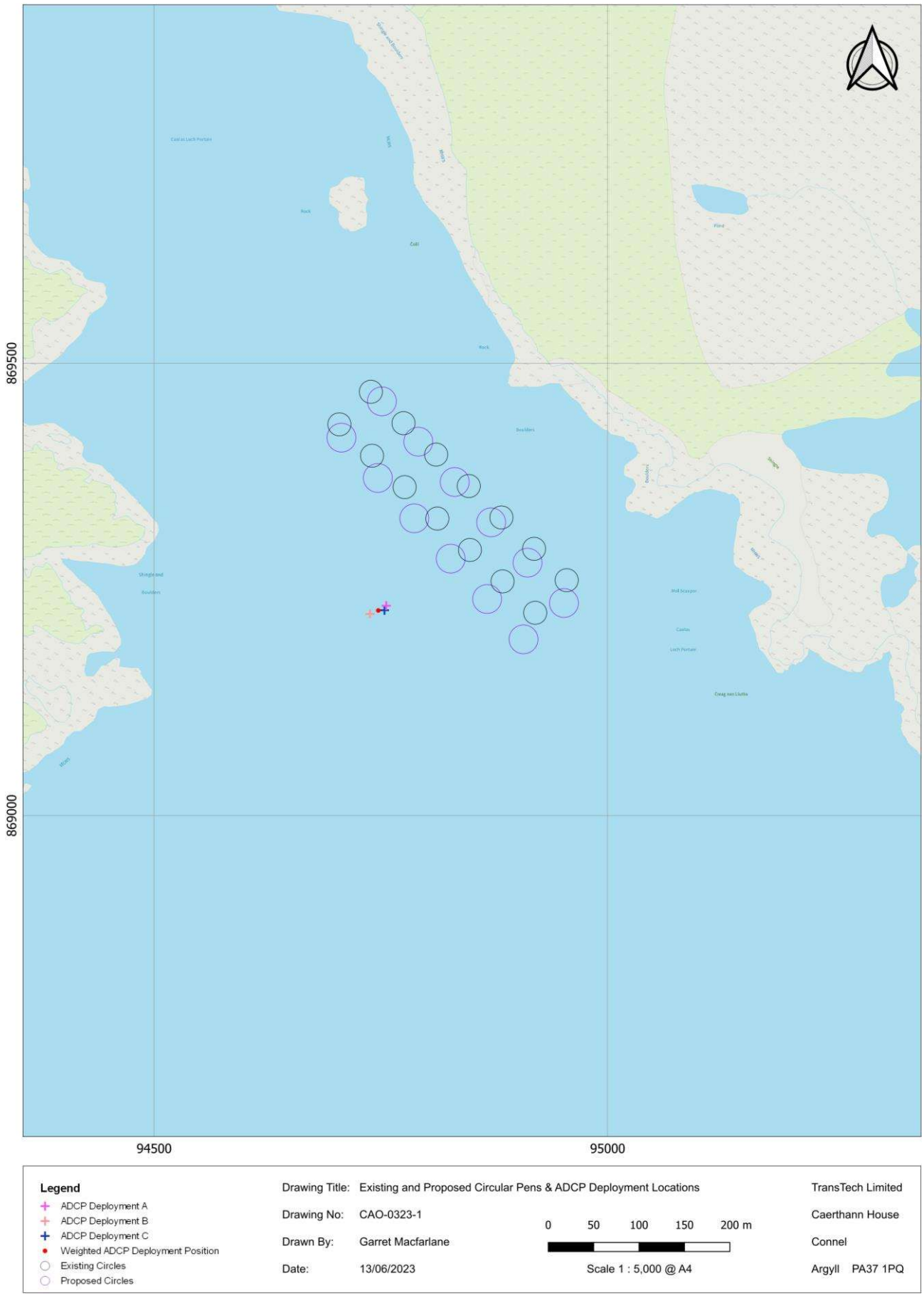


Figure 3. Location plan of existing and proposed site and ADCP deployment locations.

3. RESULTS

3.1 Benthic Runs for Existing Site with SEPA Default Settings

Note that the results presented below are for the current consent for which SEPA has TransTech's modelling on record.

The nature of the NewDEPOMOD model means that each time it is run with identical configuration parameters the results differ because the model contains random processes (settling velocities and walk/release points of sediment from bed cells). As such, for each benthic scenario five model runs were performed, and the average calculated.

In accordance with SEPA requirements, the results reported are for time-averaged output from the model runs (i.e., avg.depomodresultssur file). For the reported benthic runs this is days 275-365.

The benthic results for mean intensities within the 250 g/m^2 mixing zone (from 2023v1_CLP_Existing-Cages depomod results log) are shown in table 2.

Table 2. Summary of benthic results for 1,060 tonnes at existing site with SEPA default settings.

Modelling:	Existing Site: c. 1,060 T** (14 x 80 m circumference pens with 12 m deep nets, stocking density of c. 12.388721029781 kg/m^3) with SEPA defaults & vdsp of 0.003310				
Benthic run reference as per consented biomass application*:	ES1	ES2	ES3	ES4	ES5
Mixing zone contour area (m^2): [Eqs.benthic.mixingZone.area]	133,185				
Mixing zone mean intensity (g/m^2): [Eqs.benthic.mixingZone.boundary.contour.approx.meanFlux]	754.5	762.7	733.3	753.7	759.2
Average mean intensity for the 5 runs (g/m^2):	752.7				
250 g/m^2 mixing zone area for the 25 m^2 cells (m^2): [Eqs.benthic.mixingZone.approx.contourArea]	43,750	44,375	45,625	43,125	44,375
Average of 250 g/m^2 mixing zone areas (m^2) for the 5 runs:	44,250				
Average of 250 g/m^2 mixing zone areas (m^2) for the 5 runs as % of mixing zone contour area:	33.2				

* The results for the above runs are contained within the ES1 to ES5 directories in 2023v1_CLP_Existing\depomod\results which accompanies this report.

** Note that the cage positions were amended slightly and only after these runs were performed was it realised that the UI does not store the stocking density to the same number of decimal places as originally input so the modelled biomax was in fact 1060.1094 tonnes. This is not deemed to have a significant bearing on the results and this was rectified for the 1105 tonnes calibration run (§3.4).

The 250 g/m^2 contour area for Runs ES2 and ES5 was closest to the average of all 5 runs. An example of the 250 g/m^2 44,375 m^2 footprint for these runs is shown in figure 4.

Figure 4. Run ES5 (average for days 275-365): 44,375 m^2 mixing zone area and 250 g/m^2 contour. UI plot also shown.

3.2 Benthic Runs for Modified Site with SEPA Default Settings

The modified site was modelled using the same default run settings as those used for the existing site, albeit with the proposed modified pens, biomass, net depth and stocking density.

Five benthic runs were performed and the predicted mean intensities within the mixing zone (from 2023v1_CLP_Modified-Cages depomod results log) are provided in table 3.

Table 3. Summary of benthic results for 1,720 tonnes at modified site with SEPA default settings.

Modelling:	Modified Site: 1,720 T (12 x 100 m circumference pens with 12 m deep nets, stocking density of 15.0098315671512 kg/m^3) with SEPA defaults & vdsp of 0.003310				
Benthic run reference*:	MS1	MS2	MS3	MS4	MS5
Mixing zone contour area (m^2): [Eqs.benthic.mixingZone.area]	142,729				
Mixing zone mean intensity (g/m^2): [Eqs.benthic.mixingZone.boundary.contour.approx.meanFlux]	1,471.6	1,480.8	1,443.7	1,453.4	1,523.6
Average mean intensity for the 5 runs (g/m^2):	1,474.6				
250 g/m^2 mixing zone area for the 25 m^2 cells (m^2): [Eqs.benthic.mixingZone.approx.contourArea]	85,000	86,250	89,375	86,875	86,250
Average of 250 g/m^2 mixing zone areas (m^2) for the 5 runs:	86,750				
Average of 250 g/m^2 mixing zone areas (m^2) for the 5 runs as % of mixing zone contour area:	60.8				

* The results for the above runs are contained within the MS1 to MS5 directories in 2023v1_CLP_Modified\depomod\results which accompanies this report.

For the SEPA defaults runs, the average mean intensity at the existing site is 752.7 g/m^2 and the average mean intensity for the proposed modification is 1,474.6 g/m^2. Therefore, for the modified site there is an increase of c. 95.9% but nevertheless mean intensity remains significantly lower than the 4,000 g/m^2 EQS.

The mixing zone area for MS4 was closest to the average for all 5 runs. The 250 g/m^2 footprint and the 86,875 m^2 mixing zone area for this run is shown in figure 5.

Figure 5. Run MS4 (average for days 275-365): 86,875 m^2 mixing zone area and 250 g/m^2 contour. UI plot also shown.

3.3 Model Calibration

To improve NewDEPOMOD's predictions for benthic deposition at the modified site the model was calibrated for the existing site.

To do so, a new project was created which was named 2023v1_CLP_Existing_Calib.

The IQI benthic results for the 2021/2022 production cycle were obtained from the Pharmaq Analytiq's submission to SEPA (MPFF-EMSR-v6 Caolas Loch Portain 2022). The extents of the 0.64 IQI ellipse area for the 2022 survey were obtained by configuring and running Kraken[4] in RStudio (figures 1 and 2). Kraken gives the 5th percentile area as 64,416 m^2 (figure 6).

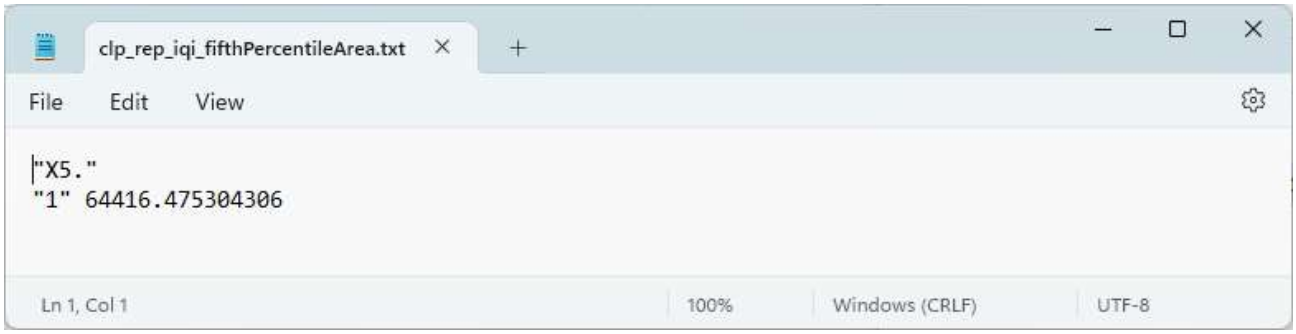


Figure 6. Kraken 5th percentile area output.

The existing site was then modelled using modified parameters to achieve the closest match to the ellipse area.

The same parameters were then used to model the modified site. The project for the modified site was named 2023v1_CLP_Modified_Calib.

There is little information available on the accepted methods for calibration of the NewDEPOMOD model. Indeed, few published SEPA accepted model calibration reports are available given the infancy of the regulatory framework and the relative newness of the model.

3.4 Benthic Calibration Runs for Existing Site

The biomax during the 2021/2022 production cycle was 1,105 tonnes. To achieve a comparable mixing zone area to the Kraken ellipse the only revision required was to the resuspension transport coefficient Z (vdsp) as shown in table 4.

Table 4. Summary of benthic calibration run results for existing site.

Modelling:	Calibration Runs for Existing Site: 1,105 T (14 x 80 m circumference pens with 12 m deep nets, stocking density: 12.914657299913 kg/m^3)

Benthic run reference*:	ESC1	ESC2	ESC3	ESC4	ESC5	**ESC6**
Resuspension transport coefficient Z (m^2/s):	0.001	0.002	0.0025	0.003	0.0028	**0.0029**
Mixing zone contour area (m^2): [Eqs.benthic.mixingZone.area]	133,185					
Mixing zone mean intensity (g/m^2): [Eqs.benthic.mixingZone.boundary.contour.approx.meanFlux]	4,922.4	2911.3	1,910.6	922.5	1,134.0	**932.3**
250 g/m^2 mixing zone area for the 25 m^2 cells (m^2): [Eqs.benthic.mixingZone.approx.contourArea]	73,125	73,750	68,750	56,875	69,375	**66,250**
Kraken ellipse area of 64,416 m^2 as % of 250 g/m^2 mixing zone area for the 25 m^2 cells (m^2):	88.1	87.3	93.7	113.3	92.9	**97.2**
Eqs.BenthicImpactedAreaEQS.eqsResult:	HIGH	LOW		HIGH		
Eqs.benthic.pass:	LOW					
Eqs.control.eqsResult:	LOW					
Eqs.critical.eqsResult:	HIGH		LOW		HIGH	
Eqs.warning.eqsResult:	HIGH	LOW				

* The results for the above runs are contained within the ESC1 to ESC6 directories in 2023v1_CLP_Existing_Calib\depomod\results.

The mixing zone area for ESC6 was closest to the Kraken ellipse area of 64,416 m^2 (figure 7).

Figure 7. Run ESC6 (average for days 275-365): 66,250 m^2 mixing zone area, 250 g/m^2 contour, 2022 benthic survey IQIs and 0.64 IQI ellipse from Kraken (NB: this is the RStudio plotted ellipse (area = 64,416 m^2) which is slightly larger than the 5th percentile area of 64,416 m^2). UI plot also shown.

3.5 Benthic Runs for Modified Site Using Run ESC6 Calibration Settings for Existing Site

The results for the modified site using the calibration settings for the existing site are presented below (table 5).

Table 5. Summary of benthic results for modified site with calibration settings.

Modelling:	Modified Site: 1,720 T (12 x 100 m circumference pens with 12 m deep nets, stocking density of 15.0098315671512 kg/m^3) with Run ESC6 calibration settings				
Benthic run reference*:	MSC1	MSC2	MSC3	MSC4	MSC5
Mixing zone contour area (m^2): [Eqs.benthic.mixingZone.area]	142,729				
Mixing zone mean intensity (g/m^2) [Eqs.benthic.mixingZone.boundary.contour.approx.meanFlux]:	2,474.9	2,499.9	2,474.4	2,532.5	2,527.5
Average mean intensity for the 5 runs** (g/m^2):	*2,501.8 (168.3% higher than calibration Run ESC6 (*932.3*, table 4) albeit this was for 1,105 T as opposed to the consented biomass of 1,060 T)*				
250 g/m^2 mixing zone area for the 25 m^2 cells (m^2): [Eqs.benthic.mixingZone.approx.contourArea]	90,000	88,750	91,875	87,500	86,250
Average 250 g/m^2 mixing zone area (m^2):	88,875				
Average of 250 g/m^2 mixing zone areas (m^2) for the 5 runs as % of mixing zone contour area:	62.3				
Eqs.BenthicImpactedAreaEQS.eqsResult:	HIGH				
Eqs.benthic.pass:	LOW				
Eqs.control.eqsResult:	LOW				
Eqs.critical.eqsResult:	HIGH				
Eqs.warning.eqsResult:	LOW				

* The results for the above runs are contained within the MSC1 to MSC5 directories in 2023v1_CLP_Modified_Calib\depomod\results.

** % difference in mean intensity although it is acknowledged that SEPA generally only requires this for the default benthic runs (§3.1 and §3.2).

The mixing zone area for MSC2 was closest to the average for all 5 runs. The 250 g/m^2 footprint and the 88,750 m^2 mixing zone area for this run is provided in figure 8.

Figure 8. Run MSC2 (average for days 275-365): 250 g/m^2 modelled footprint and this run's 88,750 m^2 mixing zone area along with the UI's display of this.

4. CONCLUSIONS

SEPA default runs were performed pre and post modification. For these runs the modified site complies with SEPA EQS for mean intensity, albeit it is underpredicting the 0.64 IQI depositional footprint i.e., for the existing site the surveyed footprint is c. 64,000 m^2 whereas the model prediction is c. 44,250 m^2.

For the pre and post modification benthic runs using default settings, mean intensity does not exceed SEPA's 4,000 g/m^2 threshold i.e., the average of the 5 runs performed is 752.7 and 1,474.6 g/m^2 respectively. It is appreciated that SEPA often prefers the use of default settings to assess mean intensity compliance.

However, to be robust, solids were also modelled using calibration settings. For what is deemed to be appropriate settings mean intensity at the existing site rose by approximately 23.9% to 932.3 g/m^2 and for the modified site there was an approximate 69.7% increase to 2,501.8 g/m^2. Also, the calibration run at the existing site was for 1,105 tonnes as opposed to the consented biomass of 1,060 tonnes. The mean intensity values are still significantly lower than SEPA's 4,000 g/m^2 threshold, even when not considering the additional ≤15% that is permitted for the modification of an existing site, such as Caolas, that has good benthic survey results.

250 g/m^2 deposition for the existing and modified site does not exceed the 100 m mixing zone Indeed, for the modified site, after calibration, this was 62.3%.

Although the proposed modification is predicted to increase the intensity of waste on the seabed in close proximity to the cage group, the proposal is considered compliant with SEPA requirements.

FILES ACCOMPANYING THIS REPORT

- Results reported herein contained within the following directories:

  ES Runs: 2023v1_CLP_Existing\depomod\results

  MS Runs: 2023v1_CLP_Modified\depomod\results

  ESC Runs: 2023v1_CLP_Existing_Calib\depomod\results

  MSC Runs: 2023v1_CLP_Modified_Calib\depomod\results

- Also provided is:

  2023v1_CLP_modelling_metadata_template_v6.xlsx

FILES THAT HAVE BEEN PREVIOUSLY SUBMITTED TO SEPA

- Hydrographic report and associated SEPA validated datasets which were used for the modelling:

  CLP_2023v1_Hydrographic_Report.pdf, 3 May 2023.

  B - hgdata_analysis_v7.xls.

  M - hgdata_analysis_v7.xls.

  S - hgdata_analysis_v7.xls.

- Method statement for TransTech's modelling of the Caolas site:

  CLP_2023v1_ND_Modelling_Method_Statement.pdf, 3 May 2023.

- Marine Pen Fish Farm Monitoring Survey Results for 2021/2022 production cycle. Report by Pharmaq Analytiq Ltd:

  MPFF-EMSR-v6 Caolas Loch Portain 2022.xlsx, 23 March 2023.

REFERENCES

(1) SEPA Position Statement. Interim position statement for protecting the water environment in relation to emamectin benzoate in finfish farm regulation. Scottish Environment Protection Agency. March 2023.

(2) New Depomod Draft Guidance. Scottish Environment Protection Agency. April 2023.

(3) Wave Exposure Index (Wave Fetch Model). The Scottish Association for Marine Science. WMS layer. Date last updated: Tuesday, May 26, 2015.
Website link.

(4) Kraken IQI Ellipse Calculator. Website link.

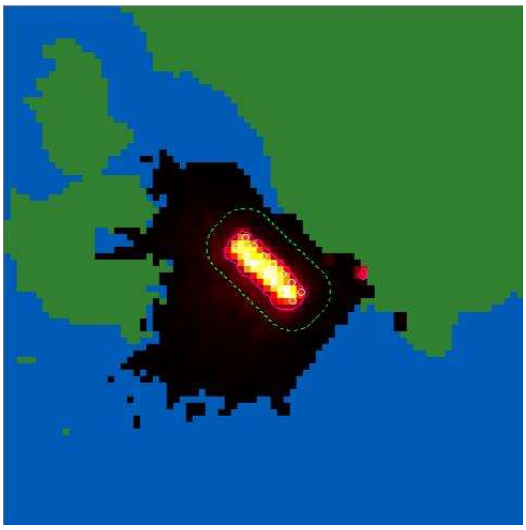
BIBLIOGRAPHY

- NewDEPOMOD User Guide. Scottish Association for Marine Science. 8 February 2022.

