Screening for Appropriate Assessment and Natura Impact Statement

Volume 1 – Main Report

Renewal of Marine Finfish Aquaculture Licence at Deenish Island, Co. Kerry

Licence Site Ref: T6/202

Produced by

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On behalf of

MOWI Ireland

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1. Introduction

1.1. Background

This 'Screening for Appropriate Assessment and Natura Impact Statement' report accompanies an aquaculture licence renewal application by Comhlucht Iascaireachta Fanad Teoranta (trading as MOWI Ireland) to the Department of Agriculture, Food and the Marine (DAFM) for site T6/202 (the site is also referred to