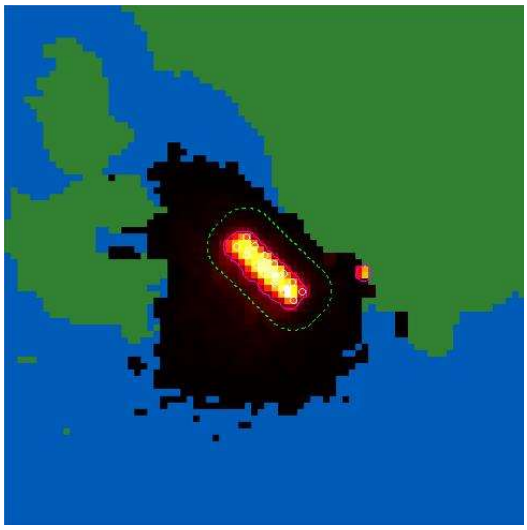
APPENDIX A: Plots for Benthic Runs using SEPA Defaults – Existing Site

Plots of the benthic runs for the existing site (CLP_Existing-Cages-NONE-N-solids-g0-avg.depomodresultssur) are provided below:

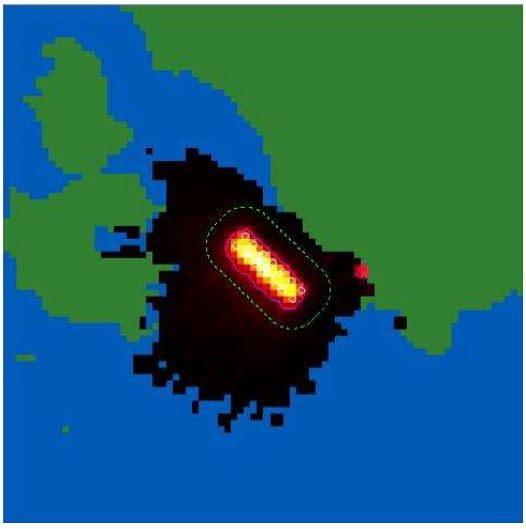
Existing Site (14 circular pens): 1,060 tonnes (stocking density c. 12.388721029781 kg/m^3) with SEPA defaults & vdsp of 0.003310. 250 g/m^2 contour and mean intensity:



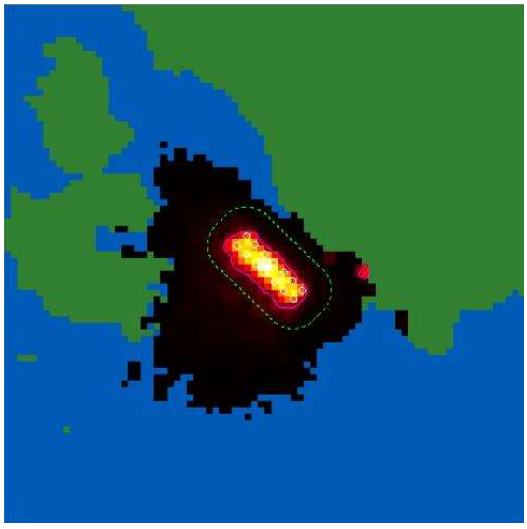
Run ES1



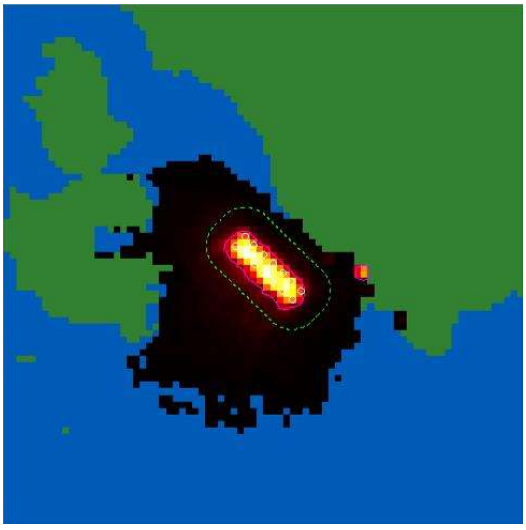
Run ES2



Run ES3



Run ES4

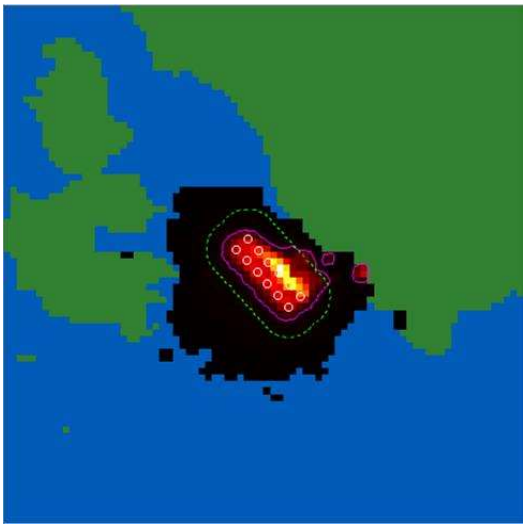


Run ES5

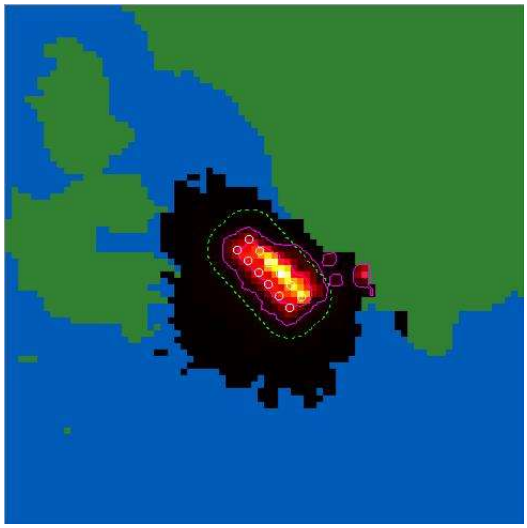
APPENDIX B: Plots for Benthic Runs using SEPA Defaults – Modified Site

Plots of the benthic runs for the proposed modification (2023v1_CLP_Modified-Cages-NONE-N-solids-g0-avg.depomodresultssur) are provided below:

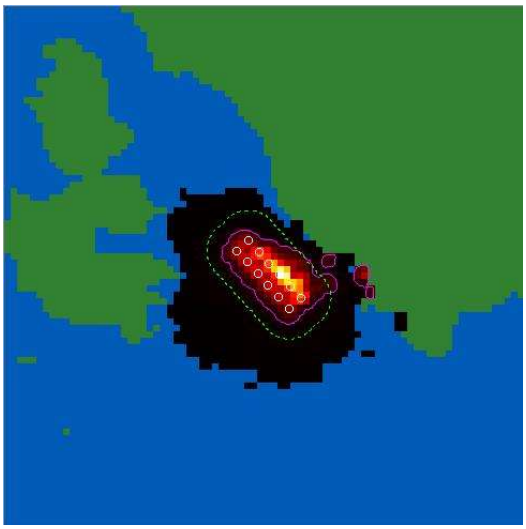
Modified Site (12 circular pens): 1,720 tonnes (stocking density 15.0098315671512 kg/m^3) with SEPA defaults & vdsp of 0.003310. 250 g/m^2 contour and mean intensity:



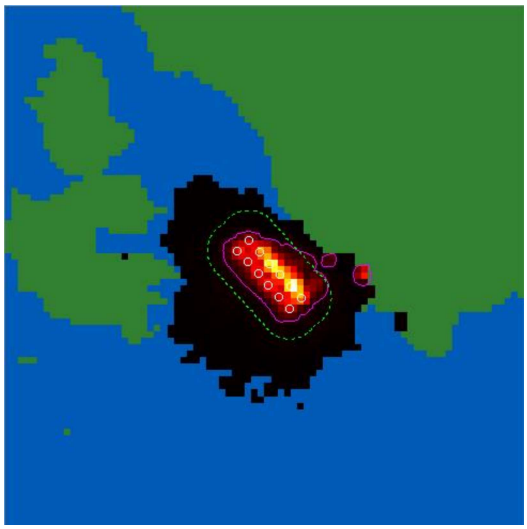
Run MS1



Run MS2



Run MS3



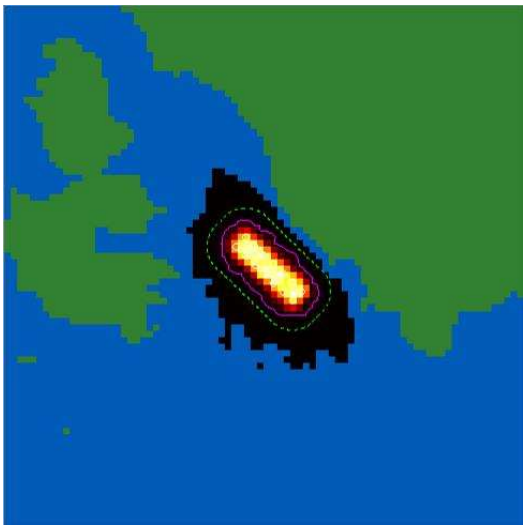
Run MS4

Run MS5

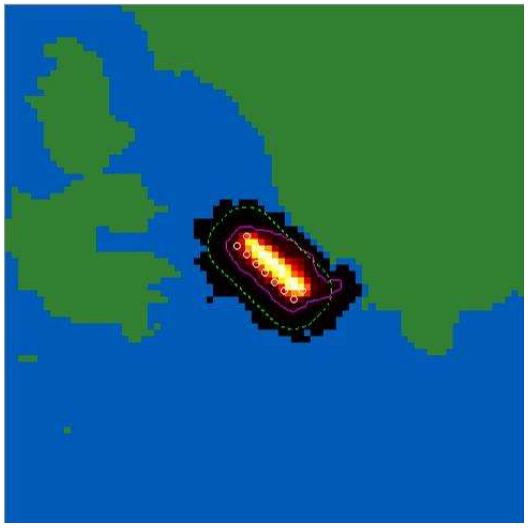
APPENDIX C: Plots for Benthic Calibration Runs – Existing & Modified Site

Plots of the calibration runs for the existing site (CLP_Existing_Calib-Cages-NONE-N-solids-g0-avg.depomodresultssur) are provided below.

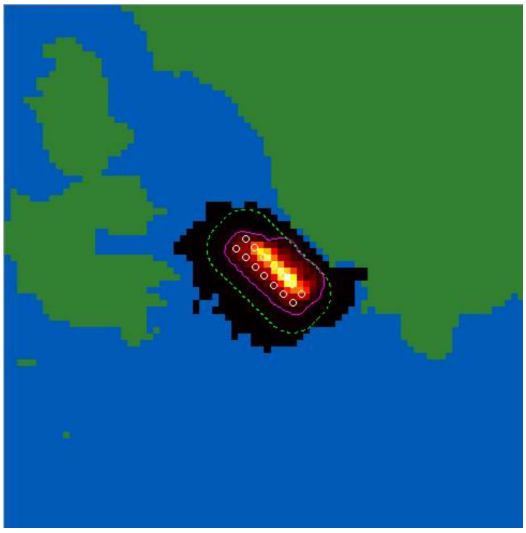
Existing Site (14 circular pens): 1,105 tonnes (stocking density 12.9146572999134 kg/m^3) with calibration settings provided in table 4. 250 g/m^2 contour & mean intensity:



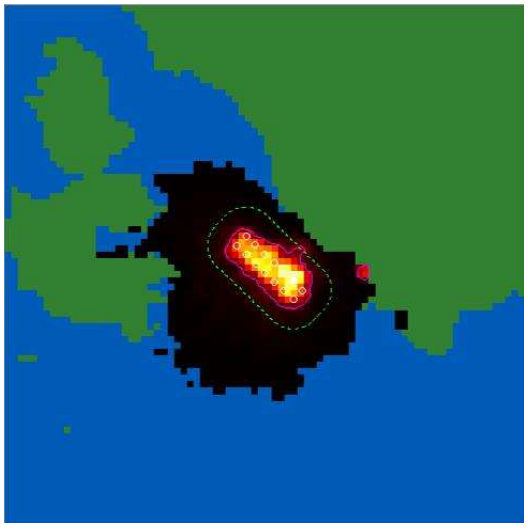
Run ESC1



Run ESC2

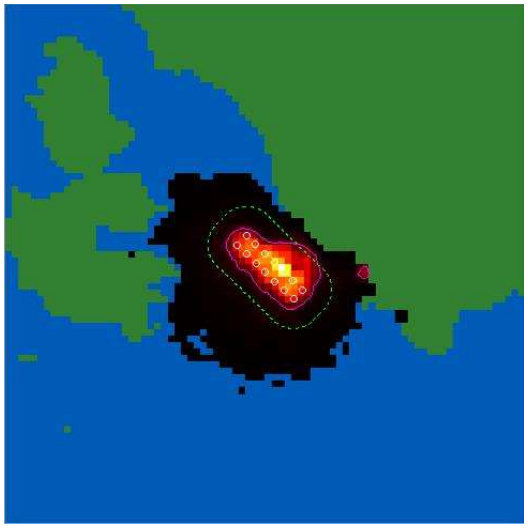


Run ESC3



Run ESC4

Run ESC5

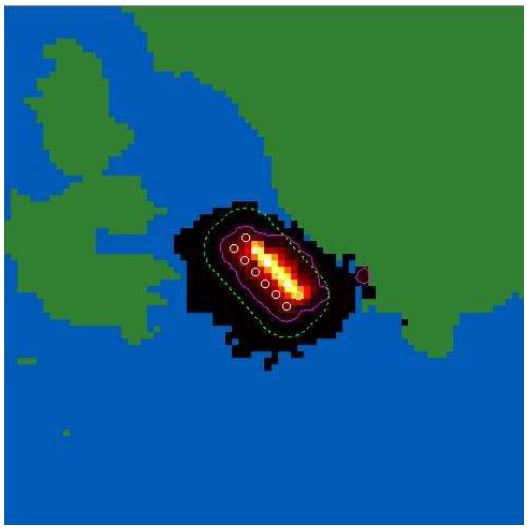


Run ESC6

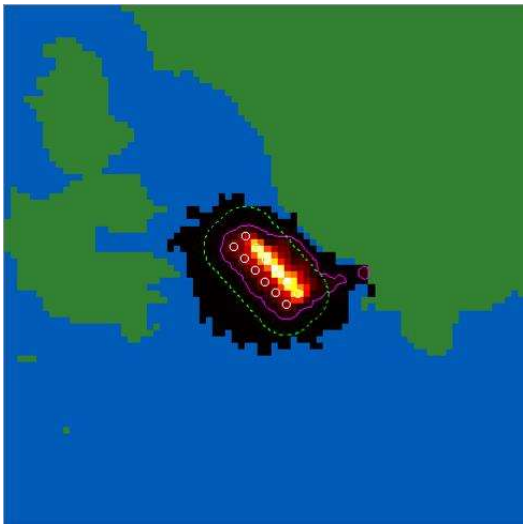
Plots of the calibration runs for the modified site (2023v1_CLP_Modified-Cages_Calib-NONE-N-solids-g0-avg.depomodresultssur) are provided below.

Modified Site (12 circular pens): 1,720 tonnes (stocking density 15.0098315671512 kg/m^3) with calibration settings provided in table 4 for Run ESC6. 250 g/m^2 contour & mean intensity:

Run MSC1

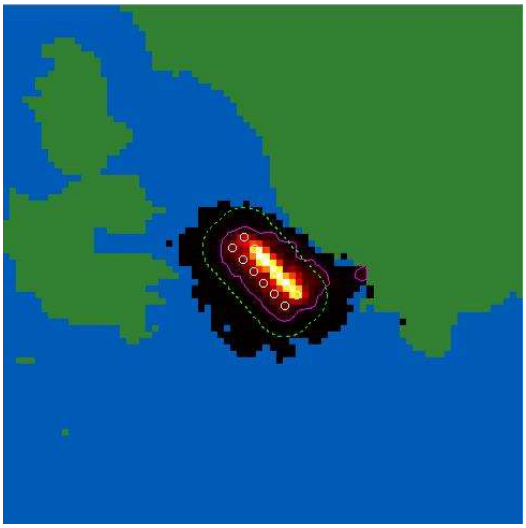


Run MSC2



Run MSC3

Run MSC4



Run MSC5

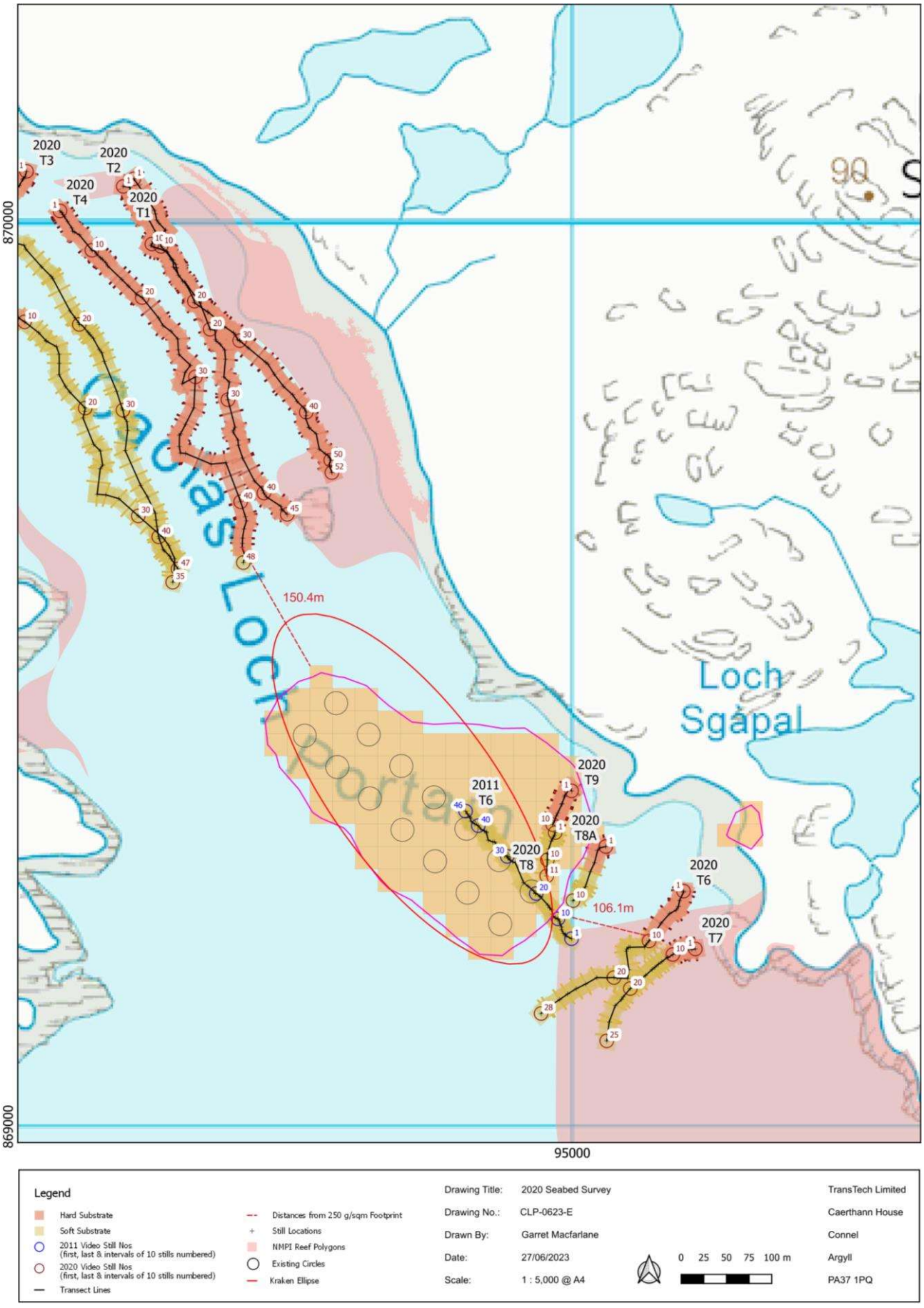
APPENDIX D: Benthic Calibration Run Footprints in Relation to Nearby Reef Features

As SEPA may be aware, in 2020 we were involved in mapping rov survey data for the hard substrate that could support reefs in proximity to Caolas. The rov work was comissioned by Loch Duart because the NMPI polygons aren't particularly accurate. Numerous transects were surveyed by Anderson Marine Surveys and the hard substrate found closest to the existing and proposed pens is provided in the drawings below.

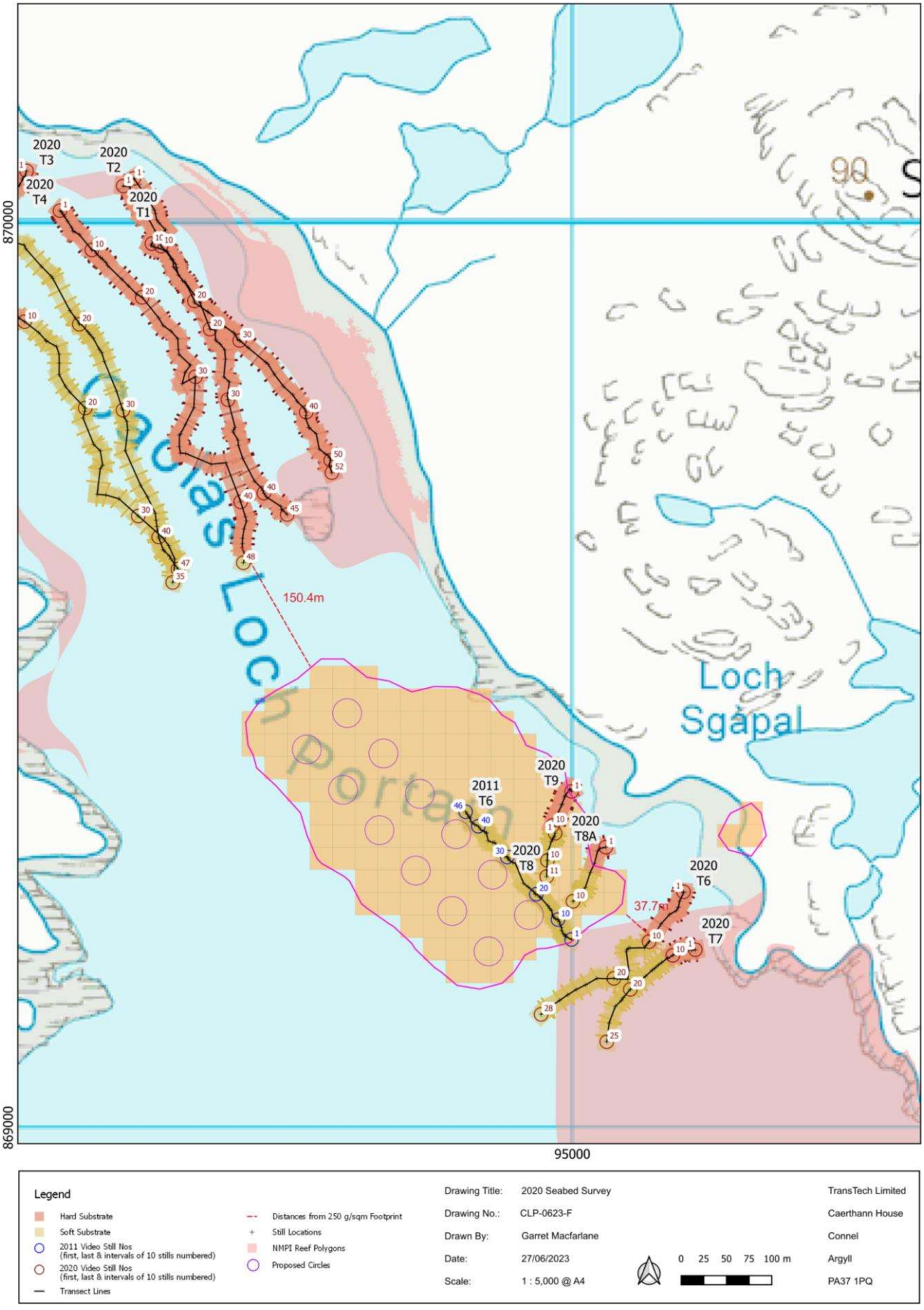
Although we appreciate that the NewDEPOMOD modelling we have undertaken has focused on calibrating the model to achieve a similair sized 0.64 IQI benthic footprint at the existing site to that surveyed in 2022, and not the precise direction the footprint is predicted to travel in, any potential impact on reef features requires consideration.

Indeed, when viewing the Kraken ellipse (see figure 7 and the drawing on the following page) it indicates that in reality the 0.64 IQI footprint extends further northwest and east of its modelled northwesterly extent. This indicates that waste will travel in a predominantly northwesterly direction which implies that the hard substrate to the east will be at low risk. There is some hard substrate to the north of the modified pen group. However, given that the nearest proposed pen edge is 200.4 m from its start, this suggests that there is unlikely to be any significant imapct on reef features in this area or those further north of the site.

HARD SUBSTRATE IN PROXIMITY TO EXISTING PENS:



HARD SUBSTRATE IN PROXIMITY TO PROPOSED PENS:



Attachment 20

Caolas Loch Portain – Sea lice Management, Treatment Strategy and Treatment Efficacy Statement

This attachment provides an overview of the sea lice management and treatment strategies and monitoring procedures to be employed at the proposed Caolas Loch Portain marine fish farm. This attachment is not a Loch Duart Ltd (LDL) technical document, but a collation of the information requested by the Marine Directorate in the EIA Screening Decision Letter (see attachment 21 for the full EIA Screening Decision Letter response).

It should be noted that the risk of interaction between farmed and wild salmonids in terms of sea lice infection will be assessed by SEPA under the new Sea Lice Risk Framework.

1. Historic sea lice data for Caolas Loch Portain

Historic sea lice data is available on Scotland's Aquaculture Database[1]. It should be noted that the Caolas Loch Portain and Ferramus pen groups are authorised as one site by the Marine Directorate, identified as Lochmaddy. Therefore sea lice data is reported as one site (Lochmaddy). The site is the only site in Farm Management Area (FMA) W-12.

2. Sea Lice Management Strategy

Loch Duart Ltd (LDL) will employ an Integrated Pest Management Strategy for sea lice at the site, widely recognised as the most effective method of parasite control and farmed fish health management. Prevention and early intervention are the basis of the strategy, with control measures including strategic stocking, good husbandry, biological control using cleanerfish, and access to both medicinal and non-medicinal treatment strategies. Specific practice with regards to each control measure is set out in the following sections. In the event of preventative and early intervention measures being insufficient to satisfactorily control a sea lice challenge on site, corrective (escalation) measures and the trigger points for these are also described.

2.1 Strategic Stocking and Fallowing

LDL operates a policy of single year class stocking within FMAs in compliance with the Code of Good Practice for Scottish Finfish Aquaculture (CoGP). Separation of year classes is recognised as a significant factor in sea lice control.

A fallow period is also implemented after each production cycle to minimise the risk of disease transference between generations. Fallows periods between production cycles are per those stipulated by the site's CAR licence authorisation and are a minimum of 28 days. This regime means that a zero lice

[1] https://aquaculture.scotland.gov.uk/default.aspx

burden can be guaranteed for the farm in the fallow period, and during the stocked phases focused control measures will be employed to minimise sea lice infection risk.

2.2 Husbandry Measures

In addition to strategic stocking, good husbandry and welfare measures are a first line of defence against sea lice. A good rearing environment maintains optimal fish health, lowering the risk of sea lice infection. LDL carry out the following husbandry measures to achieve this:

- **Vaccination** – vaccines are administered prior to smolt input to support fish health during the marine growing cycle. Vaccines for Pancreas Disease (1-PD) and Furunculosis (MJ6) are administered to all fish. With protection provided by vaccination the risk of PD as well as *Aeromonas salmonicida* adversely affecting sea lice monitoring, control options and infection susceptibility will be reduced

- **Low stocking density** – a maximum density of 15kg/m^3 across the site, in accordance with and indeed lower than and Global Gap (20gk/m^3) standards. This both mitigates stress to promote optimal fish health and reduces the potential for lice infection as the number and density of potential hosts is reduced

- **Daily checks** – fish and the on-farm water quality are checked daily by experienced husbandry staff, so that any potential issues are quickly identified and appropriate action taken to avoid compromising fish health

- **Good net hygiene** – maintained using net washing methods. This underpins the efficacy of biological sea lice control by cleanerfish, maintains good water quality within the pen, and reduces potential habitat for larval sea lice

- **High quality diet** – used to ensure optimal fish health and includes targeted use of functional feeds which can help prevent sea lice infection

- **Minimised stock handling** – stock typically undergo one planned handling event during a cycle, to size grade and maintain low stocking densities. This ensures minimal stress, promotes optimal fish health and avoids any interruption of biological sea lice control during the cycle

In addition, LDL are committed to continual improvement in farming operations. Over the last ten years LDL have worked to identify key sea lice control points in the farming cycle and develop suitable interventions to support sea lice management. Developments include (further detail provided in section 2.3):

- Use of filtration during certain fish handling events to catch lice which, if present, could be shed to surrounding waters as a result of the handling process

- Early deployment of cleanerfish at all sites, with suitable husbandry measures in place to ensure '24/7' sea lice management and minimise the potential for infection to become established

- Use of low-salinity bath treatments as a non-medicinal health control, primarily for gill health management but also supporting sea lice control by maintaining good fish health and therefore minimising risk of infection

- Use of mechanical methods to reduce sea lice levels if needed, along with early harvesting to reduce fish biomass

2.3 Treatment Strategy and Measures

Biological control forms the basis of sea lice management at LDL sites. The Caolas Loch Portain site is authorised for the use of both wrasse and lumpsucker cleanerfish species. Hatchery and wild wrasse are deployed early in the cycle, from smolt input, and daily cleanerfish husbandry routines of supplementary feeding, mortality or moribund removal, net hygiene maintenance, provision of hides and cleanerfish stock control are in place to ensure efficacy. Detailed data provided by sea lice monitoring at the site (see section 3) is used to inform any biological control adjustments needed, such as alteration of stocking % of cleanerfish or supplementary feeding regime to optimise lice control. Additionally, cleanerfish are restocked before winter to ensure a healthy and stable population that will provide adequate lice control.

Supply of cleanerfish for the site is secured from several sources, to reduce the reliance on any one source, and the following measures are employed to ensure requirements are minimised:

- Deployment of cleanerfish early in the farming cycle for sustained sea lice management, requiring lower stocking %, rather than use as an 'emergency treatment'

- Documented cleanerfish husbandry and health monitoring routines

- Reuse of cleanerfish where compatible with Marine Directorate (formerly Marine Scotland) Fish Health Inspectorate and CoGP criteria to minimise the need for new stocks and to optimise efficacy through the deployment of 'habituated' cleanerfish across the site

In the event that the measures outlined above require augmentation, a clear decision-making process is in place to determine when additional intervention is necessary (see Table A1 below). Table A1 sets out the trigger points for consideration of such additional intervention measures, which in consultation with the designated Veterinary Surgeon for the site, are based upon the following factors:

- Preventing the development of adult female and gravid salmon lice (*L. salmonis)*

- Trigger levels set out in the National Strategy for Control of Sea Lice on Scottish Salmon Farms within the CoGP – this being 0.5 and 1.0 adult female salmon lice per fish for the periods Feb-June and Jul-Jan respectively

- The presence of other lice species namely *Caligus* spp.

Where further intervention is required, decisions are carefully made to ensure the best possible strategy is applied. Non-medicinal controls and both in-feed and bath treatment medicinal solutions may be used:

- Additional cleanerfish stocking, including the use of 'habituated' fish to help establish efficacious lice control
- Use of low-salinity bath treatments (non-medicinal control; primarily for gill health management but also supports sea lice control)
- Use of licensed medicines; medicine quantities for the Caolas Loch Portain site allow for in-feed and bath treatments throughout the production cycle (see section 2.4)
- If medicines are utilised, a rotation of licensed products (where the CAR licence permits this) will be sought to ensure long term efficacy of the medicines used
- Sensitivity tests (bioassays) to monitor the efficacy of available medicines, to inform treatment choice to ensure the best possible results are achieved
- Mechanical treatments such as hydrolicer and thermolicer will be used if lice levels threaten to surpass the Marine Directorate reporting threshold or if the use of fresh water or medicines are not an option
- Targeted harvesting to remove populations where lice are prevalent and to reduce stocking levels on site which both minimizes host availability and maximises cleanerfish efficacy

Ultimately interventions are planned and carried out in accordance with CoGP requirements and in compliance with Marine Directorate Fish Health Inspectorate's Sea Lice Enforcement Policy.

Table A1 Standard and Escalation Measures for the Control of Sea lice

	Control Measure	Trigger	Factors Considered in Selection
Operational Norms	Fallow prior to stocking	Site operational	N/A - control always used
	Single year-class stocking	Site operational	N/A - control always used
	Husbandry *(low stocking density, minimal handling, net hygiene, high quality diet, daily checks)*	Site operational	N/A - control always used
	Cleanerfish stocking & management	Site operational	N/A - control always used
	Sea lice barriers/skirts	Smolt input & infection risk	To be used if there is evident risk of *L. salmonis* infection on to farm from external source(s)
	Filtration system on fish-handling equipment	Handling event e.g. harvest	N/A - control always used
	Adjustment of cleanerfish stocking & management *(review net hygiene, alter feeding, review hides, introduce 'habituated' fish)*	Adult Female/Gravid lice level above zero	N/A - control always used
Escalation Measures	Augmentation of cleanerfish stocking *(increase stocking %, introduce 'habituated' fish)*	Adult Female/Gravid lice level approaching CoGP trigger	Used prior to medicinal intervention based on proven level of efficacy
	Medicinal treatment - in-feed (as per site-specific CAR licence)	Adult Female/Gravid lice level above CoGP trigger or *Caligus spp.* present	Used primarily against *Caligus spp.* or early life-stages of *L. salmonis*
	Medicinal treatment – bath (as per site-specific CAR licence)	Adult Female/Gravid lice level approaching MS Reporting threshold	Medicine selection dependent on sensitivity-test results, lice stage & medicine rotation
	Mechanical treatment	Adult Female/Gravid lice level approaching MS Reporting threshold	Dependent on health status, size and condition of fish
	Low-salinity treatment	Gill health challenge	Supports fish health to reduce risk of sea lice infection & also directly disrupts lice e.g. *Caligus spp.*
	Harvesting	Adult Female/Gravid lice level not reduced by above measures	N/A - ultimate control measure should other methods fail to bring sea lice levels back to below CoGP trigger

2.4 Sea Lice Treatment Efficacy

Should medicinal treatments be required at Caolas Loch Portain, a number of measures are in place to ensure that effective treatment is achieved in a responsible manner.

Bath products are administered within a fully enclosed tarpaulin or wellboat. Medicine-specific dosage systems are used to dose products, ensuring an effective treatment by achieving the correct treatment dose throughout the tarpaulin enclosure.

For in-feed treatments a functional feed may be used alongside to optimise efficacy of the in-feed medicine. This may be through promoting gut health to ensure good absorption of the medicine, or through boosting other aspects of fish health such as immune response or mucus production.

For all treatments, in-feed and bath, a synchronous approach is used. Fish within a year class and area will be treated simultaneously. For bath treatments the aim is to treat all pens in as short a time frame as possible.

Medicine consent being sought for Caolas Loch Portain (via a CAR licence amendment to be submitted in due course) is anticipated to allow the following treatments should they be required:

- Slice (active ingredient Emamectin Benzoate) – any treatment of the active ingredient must not exceed the maximum environmental quantity of 1338.86 grams. The site at maximum biomass could be treated in 7 days in practical terms
- AMX (Deltamethrin) – 5.8 g in any 3 hrs; fully stocked site treatable in 12 days in practical terms (based on a peak biomass of 1,720 T; see attachment 15 Bath Treatment Modelling Report)
- Paramove 50 – permitted for use under PSWP, site treatable in 6 days in practical terms

It should be noted that medicinal treatment would be used at the site in support of the non-medicinal techniques outlined above. Across LDL operations, the use of these non-medicinal techniques have proven efficacious in managing sea lice infections and consequently contributed to only limited medicinal treatments being required.

3. Sea Lice Monitoring Programme

The following section describes the current sea lice monitoring strategy. Under the new Sea Lice Risk Framework (SLRF), the amended CAR licence (if consented) will specify sea lice monitoring requirements. This will be in accordance with the appropriate Measurement Assurance and Certification Scotland (MACS) document, and monitoring and reporting requirements will be conditioned within the amended CAR licence.

Sea lice monitoring is carried out every week, all year round, on all stocked LDL sites. Fully trained, designated staff carry out the monitoring – either the LDL Fish Health team or experienced Husbandry staff.

At all LDL sites, a minimum of 5 pens are sampled, often more. Five fish are taken from each pen and anaesthetised; any attached or mobile stages of lice are identified, counted and recorded for each individual fish. This data is then used to produce an average louse count per fish.

From each week's count detailed records of any lice present, including the population structure in terms of life stage, are produced for each site. The data can be viewed on a pen-by-pen basis or as a farm site average. This detailed information is used to ensure the effectiveness of cleanerfish or in the planning of other interventions where necessary as set out in section 2.4 above.

This monitoring programme is in compliance with the National Strategy for the Control of Sea Lice on Scottish Salmon Farms. It is currently subject to statutory weekly reporting to Marine Directorate Fish Health Inspectorate and periodic statutory inspection. Further to implementation of the SLRF, it is anticipated that the required statutory reports will be submitted to SEPA.

ANDERSON MARINE SURVEYS

Report To: Loch Duart

Issued By: *SJA*

Date: 11 April 2022

Lochmaddy Caolas Loch Portain video survey

Introduction

The Caolas Loch Portain site is located in Lochmaddy, North Uist (Figure 1), and is currently in production. Lochmaddy (Loch nam Madadh) is a designated Special Area of Conservation (SAC), with protected features including reefs and subtidal sandbanks[1]. This report describes findings of a video survey of the site vicinity carried out in March 2022; with reference to general seabed habitat (biotopes) and condition, visible biota, and the presence of any Priority Marine Features[2]. Survey information will be submitted to NatureScot / Marine Scotland in support of accurate defining of sensitive features (or indeed their absence) around the farm site.

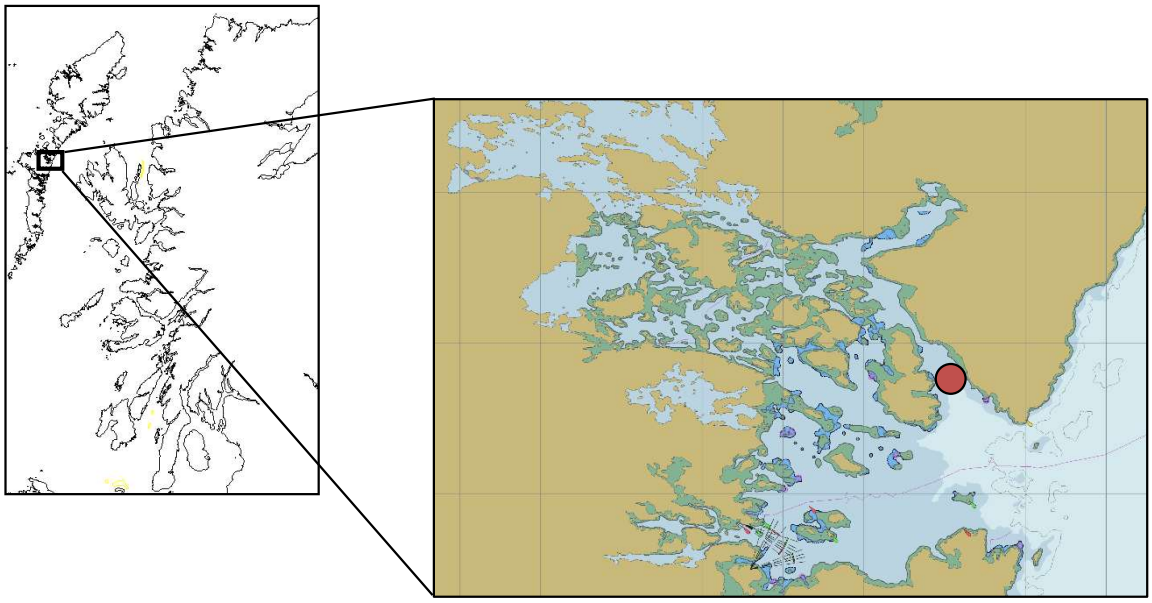


Figure 1. Lochmaddy CLP general location

[1] NatureScot (2021). Conservation and Management Advice. Loch nam Madadh SAC. March 2021
[2] As defined by Tyler-Walters et al (2016)

Methods

Survey operations were carried out on 30-31 March 2022 from AMSL's 6.7m survey vessel *Mollie B*. Positioning and depth data were provided by a Simrad NSS7 evo.2 with fixes at 1s intervals logged directly to PC.

Video survey was carried out using a camera frame fitted with a Bowtech DIVECAM-550C-AL-I4 camera, GoPro video camera and two high intensity LED lights. A series of short drops, duration 1-2 minutes, were carried out at 94 locations (Figure 2), with the camera frame allowed to rest briefly on the seabed at intervals during each drop.

Site descriptor, position, elapsed time and depth overlays were added to the video post-survey, and deployment and recovery periods edited from the final video files in mp4 format. Still images of representative biotopes from each drop were captured from the video.

Video footage has been examined and interpreted for each individual drop. Fauna was identified using standard sources (primarily Southward and Campbell 2006, Naylor 2011, Porter 2012, Wood 2013, Hayward and Ryland 2017, Bowen et al. 2018).

Seabed biotopes have been identified consistent with The Marine Habitat Classification for Britain and Ireland (v 04.05) (Connor et al. 2004). Where several biotopes were recorded at a site (for example, scattered boulders with *Caryophyllia smithii* and *Swiftia pallida* CR.MCR.EcCr.CarSwi.LgAs on circalittoral muddy sand SS.Ssa.CMuSa), both biotopes were recorded at the relevant positions.

Biotopes were mapped using Nearest Neighbour gridding at 5m resolution in Surfer (v23.2).

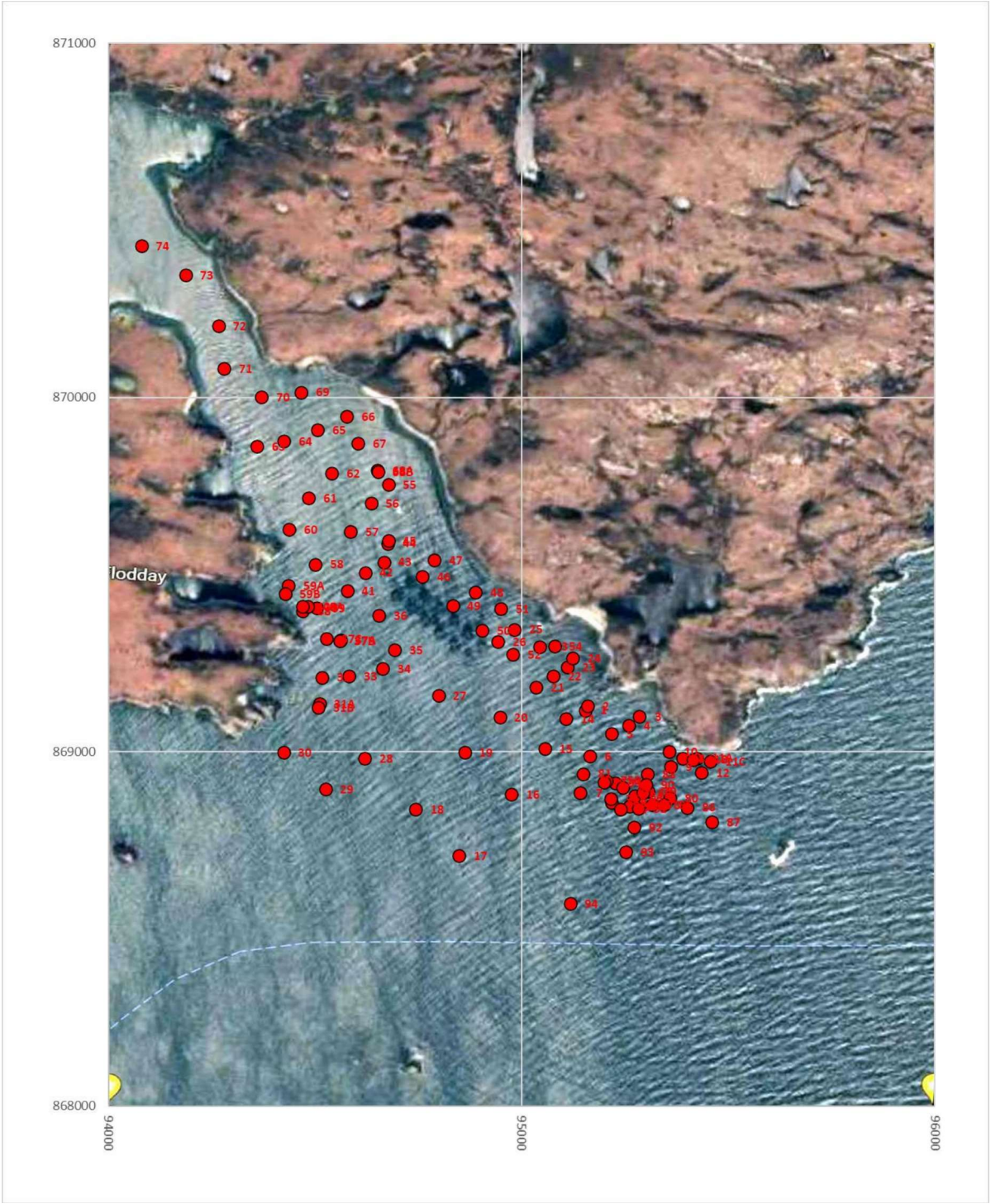


Figure 2. Video drop locations and site numbering (imagery date 25/04/2019)

Results

Depths recorded throughout the survey have been corrected to chart datum and are shown as a contoured bathymetry plot in Figure 3. Recorded depths varied from 1.1 to 43.1 mCD.

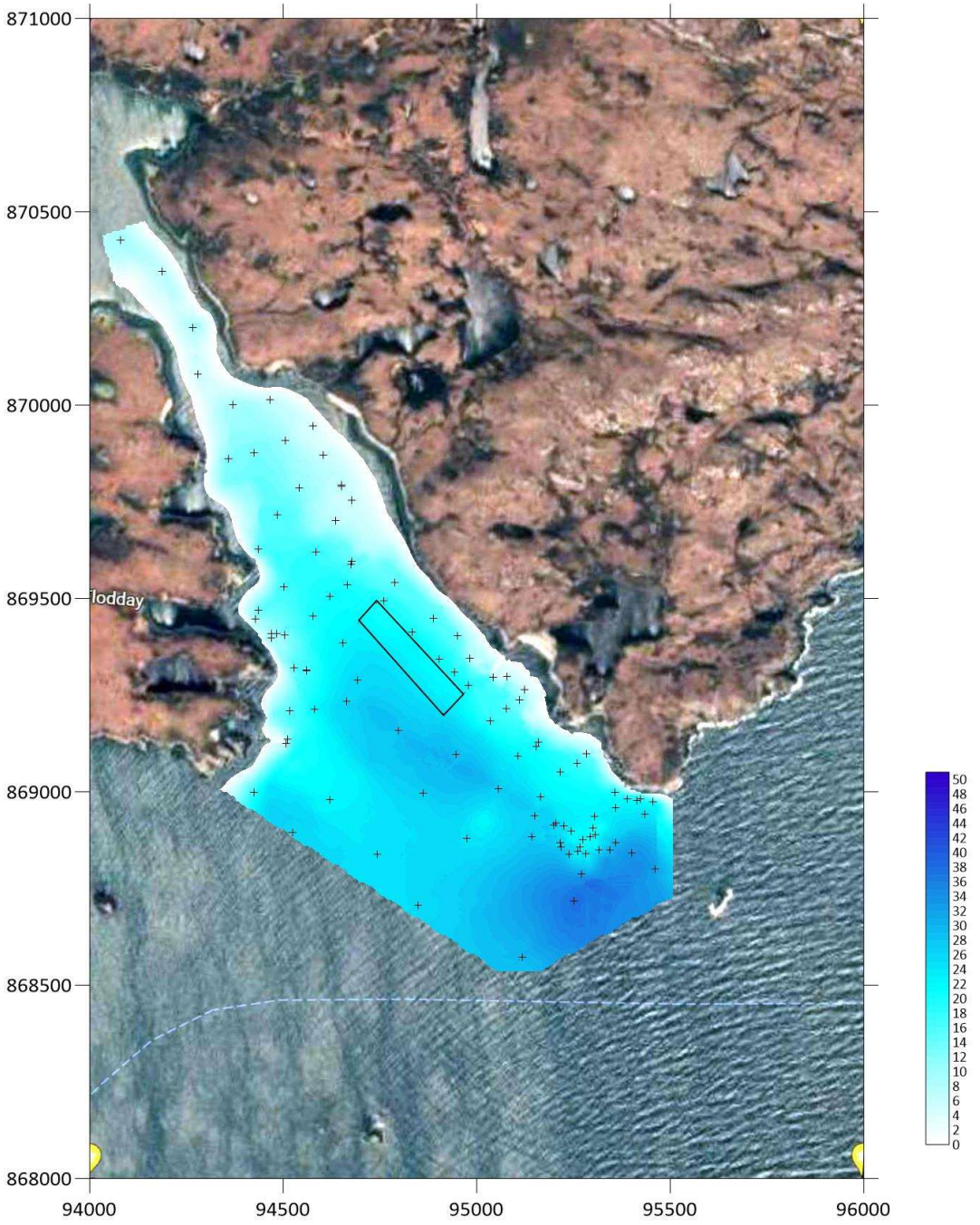


Figure 3. Contoured bathymetry, depths in mCD. Rectangle shows measured cage grid corners

A total of 14 biotopes were recorded:

IR.MIR.KR.Lhyp.Ft	*Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock
IR.HIR.Ksed.XKScrR	Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock
IR.FIR.SG.CC.Mo	Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies
SS.SCS.ICS	Infralittoral coarse sediment
SS.Ssa.IMUSa	Infralittoral muddy sand
SS.SMu.IFiMu.PhiVir	*Virgularia mirabilis* in soft stable infralittoral mud
SS.Ssa.IMuSa.AreISa	*Arenicola marina* in infralittoral fine sand or muddy sand
SS.SCS.CCS	Circalittoral coarse sediment
SS.SSa.CFiSa	Circalittoral fine sand
SS.SMu.CSaMu.AfilMysAnit	*Amphiura filiformis* in circalittoral sandy mud
SS.Ssa.CMuSa	Circalittoral muddy sand
SS.Smu.CFiMu.SpnMeg	Seapens and burrowing megafauna in circalittoral fine mud
CR.MCR.EcCr.CarSwi.LgAs	*Caryophyllia smithii*, *Swiftia pallida* and large solitary ascidians on exposed or moderately exposed circalittoral rock
CR.MCR.EcCr.CarSp	*Caryophyllia smithii*, sponges and crustose communities on wave-exposed circalittoral rock

In general, the north of the survey area in shallower water depths was characterised as infralittoral (i.e. with light penetration sufficient for significant algal growth), with kelp forest or park (IR.MIR.KR.Lhyp.Ft and IR.HIR.Ksed.XKScrR) where suitable substrate (rock, boulders or cobbles) were available. Infralittoral coarse sediment (SS.SCS.ICS) and muddy sands (SS.Ssa.IMUSa) in this area were frequently covered by a layer of detached kelp detritus.

The northernmost site (LM74), in Loch Portain, had a relatively dense population of the seapen *Virgularia mirabilis*, in unusually shallow depth (9.6mCD) and was characterised as *Virgularia mirabilis* in soft stable infralittoral mud (SS.SMu.IFiMu.PhiVir).

One site (LM45) in 14.4mCD had a silted boulder substrate, with limited red coralline algal crust, and was characterised as coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies (IR.FIR.SG.CC.Mo).

Sites (LM46, LM49) where casts of the lugworm *Arenicola marina* were observed were characterised as *Arenicola marina* in infralittoral fine sand or muddy sand (SS.SMu.CSaMu.AfilMysAnit).

Sites south of the cage group, in water depths >16mCD, were generally characterised as circalittoral (too deep for significant algal growth). Sediments included coarse (16 sites), fine sand (two sites), sandy mud (two sites), muddy sand (23 sites) and fine mud (10 sites). Of these, the brittlestar *Amphiura filiformis* was abundant at two sandy mud sites (LM35 and LM37A) characterised as *Amphiura filiformis* in circalittoral sandy mud (SS.SMu.CSaMu.AfilMysAnit). Deeper muddy sites were densely burrowed by crustacea (identified on the basis of burrow entrance morphology as *Calocaris macandreae* and *Nephrops norvegicus*) and were characterised as seapens and burrowing megafauna in circalittoral fine mud (SS.Smu.CFiMu.SpnMeg). Burrows typical of the thalassinid crustacean *Callianassa subterranea* were also observed in circalittoral muddy sand, and possibly also those of *Upogebia spp*. in coarse sediments.

The burrowing anemone *Arachnanthus sarsi* was tentatively identified at one burrowed mud site (LM94) where it was relatively common (densities 1-2/m^2).

Two circalittoral rock biotopes were identified. A distinct area of exposed bedrock and boulders, in water depths 19 – 24mCD approximately 420m southeast of the cage group, had dense populations of the cup coral *Caryophyllia smithii* and soft coral *Swiftia pallida*, and was characterised as *Caryophyllia smithii*, *Swiftia pallida* and large solitary ascidians on exposed or moderately exposed circalittoral rock (CR.MCR.EcCr.CarSwi.LgAs). The colonial ascidian *Diazona violacea* was also present in this habitat. *Caryophyllia* was also present on rock surfaces at two shallower sites west of the cage group (LM31A and 37C), which were characterised as *Caryophyllia smithii*, sponges and crustose communities on wave-exposed circalittoral rock (CR.MCR.EcCr.CarSp).

Individual site locations, depths and biotopes are tabulated below.

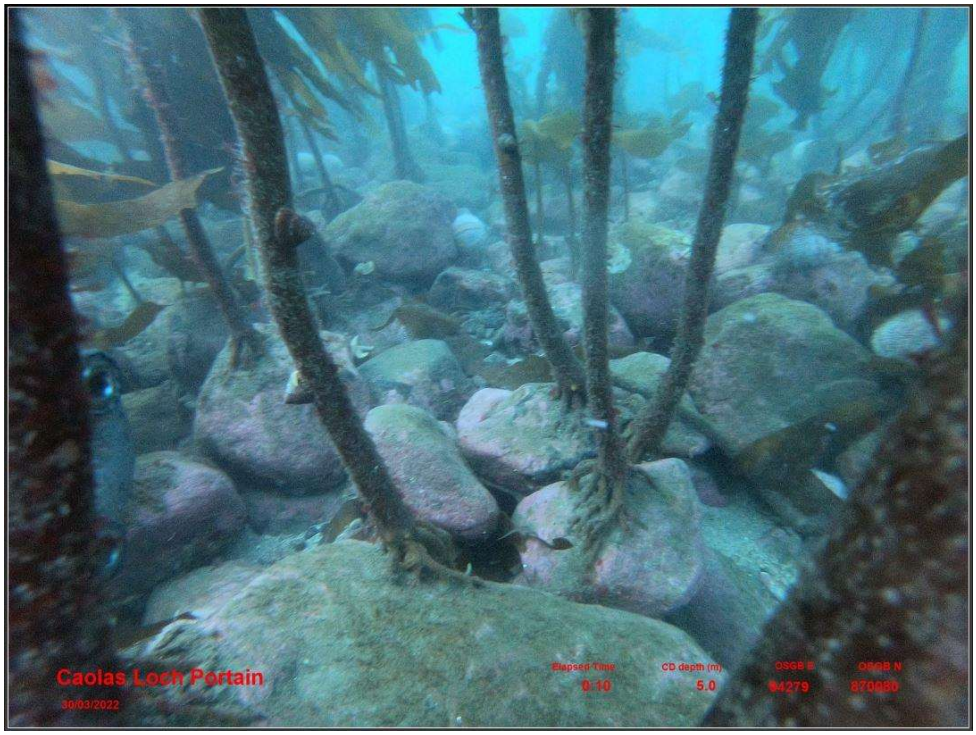
site	OSGB E	OSGB N	Depth (mCD)	Biotope
24	95123	869265	5.0	IR.MIR.KR.Lhyp.Ft
25	94981	869345	8.8	IR.MIR.KR.Lhyp.Ft
53	95043	869297	5.4	IR.MIR.KR.Lhyp.Ft
54	95079	869298	5.4	IR.MIR.KR.Lhyp.Ft
56	94635	869702	6.5	IR.MIR.KR.Lhyp.Ft
65	94505	869908	10.2	IR.MIR.KR.Lhyp.Ft
66	94577	869946	4.1	IR.MIR.KR.Lhyp.Ft
67	94603	869871	5.8	IR.MIR.KR.Lhyp.Ft
68A	94650	869794	6.6	IR.MIR.KR.Lhyp.Ft
70	94370	870001	9.4	IR.MIR.KR.Lhyp.Ft
71	94280	870081	5.0	IR.MIR.KR.Lhyp.Ft
72	94266	870201	10.5	IR.MIR.KR.Lhyp.Ft
23	95111	869238	10.2	IR.HIR.Ksed.XKScrR
38	94469	869397	10.1	IR.HIR.Ksed.XKScrR
39	94505	869406	12.0	IR.HIR.Ksed.XKScrR
40A	94483	869410	11.4	IR.HIR.Ksed.XKScrR
40B	94469	869409	10.2	IR.HIR.Ksed.XKScrR
59B	94428	869446	10.5	IR.HIR.Ksed.XKScrR
69	94466	870015	5.8	IR.HIR.Ksed.XKScrR
45	94677	869596	14.4	IR.FIR.SG.CC.Mo
3	95284	869099	10.0	SS.SCS.ICS
55	94677	869753	5.7	SS.SCS.ICS
57	94585	869621	17.8	SS.SCS.ICS
68B	94652	869790	6.4	SS.SCS.ICS
73	94186	870345	6.7	SS.SCS.ICS
47	94788	869541	14.2	SS.Ssa.IMUSa
48	94888	869449	15.7	SS.Ssa.IMUSa
60	94436	869627	15.5	SS.Ssa.IMUSa
61	94484	869716	15.3	SS.Ssa.IMUSa

62	94540	869786	11.5	SS.Ssa.IMUSa
63	94359	869862	12.3	SS.Ssa.IMUSa
64	94424	869876	12.1	SS.Ssa.IMUSa
74	94079	870427	9.6	SS.SMu.IFiMu.PhiVir
46	94760	869495	18.7	SS.Ssa.IMuSa.AreISa
49	94833	869413	20.8	SS.Ssa.IMuSa.AreISa
1	95153	869117	20.3	SS.SCS.CCS
2	95159	869129	19.3	SS.SCS.CCS
4	95258	869074	17.7	SS.SCS.CCS
5	95216	869051	20.1	SS.SCS.CCS
8	95390	868981	20.9	SS.SCS.CCS
9	95359	868958	21.9	SS.SCS.CCS
10	95357	868999	19.8	SS.SCS.CCS
11B	95415	868978	21.7	SS.SCS.CCS
12	95435	868941	24.5	SS.SCS.CCS
14	95107	869093	22.0	SS.SCS.CCS
21	95035	869182	18.3	SS.SCS.CCS
22	95076	869214	15.4	SS.SCS.CCS
32	94517	869210	15.5	SS.SCS.CCS
36	94654	869384	22.4	SS.SCS.CCS
42	94621	869506	20.0	SS.SCS.CCS
51	94949	869403	13.9	SS.SCS.CCS
35	94692	869288	25.3	SS.SSa.CFiSa
37A	94561	869314	17.2	SS.SSa.CFiSa
27	94798	869159	27.2	SS.SMu.CSaMu.AfilMysAnit
34	94663	869234	25.8	SS.SMu.CSaMu.AfilMysAnit
6	95164	868988	23.7	SS.Ssa.CMuSa
7	95142	868884	27.5	SS.Ssa.CMuSa
15	95055	869008	26.4	SS.Ssa.CMuSa
17	94848	868707	25.7	SS.Ssa.CMuSa
26	94942	869310	19.3	SS.Ssa.CMuSa
29	94525	868894	25.0	SS.Ssa.CMuSa
30	94424	868999	18.8	SS.Ssa.CMuSa
31B	94508	869124	5.2	SS.Ssa.CMuSa
33	94581	869212	21.9	SS.Ssa.CMuSa
37B	94559	869312	17.0	SS.Ssa.CMuSa
41	94578	869455	19.4	SS.Ssa.CMuSa
43	94666	869535	19.2	SS.Ssa.CMuSa
44	94675	869588	15.6	SS.Ssa.CMuSa
50	94904	869343	20.3	SS.Ssa.CMuSa
52	94979	869275	19.7	SS.Ssa.CMuSa
58	94501	869529	16.7	SS.Ssa.CMuSa
59A	94436	869469	13.5	SS.Ssa.CMuSa
76A	95218	868857	27.2	SS.Ssa.CMuSa
80	95359	868869	29.4	SS.Ssa.CMuSa

85	95344	868850	30.1	SS.Ssa.CMuSa
86	95400	868843	32.8	SS.Ssa.CMuSa
87	95460	868801	32.0	SS.Ssa.CMuSa
88	95305	868937	22.7	SS.Ssa.CMuSa
18	94743	868838	24.6	SS.Smu.CFiMu.SpnMeg
19	94861	868997	26.9	SS.Smu.CFiMu.SpnMeg
20	94947	869097	28.5	SS.Smu.CFiMu.SpnMeg
28	94620	868980	22.5	SS.Smu.CFiMu.SpnMeg
75B	95204	868919	26.0	SS.Smu.CFiMu.SpnMeg
81	95149	868938	25.9	SS.Smu.CFiMu.SpnMeg
82	95199	868913	24.9	SS.Smu.CFiMu.SpnMeg
92	95271	868787	32.4	SS.Smu.CFiMu.SpnMeg
93	95251	868718	37.0	SS.Smu.CFiMu.SpnMeg
94	95117	868572	29.5	SS.Smu.CFiMu.SpnMeg
11A	95424	868982	20.0	CR.MCR.EcCr.CarSwi.LgAs
11C	95456	868973	20.6	CR.MCR.EcCr.CarSwi.LgAs
13A	95267	868857	19.6	CR.MCR.EcCr.CarSwi.LgAs
13B	95262	868846	22.3	CR.MCR.EcCr.CarSwi.LgAs
16	94975	868880	24.5	CR.MCR.EcCr.CarSwi.LgAs
75A	95225	868912	23.3	CR.MCR.EcCr.CarSwi.LgAs
76B	95216	868867	26.9	CR.MCR.EcCr.CarSwi.LgAs
77	95239	868838	26.6	CR.MCR.EcCr.CarSwi.LgAs
78	95316	868849	24.0	CR.MCR.EcCr.CarSwi.LgAs
79	95307	868889	20.8	CR.MCR.EcCr.CarSwi.LgAs
83	95244	868899	21.1	CR.MCR.EcCr.CarSwi.LgAs
84	95274	868876	21.0	CR.MCR.EcCr.CarSwi.LgAs
89	95294	868884	21.3	CR.MCR.EcCr.CarSwi.LgAs
90	95301	868906	19.5	CR.MCR.EcCr.CarSwi.LgAs
91	95282	868840	22.2	CR.MCR.EcCr.CarSwi.LgAs
31A	94510	869136	12.5	CR.MCR.EcCr.CarSp
37C	94527	869320	14.7	CR.MCR.EcCr.CarSp

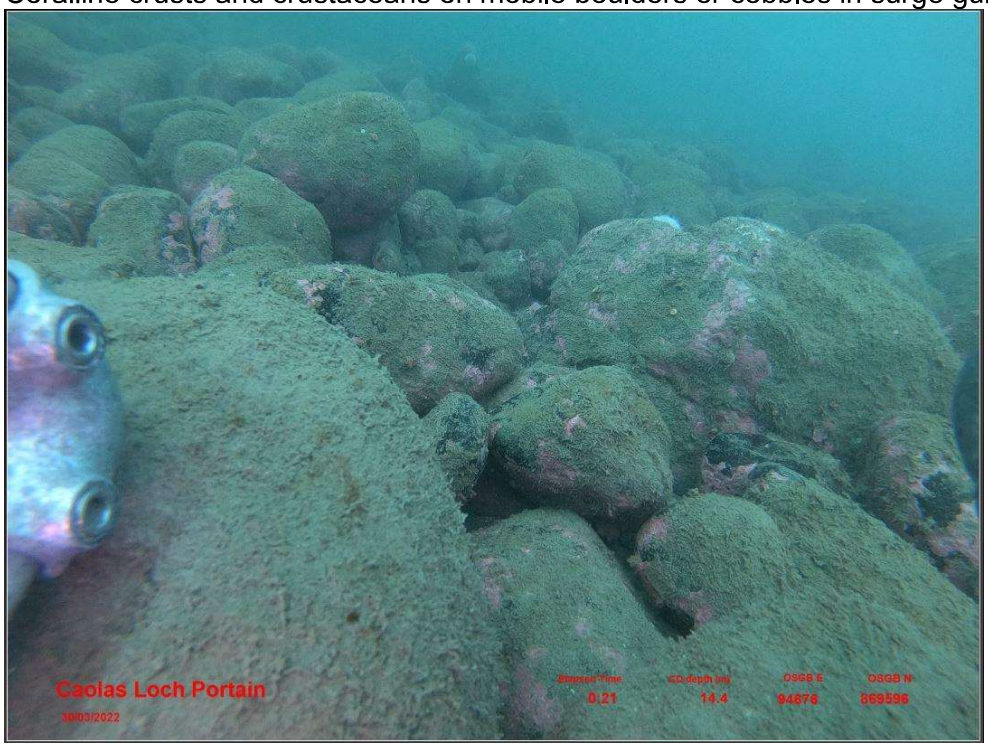
Representative stills of each biotope are shown in Figure 4, and the biotope map in Figure 5.

IR.MIR.KR.Lhyp.Ft
Laminaria hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock



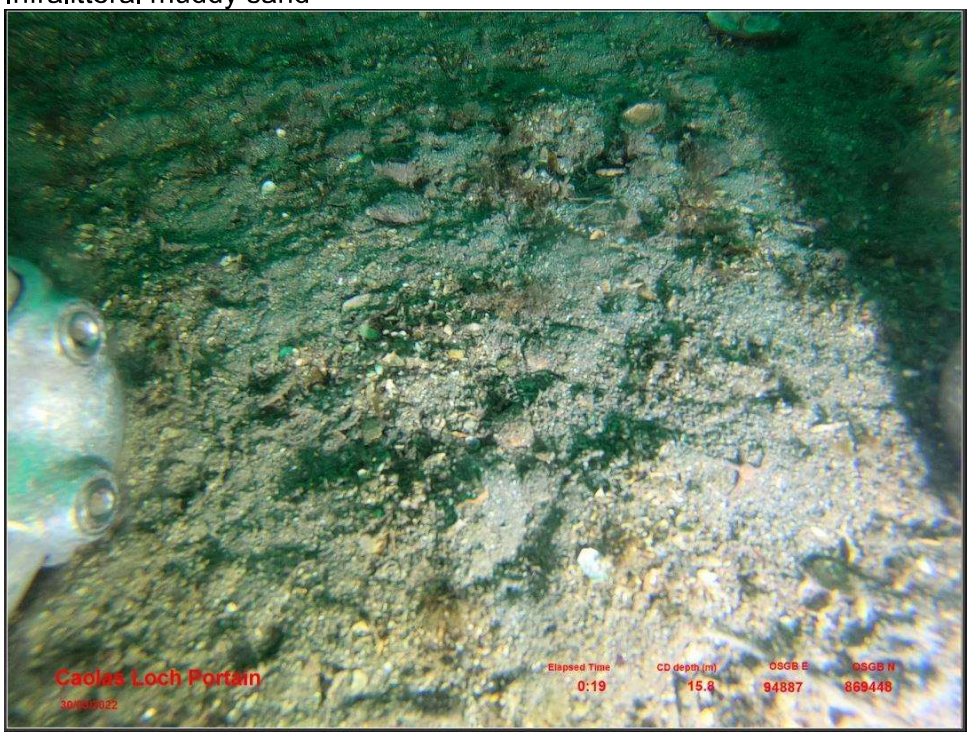
IR.HIR.Ksed.XKScrR
Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock

IR.FIR.SG.CC.Mo
Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies

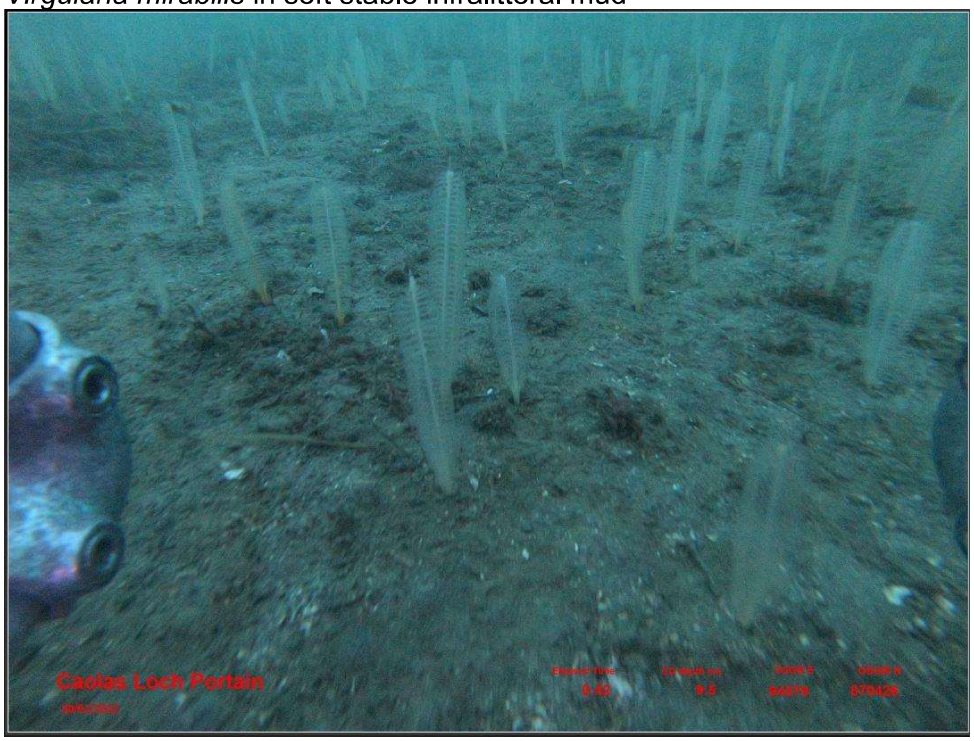


SS.SCS.ICS
Infralittoral coarse sediment

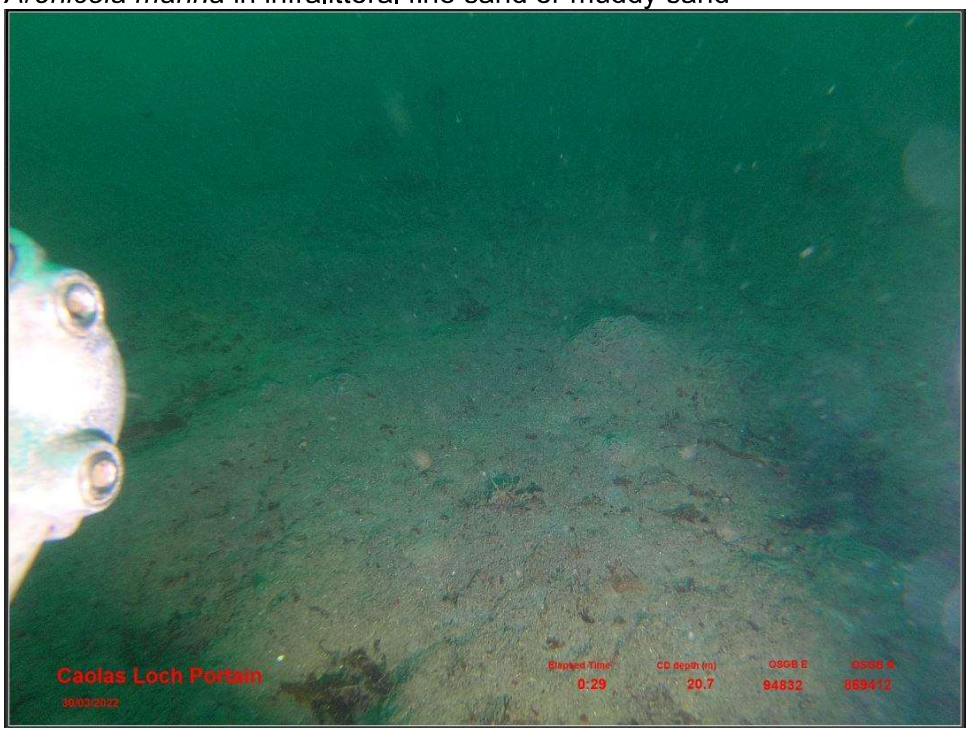
SS.Ssa.IMUSa
Infralittoral muddy sand



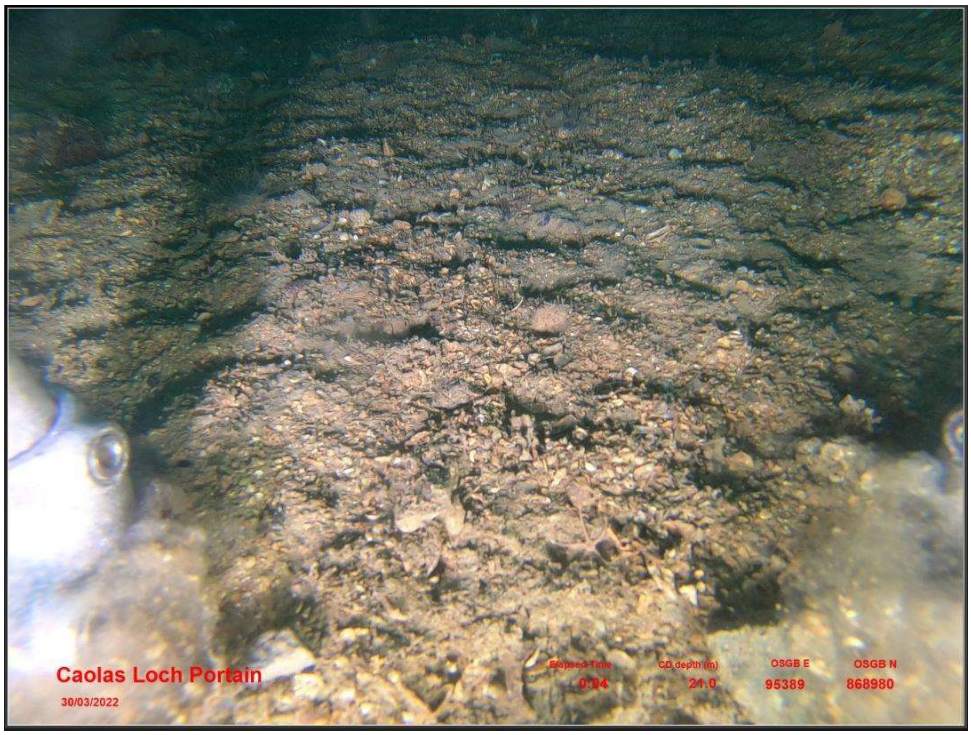
SS.SMu.IFiMu.PhiVir
Virgularia mirabilis in soft stable infralittoral mud



SS.Ssa.IMuSa.ArelSa
Arenicola marina in infralittoral fine sand or muddy sand



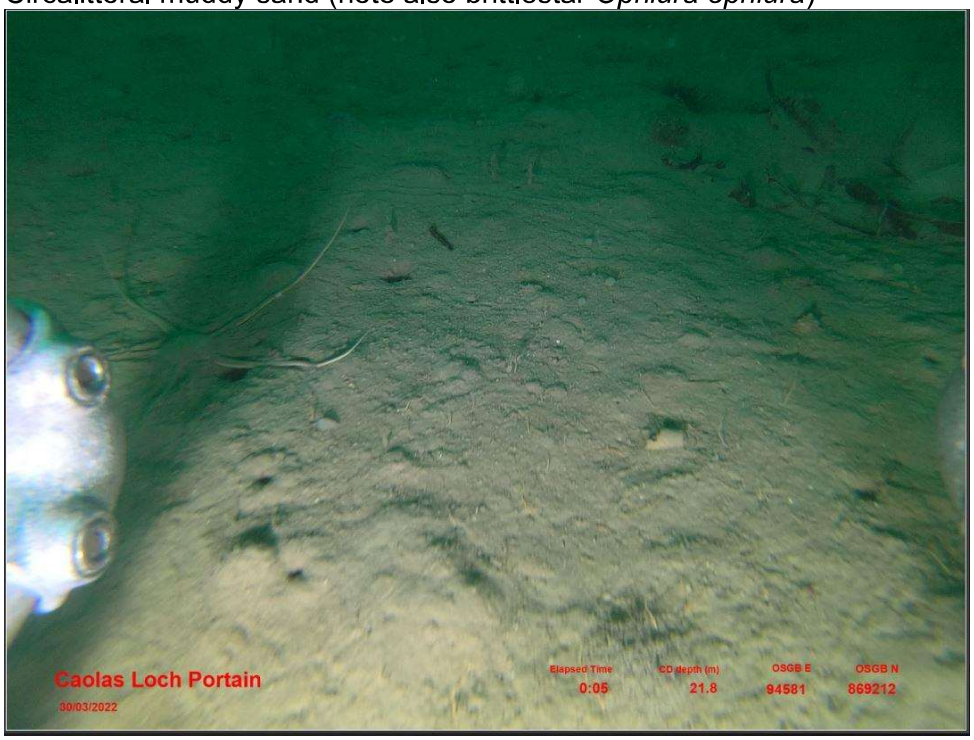
SS.SCS.CCS
Circalittoral coarse sediment



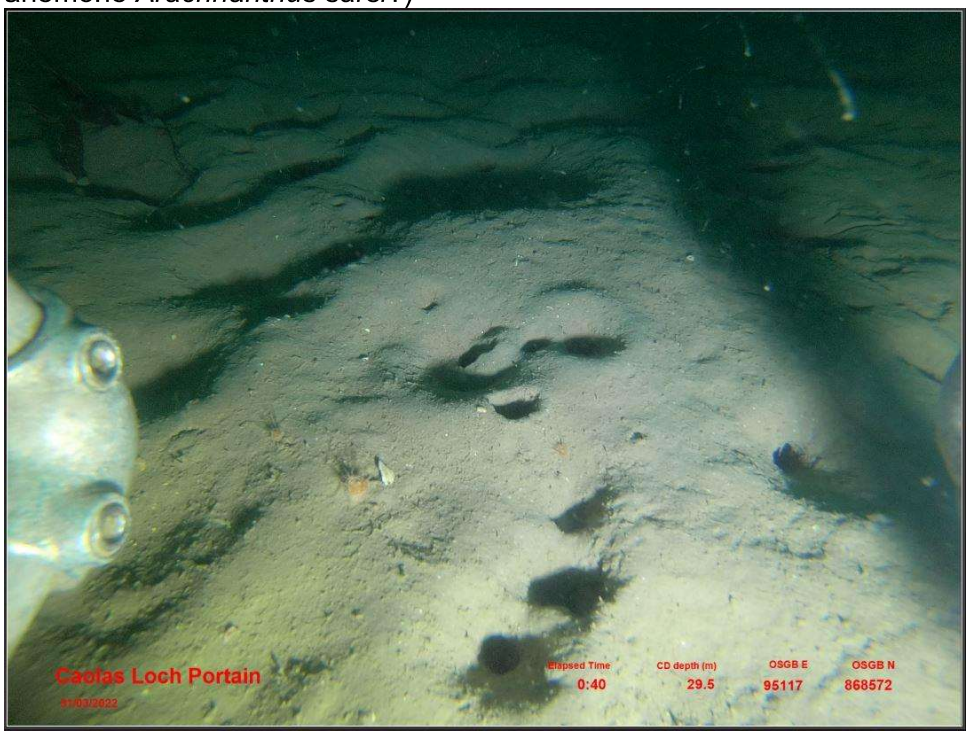
SS.SSa.CFiSa
Circalittoral fine sand (with overlying kelp detritus)

SS.SMu.CSaMu.AfilMysAnit
Amphiura filiformis in circalittoral sandy mud

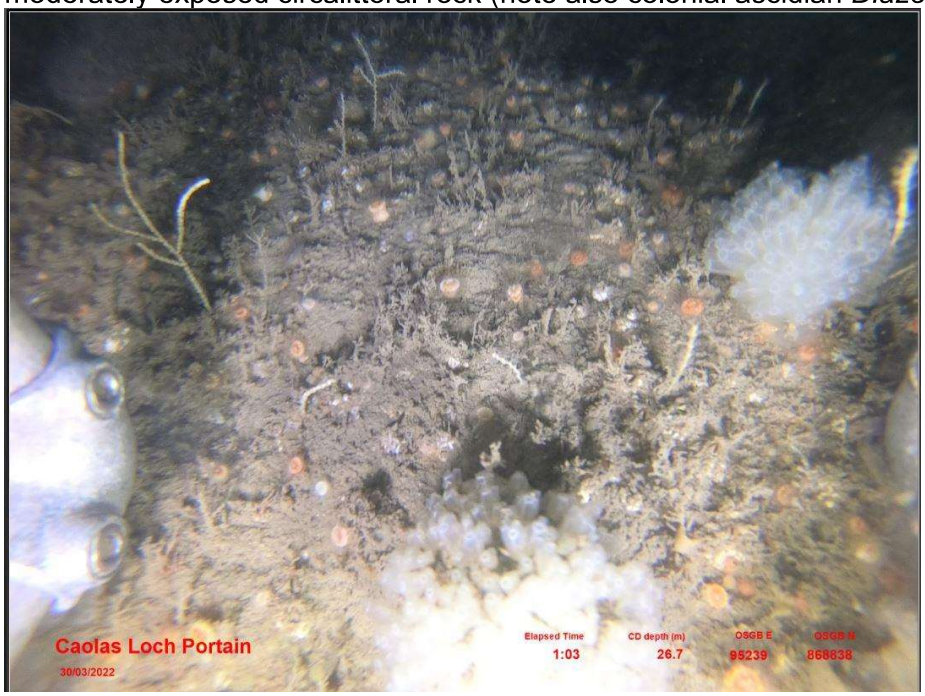
SS.Ssa.CMuSa
Circalittoral muddy sand (note also brittlestar *Ophiura ophiura*)



SS.Smu.CFiMu.SpnMeg
Seapens and burrowing megafauna in circalittoral fine mud (note also burrowing anemone *Arachnanthus sarsi*?)



CR.MCR.EcCr.CarSwi.LgAs
Caryophyllia smithii, *Swiftia pallida* and large solitary ascidians on exposed or moderately exposed circalittoral rock (note also colonial ascidian *Diazona violacea*)



CR.MCR.EcCr.CarSp
Caryophyllia smithii, sponges and crustose communities on wave-exposed circalittoral rock (note also plumose anemone *Metridium senile*)

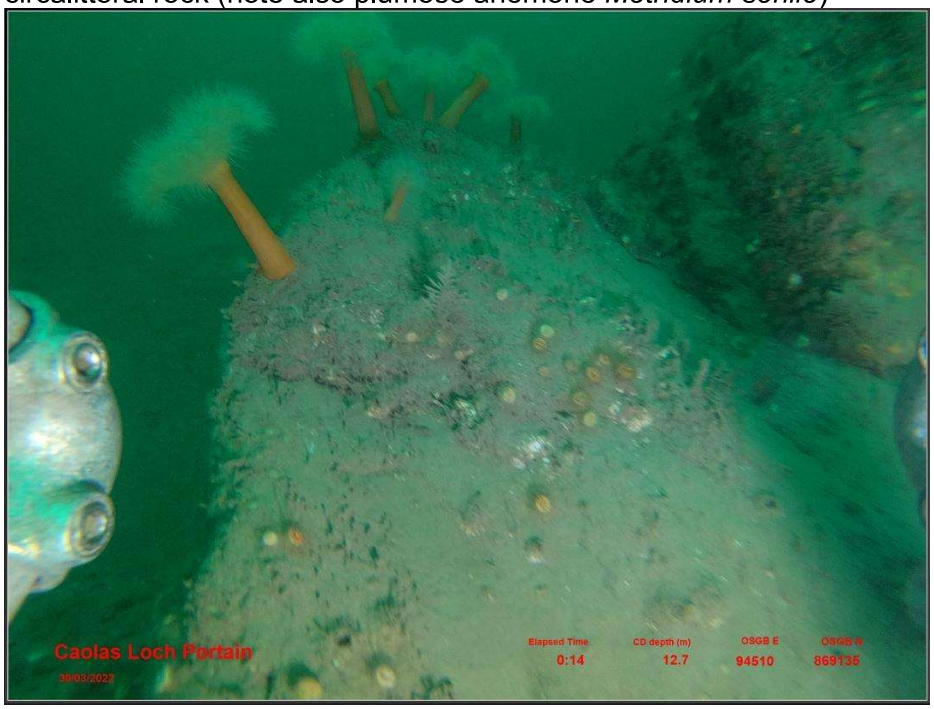
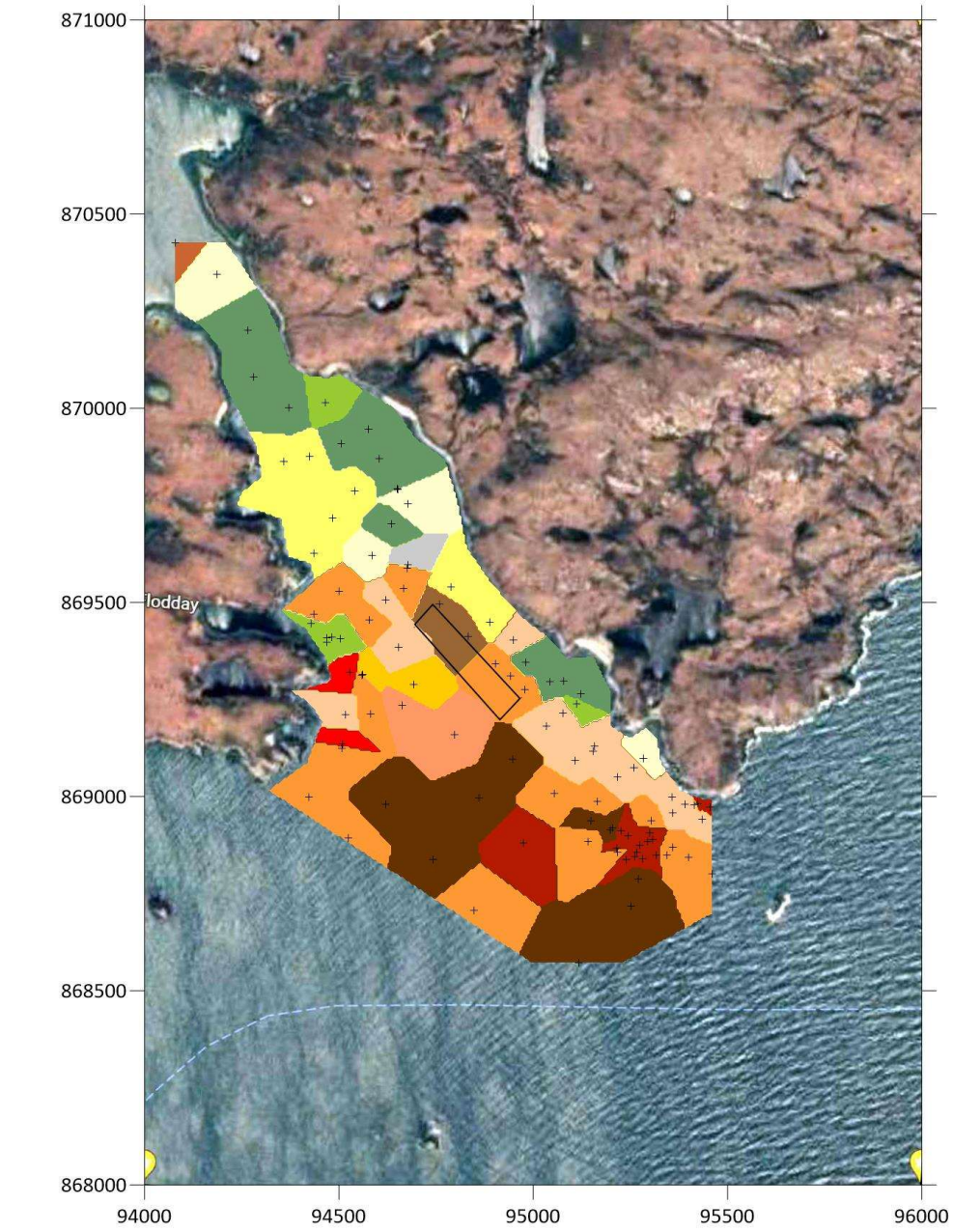


Figure 4. Representative stills of each biotope



CR.MCR.EcCr.CarSp	Caryophyllia smithii, sponges and crustose communities on wave-exposed circalittoral rock
CR.MCR.EcCr.CarSwi.LgAs	Caryophyllia smithii, Swiftia pallida and large solitary ascidians on exposed or moderately exposed circalittoral rock
SS.Smu.CFiMu.SpnMeg	Seapens and burrowing megafauna in circalittoral fine mud
SS.Ssa.CMuSa	Circarcalittoral muddy sand
SS.SMu.CSaMu.AfilMysAnit	Amphiura filiformis, Mysella bidentata and Abra nitida in circalittoral sandy mud
SS.SSa.CFiSa	Circalittoral fine sand
SS.SCS.CCS	Circalittoral coarse sediment
SS.Ssa.IMuSa.AreISa	Arenicola marina in infralittoral fine sand or muddy sand
SS.SMu.IFiMu.PhiVir	Philine aperta and Virgularia mirabilis in soft stable infralittoral mud
SS.Ssa.IMUSa	Infralittoral muddy sand
SS.SSA.IFiSa	Infralittoral fine sand
SS.SCS.ICS	Infralittoral coarse sediment
IR.FIR.SG.CC.Mo	Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies
IR.HIR.Ksed.XKScrR	Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock
IR.LIR.K.Lsac.Pk	Laminaria saccharina park on very sheltered lower infralittoral rock
IR.MIR.KR.Lhyp.Ft	Laminaria hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock

Figure 5. Biotope map

Discussion

Biotope mapping and site check work was carried out in the area in 2015 by Moore *et al* (2016). They recorded a similar range of biotopes in Caolas Loch Portain, with eight biotopes recorded at nine sites by a combination of diving, grab sampling and drop camera. In particular, bedrock and boulders on sand off Weaver's Point and Madadh Mór between depths of 18 and 26 m supported dense *Caryophyllia smithii* and a fairly sparse accompanying fauna including *Swiftia pallida* (locally common) and hydroid patches (CR.MCR.EcCr.CarSwi.LgAs). This biotope also supported the sponge *Axinella infundibuliformis*, and ascidians *Ascidia mentula* and *Diazona violacea*, all of which were also recorded by this survey.

This reef biotope was recorded by Moore *et al* (2016), and also by this survey, close to Weaver's Point and the reef area further offshore was not described by Moore although it does appear on subsequent predictive habitat maps (as habitat MC1: circalittoral rock) for the area (e.g. EUNIS 2019).

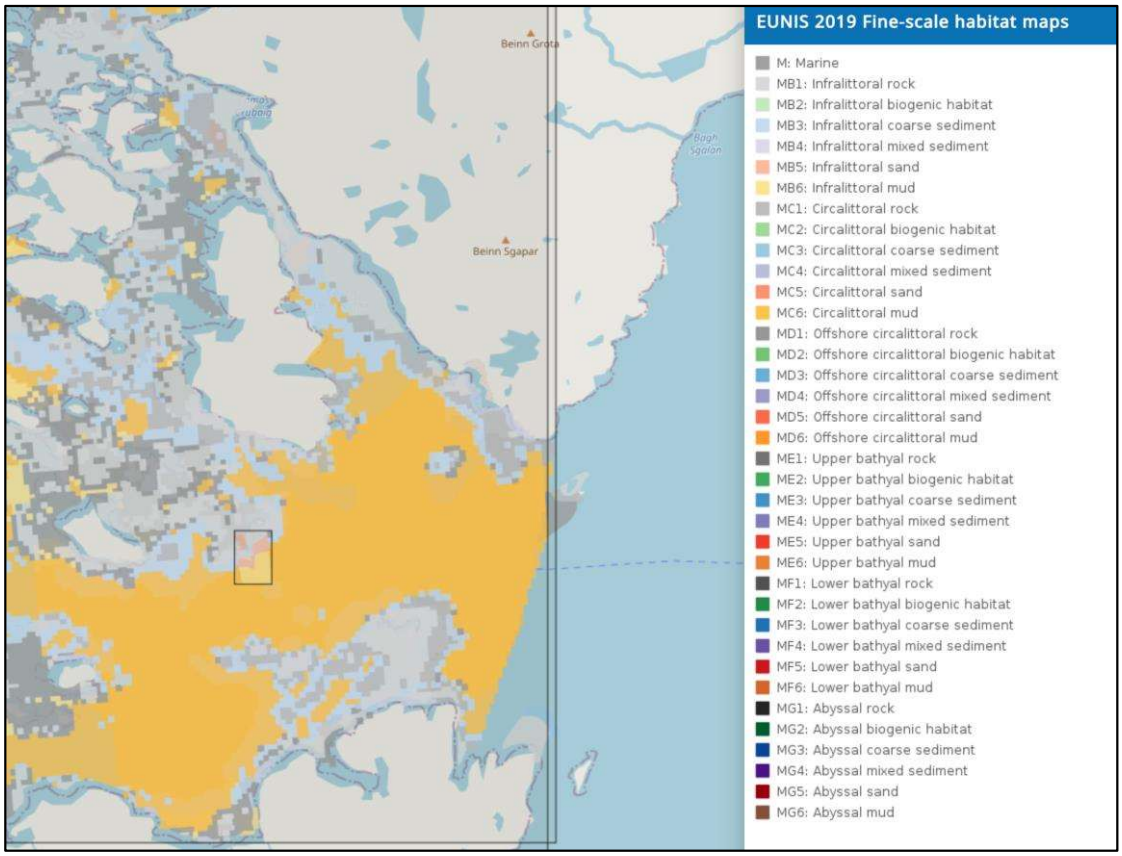


Figure 6. EUNIS 2019 fine-scale habitat map (source https://www.emodnet-seabedhabitats.eu/)

Following the video survey described above, a preliminary investigation of the extent of this reef feature was conducted using downscan sonar, with the hardness quantified by Peak SV[3] (Figure 7).

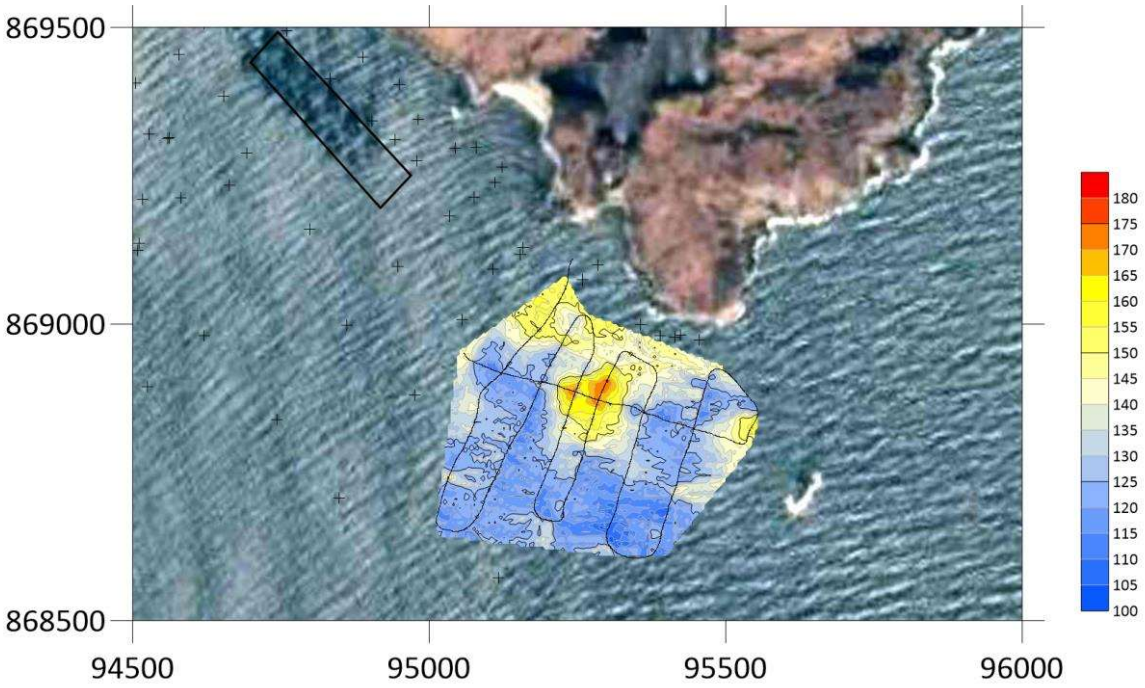


Figure 7. Contoured Peak SV over reef structure. NB Peak SV is a dimensionless descriptor of bottom hardness over the dataset, with hard substrates (rock) shown red and soft substrates (mud) blue

The area of the reef (peak SV>150) is estimated as 10,253 m^2 and the distance from cage group edge as 424m.

Five additional biotopes were recorded by this survey, which were not previously recorded by Moore et al (2016) – this is expected, given survey of 94 rather than 9 sites. Three of these (SS.SMu.CSaMu.AfilMysAnit, SS.Ssa.IMuSa.ArelSa and SS.SMu.IFiMu.PhiVir) are sub-categories of previously recorded sandy mud or mud biotopes, with the addition of a characteristic species (*Amphiura filiformis*, *Arenicola marina* and *Virgularia mirabilis* respectively). One (CR.MCR.EcCr.CarSp) is the circalittoral reef biotope, with the exception of the sea fan *Swiftia pallida* which was not recorded on the reef sites east of Flodday. The last (IR.FIR.SG.CC.Mo) is essentially infralittoral boulders without macroalgae, and is not a good fit for the biotope description (which is based on surge gullies with a higher level of wave action).

Overall, therefore, the recorded biotope distribution is very consistent with previous mapping, given the higher resolution of sites. However, there are some discrepancies with the National Marine Plan interactive (NMPi) mapping produced by

[3] Peak SV measures the strength of the sonar return as it is reflected off the bottom, and is highly correlated to the hardness of the bottom. E1 and E2 parameters were also assessed, but present no additional information in this case

Marine Scotland, which shows more extensive areas of Northern sea fan and sponge communities (Priority Marine Feature, see below).

Limitations of the biotope approach to habitat and community description are well recognised. In relation to this survey, it can be (briefly) noted that:

- Distinction between sedimentary habitats (without quantitative particle size analysis of samples) is subjective and imprecise. In particular, nearly all sedimentary habitats could be described as mixed, although the biotope descriptions contain various terms (for example "muddy sand" and "sandy mud") within the sublittoral coarse sediment (SCS) , sublittoral sand (SSa) and sublittoral mud (SMu) categories. However, simply describing all subtidal sediments as sublittoral mixed sediment (SMx) is not very useful.

- Distinction between infralittoral and circalittoral biotopes, which is at a high level in the biotope hierarchy, is necessarily imprecise especially in habitats without macroalgae. This results in a somewhat arbitrary distinction of very similar habitats (e.g. muddy sands) on the basis of water depth.

- A key issue is whether the objective is to identify all examples of a biotope within the survey area – in which case individual boulders with *Caryophyllia smithii* are described as CR.MCR.EcCr.CarSp reef – or to assess the more general ecological characteristics – in which case the site may be assessed as circalittoral muddy sand (SS.Ssa.CMuSa) with scattered boulders. This is essentially a question of scale, which (by implication) is extremely variable within the biotope description system.

- Some combinations of important species/ecological community/habitat are not defined as biotopes – for example fine sand burrowed by *Callianassa subterranea*, which is widespread and common in areas used for aquaculture, is not defined as a specific biotope although it is distinctive and easily identified by burrow morphology.

Four Priority Marine Features (PMFs), as defined by Tyler-Walters *et al* (2016) were identified in Caolas Loch Portain:

- Burrowed Mud (probably the component biotope SEAPENS AND BURROWING MEGAFAUNA IN CIRCALITTORAL FINE MUD (SS.SMu.CFiMu.SpnMeg) although seapens were rarely recorded in the deeper burrowed mud, and the *Virgularia* population in Loch Portain does not fit this PMF

- Kelp Beds (probably the biotope type LAMINARIA HYPERBOREA AND FOLIOSE RED SEAWEEDS ON MODERATELY EXPOSED INFRALITTORAL ROCK (IR.MIR.KR.Lhyp), although this is somewhat subjective given the diversity of kelp bed biotopes)

- Northern sea fan and sponge communities (component biotope MIXED TURF OF HYDROIDS AND LARGE ASCIDIANS WITH SWIFTIA PALLIDA AND CARYOPHYLLIA SMITHII ON WEAKLY TIDE-SWEPT CIRCALITTORAL ROCK (CR.HCR.XFa.SwiLgAs))

- BURROWING SEA ANEMONE – ARACHNANTHUS SARSI (tentatively identified at site LM94, Figure 7)

Figure 7. Burrowing anemone tentatively identified as PMF *Arachnanthus sarsi*, site LM94

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SEA SITE WILDLIFE INTERACTION PLAN

1. Aim of Wildlife Interaction Plan

Cetaceans, otters, birds, fish and seals are all likely to frequent the areas around aquaculture developments on the Scottish coast. Loch Duart Ltd values these species and the biodiversity around its sites. This plan aims to minimise interaction between LDL farmers/farming activities and local wildlife for the purposes of wildlife conservation, deterring predation of farmed stock and balancing the welfare needs of LDL's stock with the welfare of the surrounding environment. The sites this plan applies to are described fully in OP 28 Farm Management Statement and includes farms in Eddrachillis Bay, Loch Laxford, Loch Carnan, Lochmaddy and the Sound of Harris as well as Loch Dunvegan and Loch Snizort.

2. Wildlife Interactions

2.1 Cetaceans (whales, dolphins and porpoises)

Whales and dolphins are classed as European protected species (https://www.nature.scot/professional-advice/protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations/european-protected) and are fully protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (https://www.legislation.gov.uk/uksi/1994/2716/contents/made). It is an offense to intentionally or recklessly kill, injure, capture, disturb or harass cetaceans.

Historically, a variety of species of cetaceans have been observed around the coast of Scotland. More information about species can be found at https://seawatchfoundation.org.uk/wp-content/uploads/2012/07/SpeciesID_British_Isles2.pdf or https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammalsls .

Where potential cetacean interaction is of particular interest, sightings by site staff may be recorded and reported via the 'Wildlife Record' submitted to the Office. Historically information has been shared with NatureScot and local trusts. Information about cetacean identification will be placed in shore bases to encourage staff interest and assist identification.

Since 2010 there have been two separate occurrences wherein pods of pilot whales have entered Loch Carnan, raising concern of the possibility of mass stranding and resulting in a frenzy of onlookers and coming to the area (October 2010 and May 2011). Fortunately, on both occasions the majority of the whales exited the loch safely. Should any similar event, including distressed, injured or stranded cetacean be noted by LDL staff the following actions will be taken:

1. Staff will not approach the cetacean(s) and will remain at a minimum distance of 100 m from the animals. Boats will be operated in a careful and sensitive manner to minimise additional stress on the animals. Great care will be taken to avoid any potential contact between boat and mammal

2. Staff will notify Senior Management immediately via the region's main office;

Hebrides Office	01870 602303
Sutherland Office	01971 502451
Skye Office	07798 523922

3. Senior Management will contact the Local NatureScot Area Office, the Cetacean Research & Rescue Unit, British Divers Marine Life Rescue or SSPCA:
   - NatureScot Stilligarry – 0131 3144190 (0900 – 1700)

- NatureScot Ullapool – 01463 701600 (0900 – 1700)
- Cetacean Research & Rescue Unit (Scotland) 01261 851696 (24hr)
- British Divers Marine Life Rescue 01825 765546 (office hours) or 07787433412 (24hrs)
- SSPCA 03000 999 999

4. Staff will follow management instruction regarding boat activity during any period where cetaceans are present. No visitors will be taken in LDL vessels without approval from a Company Director and any assistance provided by staff to rescuers or scientists must be under the direction of an LDL Director in consultation with NatureScot or CRRU

Should LD staff come across a dead cetacean this may be reported to the Scottish Marine Animal Stranding Scheme 07979 245893 or strandings@sruc.ac.uk for investigation.

2.2 Birds

All wild birds in the UK are protected under the Wildlife and Countryside Act 1981 (https://www.legislation.gov.uk/ukpga/1981/69) and Birds Directive 2009 (https://environment.ec.europa.eu/topics/nature-and-biodiversity/birdssdirective), including common species. It is an offense to kill, injure, or take any wild bird or egg or to interfere with their nests. Should LD staff come across an injured bird, SSPCA may be contacted for assistance (contact as per 2.1).

A variety of birds may be observed around sites and care will be taken to minimise the potential for interactions.

Sea gulls and starlings are opportunistic feeders and will scavenge for feed pellets and/or dead fish if they are given ready access. Site tidiness is the main deterrent for this behaviour, including storage of feed bags under tarpaulin covers, frequent removal of feed bags from a site and appropriate storage of fish mortalities, as described in OP2 Biosecurity Procedure and OP 32 Mortality Removal Procedure.

Sea gulls have also been noted to scavenge feed fed from automated feed systems. This is a problem because:

1. Gull activity on site (e.g. excrement) is a potential vector for parasites such as Eubothrium (as described in OP 28)
2. Gulls may become entangled in top nets resulting in harm to and possible death of the bird
3. During attempts to obtain food, gulls may damage equipment such as rotating feed spreaders and top nets

The main deterrent for this behaviour is to limit access to fish food pellets by appropriate feed system set up and top net design tensioning/support. This issue is being researched and improvements are ongoing. Alternative top net designs/supports and feed spreader systems have been installed to discourage interaction.

Cormorants, gannets and herons are known to predate on juvenile fish (smolts). This is controlled by denying predators access to fish and is discussed further in section 3.1 of this document. Bird predation is generally low level and ceases soon after the smolt stocking period.

A cormorant nesting site is noted to be present to the SE side of Lingay, in close proximity to the Sound of Harris site. Primary boat access to the farm site will be from the north approach channel to limit interaction. This nesting site is expected to be most active during the early summer months.

Care will be taken when operating vessels – particularly the smaller boats, to avoid close contact with any seabirds.

2.3 Otters

Otters are relatively common around coastal areas and have been sighted in Eddrachillis Bay (Calbha & Loch Droighniche), Loch Laxford, Loch Carnan (near Gasay) and Lochmaddy (near slip area, main pier, and Hamersay). Otter predation on stock is very rarely observed on any Loch Duart sites at sea, although scavenging of fish mortalities may occur. Disturbance will be avoided and regular mortality removal and appropriate containment of mortalities is observed to reduce the likelihood of interaction. Should LD staff come across a distressed or injured otter SSPCA or British Divers Marine Life Rescue will be contacted (contacts as per 2.1); any deceased otter may be reported to the International Otter Survival Fund 01471 822487 or enquiries@otter.org for investigation.

2.4 Seals

Two species, the grey seal *Halichoerus grypus* and harbour or common seal *Phoca vitulina*, are present around the coast of Scotland in internationally important numbers. Under European legislation, both seal species are of "Community Interest" meaning they are relatively uncommon across Europe as a whole. Should LD staff come across a distressed or injured seal SSPCA or British Divers Marine Life Rescue will be contacted (contacts as per 2.1).

Seal predation is a noted occurrence at each of the farms covered in this document and is discussed more thoroughly in section 3.0.

2.5 Wild Fish

The waters around the Scottish coast support a variety of fish species, including wild Salmonids which are UK Biodiversity Action Plan species. Commercial fisheries and sport fishing are of significant economic value to the area.

Aquaculture sites have been noted to be a point of aggregation for some species of fish. Interactions are minimised by careful control of fish food (as per OPs 25 and 28) and good net hygiene. The health and biosecurity of farmed stock are carefully managed as per OP2 and OP 28 to minimise the possibility of any negative impact on local populations of fish. In some instances small wild fish such as Herring or Saithe may enter pen nets during a production cycle; appropriate pen net mesh sizes are chosen to minimise the potential for this interaction, but small fry inevitably enter enclosures for the food and shelter they provide and remain within the farm for a time. Where handling activities during the production cycle have the potential to affect these extraneous species the following measures are observed:

- Wherever possible extraneous fish species will be removed from the pen enclosure (by hand net or separated by swim-through) and released
- During harvesting, grading or wellboat transfer efforts will be made to minimise involvement of extraneous fish species in the process by separating them off during the crowd for release
- Where handling of extraneous species is unavoidable, any fish compromised as a result of the process will be humanely dispatched as per OP 28

Some LD sites are within 35km of watercourses supporting Freshwater Pearl Mussel (*Margaritifera margaritifera*) which are a protected species and Qualifying Interests of the Abhainn Clais an Eas & Allt a' Mhuilinn and Foinaven SACs (Special Area of Conservation). To mitigate against and monitor for any impact on the mussels from farm activities, by way of interaction with wild salmonids which mussels are dependent on as a host for their larval-stage, these sites have Environmental Management Plans (EMPs) in place. The EMPs are approved by the Local Authority, with input from NatureScot and Marine Scotland Science, and encompass sea lice monitoring and control measures on-farm, wild salmonid monitoring at sea and in

freshwater, and a regular reporting & review process. EMPs are currently in place for sites in Loch Laxford, Badcall, Calbha, Loch a Chairn Bhain and Clashnessie Bay (Oldany).

2.6 Benthos, Water-column & Shellfish

The presence of farmed stock has a predictable, local and temporary impact on the benthos within the footprint of a farm, termed the permitted mixing zone. The biomass and stocking density on each farm is regulated by SEPA and benthic monitoring is carried out regularly as per the relevant SEPA CAR Licence to assess impact and to ensure the area of seabed impacted is as per the licence assumptions. All LDL farm sites are in the process of being transferred into the latest SEPA Regulatory Framework, which includes an increased level of benthic monitoring to allow effects on the benthos to be more accurately assessed. Between production cycles a fallow period further aids recovery of the benthos to help ensure impact remains at a sustainable level.

The use of medicines and disinfectants is carefully regulated by SEPA and all medicinal treatments undertaken are as per CAR Licence conditions to ensure there are no adverse effects to shellfish or other wildlife. Furthermore, LD operate a fish health management strategy which prioritises preventative and non-medicinal controls (as documented in OP 28), which minimises the use of consented medicines.

3. Predator Interactions

LDL will undertake all reasonable non-lethal, humane methods of control to prevent predation of our fish. Physical exclusion of predators is the primary method.

3.1 Policies to reduce the risk of predation

Removal of mortalities, with numbers and diagnosis being recorded, should be carried out daily, weather permitting.

Pen nets are adequately tensioned and weighted to protect fish from predator attack through the net. Nets are weighted in accordance with OP24 Seasite Escape Contingency and Site Specific Annexes to this procedure.

Fish pens are enclosed by top nets to deny predator access.

All nets are routinely checked for damage using underwater camera and ROVs.

Nets are routinely strength tested prior to any reuse to ensure compliance with CoGP and Technical Standard.

LDL has second-generation Acoustic Deterrent Devices (ADDs) available to keep seals away from the nets. **These devices will only be deployed on acquisition of a European Protected Species (EPS) License.**

Wildlife friendly full enclosure predator nets are deployed where appropriate on sites where environmental conditions allow. Where predator nets are deployed, the advice of Section 5 of the Code of Good Practice 'Fish Welfare & Care' will be followed. Divers are used to check correct deployment of predator nets, monitor their status during use and make any necessary repairs. Deployment of such nets at relatively sheltered sites has proven successful at deterring seal predation.

3.2 Review of predation and predation deterrent efficiency and trial work

LDL will continue to investigate new and innovative ways to deter predation. Current trials include:

- Alternative net tensioning systems
- Pen net design (e.g. false bottom designs, alternative net materials)
- Predator net design and maintenance
- Novel non-acoustic deterrents (e.g. electric fish)
- Top net design and support trials
- Continuous monitoring of state of change of seal deterrent systems

Predation and wildlife interactions are a routine item on the agenda of the weekly Production Report and monthly Health Status Report for each site, facilitating continuous assessment of deterrent measures and reactive management of any issues arising.At the end of each cycle a review of predation and predation associated stock mortalities is also undertaken by the Fish Health team. Active documentation of these reviews will be kept in the format of Site-Specific Annexes to this Procedure which will be used to determine actions and timelines for anti-predation measures at that farm site.

3.3 Actions in the event of a seal attack

On discovery of seal predation, the following must be confirmed:

- Adequate tensioning of the pen net
- Top net fully secured to pen net
- Predator net deployed (where applicable) and integrity checked

4. Version History

Version Number	Date	Nature of Revision	Revision by
Ver. 1	Feb 2013	Rewritten to include Sutherland.	
Ver. 2	Mar 2013	Section 2.5: Amended to specify wild Salmonids as a UK BAP species.	
Ver. 3	Jul 2014	Review of procedure.	
Ver. 4	Feb 2015	Request to Cull a Seal Form updated.	
Ver. 5	Mar 2016	Review of procedure Section 2.5: Amended to include extraneous fish species Request to Call a Seal Form updated.	
Ver. 6	August 2021	Full Document Review.	
Ver.7	January 2024	Full Document Review. Inclusion of Skye operations. Use of ADDs amended.	CM

CAOLAS LOCH PORTAIN

Site Information

Equipment	One group of twelve 100m circular pens arranged 2 x 6
Pen Net Specification	12m in water, 15mm mesh HDPE netting
Net weighting	Appropriately weighted froyer ring (sinker tube)
Top net	Pole supported top net system. Top nets will be black in colour with a ceiling mesh of 100mm. Side skirts have a total height of 5m with a 50mm for the first 2m above pen handrails, and 100mm mesh to the net ceiling.
Predator nets	110m circumference x 13m depth sub-surface predator nets around pens when required in response to increased predator (seal) interaction with pens and/or recorded seal-related fish mortalities. The top 2m and bottom 2m of each predator net will consist of 50mm mesh; in-between (for 9m depth) the net mesh will be 200mm square mesh. The nets will be tensioned with a lead line around the base of the net, with additional loops for the addition of extra weights if required.
Site depth	Average 23.6m CD; see also charts below for details; approx 5m tidal range

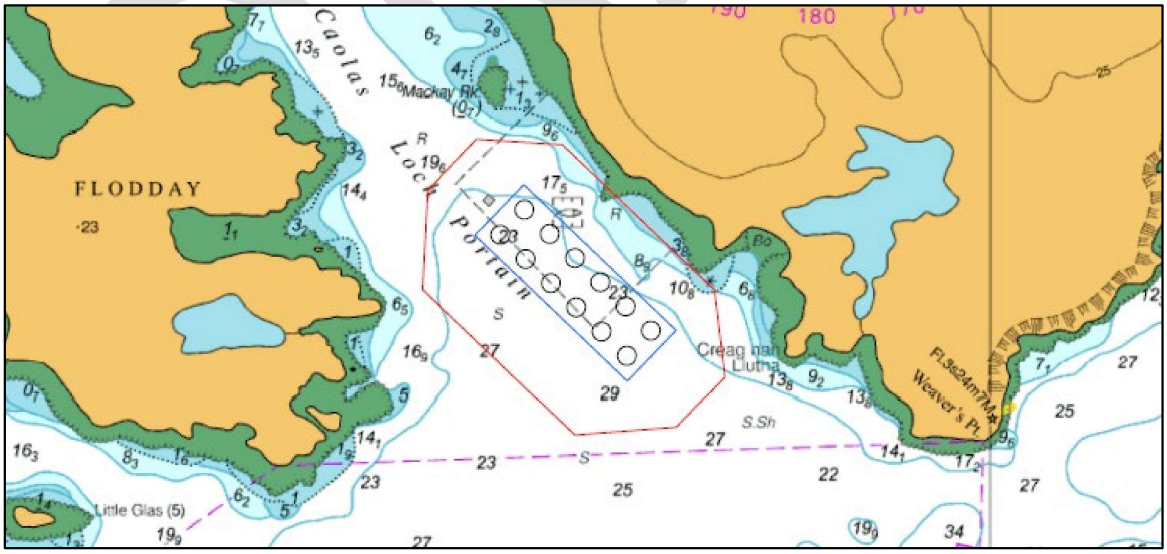

Chart illustrating site location, layout and water depth

LDL will do everything in its power to ensure that no escapes occur from the above facility. As per OP 24 Sea Site Escape Contingency Procedure, all husbandry operations (from input to harvest) and equipment will be checked to minimise the risk of escapes. In the event of a suspected escape, all actions will follow OP 24 to prevent further escape, report, investigate and take remedial action. Monofilament nets are on permanent stand-by at Shielavaig (South Uist) stored appropriately to prevent damage, to allow recapture plans to be swiftly put into place.

Site Specific Conservation Interests

- The site lies within the Loch nam Madadh SSSI & SAC, designated for intertidal & subtidal habitats and European Otter *Lutra lutra*
- Loch an Duin SSSI & Ramsar sites are adjacent to the farm, designated for diverse coastal habitats, European Otter & breeding bird aggregations
- Mointeach Scadabhaigh freshwater SSSI & SPA is approximately 4km from the site, of which breeding bird aggregations including Red Throated & Black Throated Divers are a feature
- Seabird species including Cormorants present in the area
- Common and Grey seals frequent the area around the site
- Cetaceans likely to be present in the Loch nam Madadh/Minch area, with the boundary of the Inner Hebrides & the Minches SAC, designated for Harbour porpoise, and the Sea of the Hebrides MPA designated for Minke Whale and Basking sharks (as well as fronts and geomorphology features), both approximately 3km from the site

Wildlife Record

Informal recording of wildlife sightings on walkway data sheets.

Interactions

<u>Benthic monitoring:</u>

Benthic monitoring is routinely carried out in the immediate vicinity of the farm site as is required by SEPA CAR license. The table below shows a recent history of benthic status.

Cycle	SEPA Classification	Monitoring Protocol	Comments
2010	Unsatisfactory	Extended	Site specific modelling undertaken to allow Site Specific monitoring next cycle

Cycle	SEPA Classification	Monitoring Protocol	Comments
2012	Pass - Borderline	Site Specific	Feed camera system being investigated for next cycle
2016	Pass - Borderline	Site Specific	Reconfiguration of site being modelled (circles)
2018	Not Accepted	Site Specific	Verbal confirmation from SEPA that results are satisfactory, however o official report.
2020	Satisfactory	Site Specific plus Multi-Transect	Results were compliant with Site Specific & 100m mixing-zone requirements
2021-2023	Compliant	EMP Multi Transect	Results were compliant with Site Specific & 100m mixing-zone requirements
2023-2025*	*Current Cycle*	-	-
* To be updated at the end of the current 2023-2025 production cycle			

The Caolas site is currently stocked with spring-input smolt which are reared through to harvest over a 21-23 month cycle. The minimum consented fallow period is applied between production cycles. There are grade-out options to recently acquired Skye sites. Underwater camera systems are installed in all pens to minimise feed wastage to ensure best possible benthic performance going forward. Historically the site was remodelled and reconfigured to a circular pen layout, with wider spacing between pen units reducing the potential intensity of benthic impact. The 2021 – 2023 cycle saw the successful addition of two pen units, without increase in peak biomass levels, further minimising seabed impact intensity.

Bird Predation:

Historically predation by birds has occurred to some extent after smolt input at the site, but this has not caused heavy losses:

Cycle	Percentage Mortality
2011 - 2013	0.16%

Cycle	Percentage Mortality
2014 - 2016	0.067%
2017-2019	0.033%
2019 - 2020	0.038%
2021-2023	0.07%
2023-2025*	*current cycle*
* To be updated at the end of the current 2023-2025 production cycle	

Bird interactions will be closely monitored and current mitigation measures (tensioned top nets, pen nets and secondary predator nets (when the latter are deployed)) will be maintained. Checks for ingress of birds to pens and or entanglement in top nets are conducted daily by visual inspection. Checks for entanglement in sub-surface predator nets (when deployed) are conducted fortnightly (at a minimum) using a combination of underwater remotely operated vehicle (ROV), cameras and divers.

Systematic recording of all ingress and entanglement events in top nets and sub-surface predator nets at the site will be submitted to NatureScot biannually using the NatureScot Entanglement and Entrapment Standardised Proforma. Completion of the NatureScot proforma for entanglement of birds in top nets and predator nets is the responsibility of the Site Manager. The Site Manager will submit the proformas to the Environment Manager biannually (in January and July), who will submit the returns to the relevant authority.

In addition to submitting six-monthly returns of the standardised NatureScot proforma, we will notify NatureScot and the Local Planning Authority (LPA) immediately in the event of any significant entrapment or entanglement of divers (red- or black-throated), auks (any species), or other single bird species in any predator defence nets (i.e. top nets or sub-surface predator nets). Significant is defined as:

- Involving two or more birds on any one day and/or
- A total of three or more birds in the space of any fourteen day period and/or
- Repeat incidents involving one or more birds on three or more consecutive days

Should NatureScot deem that the returns or reported events highlight entanglement/entrapment issues with the sub-surface predator nets, we will consult with the LPA and NatureScot to agree an adapted monitoring plan (to increase the frequency of pen checks) and implement any agreed mitigation measures required, for a limited period of time or throughout the deployment of the sub-surface predator nets as agreed with the LPA.

Seal Predation:

Seal predation has previously been experienced at the site, as detailed below. The table shows an increasing trend in seal-related mortalities during the current production cycle (2023-2025) at Caolas Loch Portain.

Cycle	Percentage Mortality	Comments	Deterrents
2011 – 2013	3.57%	Predation began 6 months post transfer in, and peaked during the second autumn/winter period	- Upgrade to ADDs
2014 – 2016	0.81%	Predation began 5 months post transfer in; but much improved on previous cycle	- Upgraded ADD systems in place - Upgraded net weighting
2017-2019	0.68%	Predation began 5 months post transfer in; but much improved on previous cycle	- Upgraded ADD systems in place
2019-2020	0.07%	Some predation occurring in first summer & winter, but numbers low	- ADD system in place - Lead-line in pen net base - HDPE pen net material
2021-2023	0.23%	Some predation occurring in first summer & winter, but numbers low	- ADD system removed in 2022 - Lead-line in pen net base - HDPE pen net material
2023-2025 cycle to date*	2.71% *(to 14.06.24)*	Predation began 7 months post transfer in, with high numbers lost in first winter & spring	- No ADDs in place - Lead-line in pen net base - HDPE pen net material
* Calculated up to 14/06/2024. The percentage mortality will be updated at the end of the current 2023-2025 production cycle.			

Standard anti-predation measures for the current cycle are the use of tensioned HDPE pen nets and secure top net to pen net connections around each individual pen. If/when seals are observed persistently investigating and interacting with pens, or increasing levels of seal-related mortality of fish are recorded,

additional anti-predation measures will be deployed in the form of tensioned and weighted sub-surface predator nets around the pen(s) when required. In this way, the sub-surface predator nets will be used as the final anti-predation measure within a hierarchy of measures and will only be deployed if and when required. As described in the section above, a combination of pen cameras, ROVs and divers will be used to monitor the sub-surface predator nets for wildlife entanglement, at least fortnightly, whilst the nets are deployed (see above section for full monitoring and reporting procedures if sub-surface predator nets are deployed). In addition, contracting of regular ROV netwashers will also improve net checking abilities. The results of the monitoring will be reported to NatureScot biannually using the NatureScot Entanglement and Entrapment Standardised Proforma. Completion of the NatureScot proforma for entanglement of birds in top nets and predator nets is the responsibility of the Site Manager. The Site Manager will submit the proformas to the Environment Manager biannually (in January and July), who will submit the returns to the relevant authority.

Birds:

Feeding is carried out by hand initially and then by automated feeder system. Interaction with gulls may be most prevalent during automated feeding when the birds scavenge feed as it is being spread into the pen. This has been successfully mitigated through the use of pole supported top nets. This has reduced the birds ability to gather on the top net and use their collective weight to lower the net and gain access to the feed within the pen. Monitoring of entanglement risk will be as described above.

Tensioned top nets, general house-keeping on site (especially when hand-feeding), and a staff presence on the pen group during feeding, are all used to deter this behaviour.

Recommendations

Benthic impact:

- Ongoing monitoring through seabed surveys

Anti-predation measures:

- Continue to work with manufacturers on evolving seal deterrent designs

Review Date:

March 2025 following completion of 2023-2025 cycle

SEA SITE ESCAPE CONTINGENCY PROCEDURE

1. Policies to reduce the risk of escapes

The Company shall ensure that the requirements under Chapter 4; Section 4 'Containment' of the Code of Good Practice for Scottish Finfish Aquaculture (CoGP) are complied with.

2. Pen Systems

Pen groups are selected as suitable for use on a site after taking into account production requirements, planning consents and hydrographic and wave climate conditions. In ensuring so, LDL will take advice from the manufacturers (or take due regard of manufacturers specifications) or otherwise suitably qualified persons as required.

Pen design specifications are filed in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

All equipment is installed in accordance with manufacturer's instructions. A written attestation is held from the manufacturer detailing staff competency in pen design and construction.

The persons responsible for pen installation, maintenance and inspection are employees of LDL or suitably competent contractors.

All pens are inspected daily by LDL staff attending site and signed off on the daily walkway sheet. Additional full-site checks are also carried out following severe weather conditions to ensure the continued security of the site. Any subsequent damage to equipment would be immediately informed to Senior Management and repaired. A record of repairs is held in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT. Detailed audits are also routinely undertaken by the H&S Manager.

All LDL groups are marked in accordance with the appropriate navigational legislation.

3. Moorings Systems

Moorings are selected as suitable for use after taking into account production requirements, planning consents and hydrographic and wave climate conditions. In ensuring so, LDL will take advice from the manufacturers (or take due regard of manufacturers specifications) or otherwise suitably qualified persons as required.

Mooring design specifications are filed in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

All equipment is installed in accordance with manufacturer's instructions. A written attestation is held from the manufacturer detailing component certification and staff competency in mooring design and construction.

The persons responsible for installation, maintenance and inspection are employees of LDL or suitably competent contractors. A written list of employees deemed competent is held on file in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

LDL follows manufacturer mooring maintenance plans. Additional ROV checks may also be carried out. Surface checks are completed daily by LDL staff attending site; and signed off on the daily walkway sheet. Additional checks are carried out following severe weather conditions to ensure the continued security of the site. Any subsequent damage to equipment would be immediately informed to Senior Management and repaired.

Records of mooring checks and maintenance are held in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

4. Pen Nets

LDL operates a net policy. The life span of pen nets will be determined by strength testing. As a minimum all nets are strength tested at the end of each production cycle. All new nets are permanently tagged in order to facilitate this process. Site Managers will advise the main office of net details at net arrival on site and confirm net history prior to stocking. Net usage will be recorded in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

The type of netting chosen for a pen group shall be appropriate to the expected environmental conditions and contain an adequate safety margin. Nets shall meet or exceed the standards required in Annex 7 of the CoGP. Certain nets are also reinforced at the waterline, depending on cage design and level of exposure of site. Net design specifications are filed in 9001 QUALITY\03 PRODUCTION\07 EQUIPMENT.

All pen nets are installed in accordance with manufacturer's design. A written attestation is held from the manufacturer detailing staff competency in pen net design and construction.
All nets are regularly checked for damage and signs of wear. This can occur during net cleaning, during net handling operations, by ROV, in-pen camera or through contracted dive inspection. LDL will record and sign-off net checks on the daily walkway sheet. Any damage noted will be immediately repaired by a member of LDL staff or a dive team will be contracted in to repair it. Net repairs will be recorded in the Net Log.

Handling of nets outwith the pens will be carried out in such a manner as to avoid incurring damage.

Nets will be stored away from direct sunlight.

5. Husbandry Operations

All fish handling equipment will be checked prior to use to minimise the risk of escapes. Particular attention will be given to connections in pipe work and the stitching of swim-through panels.

All fish handling activities will be supervised at all times.

No wellboat operations will proceed if weather forecast gives imminent force 7 or above, unless authorised by a Senior Manager or Director.

In the case of suspected net damage, it's not recommended to lift the net to search for the damage, as this will crowd the fish and increase the risk of an escape; possibly pushing the fish

towards a hole. Instead a dive team will be contracted to complete an investigation and any necessary repairs.

If the damage is easily identifiable; by camera / ROV; and it's possible to intervene without crowding, it's recommended to act promptly and complete the repair.

In case of suspected net damage whilst lifting the net, it's recommended to immediately drop the net and contract a dive team to complete an investigation and any necessary repairs.

6. Contingency Plan

LDL takes the threat of fish escaping from a site very seriously. Whilst LDL will do everything in its power to ensure that no escapes occur, there is still a risk that it could happen.

Thus, LDL will keep the following monofilament nets on permanent stand-by at Badcall Office (Sutherland) Shielavaig (Uist), Uig (Skye), stored appropriately to prevent damage, and to allow recapture plans to be swiftly put into place:

- Two 100m x 3.25m nets of 2" mesh for small fish.
- Two 100m x 3.9m nets of 4" mesh for large fish.

These nets are checked annually by the Area Manager and checks recorded in the Net Register.

7. Actions in the event of a suspected escape

On discovery of any incident possibly giving rise to a significant risk of escape, Senior Management must be informed immediately and actions taken to investigate.

A notice entitled 'Actions in the Event of a Suspected Escape', listing the relevant contact telephone numbers, is available on all sites for reference.

Senior Management must inform a Director immediately of the situation (as per contact list below) and an internal risk assessment will be completed to determine whether the incident gave rise to an increased risk of escape and therefore the requirement to notify Marine Scotland Fish Health Inspectorate.

As appropriate, Senior Management will then inform the relevant authorities as described below:

- Submit Initial notification - Farmed Fish Escapes to the Duty Inspector, Fish Health Inspectorate, Marine Scotland Science: email:ms.fishhealth@gov.scot.
- In the case of an event outside normal working hours contact, the on call Inspector can be reached on 0131 244 1833.
- Where appropriate, inform the relevant District Fisheries Board & Trust and other relevant parties (such as local estates; see contact list below).

8. Recapture

LDL Management together with relevant organisations will decide at the earliest possible opportunity whether recapture is deemed appropriate. If they agree a course of action which includes that nets must be deployed then management must contact the Duty Inspector from

Fish Health Inspectorate who can give verbal acknowledgement of the intention to deploy. A written application must follow within 24 hours of the acknowledgement being made.

To deploy, one of the 100m nets should be positioned along the side of the group to catch fish traveling within the group. The second net should be set at right angles to it and anchored with a weight. The second net will catch fish traveling along the side of the group. These nets must be continuously monitored and routinely brought aboard the vessel and any catch removed. Deployment should continue until no further fish are caught. All fish caught shall be culled and brought ashore to be inspected and recorded.

All recapture actions must be logged.

It is LDL's policy to issue a press release as soon as the facts and figures of the escape are known.

Final Notification Form – Farmed Fish Escapes shall be completed and submitted to Marine Scotland (email:ms.fishhealth@gov.scot), within 28 days of submission of the Initial Notification Form.

Copies of both notification forms and any associated correspondence will be retained electronically for at least 4 years in 9001 QUALITY\04 TECHNICAL\02 OFFICIAL AUTHORITIES\03 MARINE SCOTLAND\01 FISH HEALTH INSPECTORATE.

9. Contact List - Relevant Consultees / Authorities

Within Loch Duart Ltd:

Mark Warrington	[redacted]	[redacted]
Simon Maguire	[redacted]	[redacted]
Chris Orr	[redacted]	[redacted]
Hazel Wade	[redacted]	[redacted]

External Bodies:

MARINE SCOTLAND Aberdeen	Duty Inspector	[redacted]	ms.fishhealth@gov.scot
MARINE SCOTLAND Out of Hours	On-Call Inspector	[redacted]	ms.fishhealth@gov.scot
Crown Estate	Alex Adrian	[redacted]	[redacted]
Salmon Scotland	Richard Beckett	[redacted]	[redacted]
Sutherland sites:			
W Sutherland Fisheries Trust	Shona Marshall	[redacted]	[redacted]
N&W District Salmon Fishery Board	Rob Whitson	[redacted]	[redacted]

Highland Regional Council	Mark Harvey	[redacted]	[redacted]
Ardvar Estate	Michael Ross	[redacted]	[redacted]
Oldany Estate	Chris Turner	[redacted]	[redacted]
Rhiconich Estate	Richard Osborne	[redacted]	[redacted]
Scourie Estate	Alan Balfour	[redacted]	[redacted]
Westminster Estate	Dougal Lindsay	[redacted]	[redacted]
Western Isles sites:			
Outer Hebrides Fisheries Trust	Paul Hopper	[redacted]	[redacted]
Western Isles District Salmon Fisheries Board	Jason Laing	[redacted]	[redacted]
Comhairle nan Eilean Siar	Colm Fraser	[redacted]	[redacted]
Comhairle nan Eilean Siar – Out of Hours	Faire 24 (Colm Fraser)	[redacted]	
Storas Uibhist (Loch Carnan)	Darren Taylor	[redacted]	[redacted]
North Uist Estate (Lochmaddy)	Christine Macleod	[redacted]	[redacted]
Obbe Fishings (Sound of Harris)	Tim Armstrong	[redacted]	[redacted]
Skye sites:			
Skye & Lochalsh Rivers Trust	Isabel Moore	[redacted]	[redacted]
Highland Regional Council	Mark Harvey	[redacted]	[redacted]

10. Version History

Version Number	Date	Nature of Revision	Reviewed by
Ver. 7	Feb 2013	Sections numbers for easier reference. Changes to the following Sections: Section 2: Paragraph 3. Section 4: Paragraph 4. Section 5: Paragraph 2. Section 7: Paragraph 1. Section 8: Contact numbers updated	
Ver. 8	Mar 2013	Section 6: Contact protocol clarified with regard to local Fisheries Boards & Trusts Section 7: Recapture protocol clarified Section 8: Contact list separated by area.	
Ver. 9	Nov 2013	Section 8: External Bodies – SSPO Contact updated.	
Ver.10	July 2014	Sections of OP27 merged in: 5. Husbandry operations added 4. Pen nets - modified	
Ver. 11	Mar 2015	Section 2,3,4,5 & 6 updated Section 9: MSS email updated Section numbering updated	
Ver. 12	Jan 2019	Document review & update Contacts updated	
Ver. 13	April 2023	Review and update of procedure following internal audit	
Ver.14	February 2024	Document review. Section 9. Contact List, updated for Skye Sites.	CM

SEA SITE MORTALITY REMOVAL PROCEDURE

Moribund fish and mortalities should be removed from sea site pen units daily where possible and at least twice per week in accordance with RSPCA Assured standards. This is essential on grounds of welfare, fish health, accurate stock record and seal predation prevention.

1. Routine Mortality Procedure

1.1 All pen units are equipped with a basket system for effective mortality removal. Baskets are to be lifted and any mortalities removed, counted and recorded. Mortality causes are classified as per the Sea Site Farm Management Plan (FMS)-OP28 and records submitted to the office on a daily basis. Any abnormal increase in mortality should be reported immediately to Management and to the Fish Health Department for investigation.

1.2 Fallen stock removed from the pen units are to be immediately contained and transferred to sealed bins for removal ashore by Landing Craft. Mortalities are transported to a centralized collection point at Badcall shore base in Sutherland and placed in a sealed skip to prevent odour. Skips are then uplifted as needed by licensed waste carriers. On Hebridean sites they are taken ashore to Loch Carnan, Lochmaddy or Sound of Harris (Otternish slipway) shore base for immediate removal by a registered contractor. All mortalities are disposed of in accordance with Category 2 Animal By-Product laws by a licensed waste management operator.

2. Mass Mortality Contingency

2.1 In the event of mass mortality for example due to an algal bloom, rapid removal of fallen stock is essential on grounds of health and welfare of surviving stock, potential environmental impact and maintaining containment security. Loch Duart Ltd has access to suitable equipment and/or contract divers to allow this to be achieved.

Should the worst happen, the following actions will be taken:

- The most suitable means to rapidly remove fallen stock from pen units will be implemented. Air lift systems and/or divers may be utilized.
- Mortalities will be immediately contained in sealed bins on removal from pen units
- Additional sealed skips for containing fallen stock will be sourced and uplifted as needed
- Pen nets and enclosures will be thoroughly inspected to ensure no damage has occurred
- The Fish Health Inspectorate will be notified if necessary, as per the SS FMS (OP28)

2.2 In the event of a mass cull being required for example due to a notifiable disease, a condition compromising fish welfare or contamination e.g. with petro-chemicals, a suitable cull method will be implemented (see Sea Site FMS – OP28 for further details). This may involve anaesthetic overdose or standard harvest procedure and is dependent on:

1. The speed at which the fish need to be culled and disposed of
2. The reasons of the mass cull
3. The requirements of any statutory authorities
4. Appropriate discharge consents for the site
5. Availability of equipment and staff

2.3 All culled fish will be immediately contained in bins and transferred ashore. Disposal will comply with any statutory authority requirements and Category 2 Animal By-Product Legislation.

2.4 When all mortalities have been removed all equipment and PPE shall be scrubbed and disinfected. The site managers shall insure that no equipment is moved to another site before this process occurs.

2.5 A report shall be made to the Managing Director as to the cause of the mass mortality; this will be undertaken by the Operations Manager, Area Manager and where appropriate a Fish Biologist and other members of the production team.

3. Version History

Version Number	Date	Nature of Revision
Ver. 1	October 2012	New Document.
Ver. 2	May 2013	First paragraph amended to state that mortalities are to be removed 'daily where possible and at least twice per week'
Ver. 3	February 2021	Full Document Review following inhouse Audit (completed by GD)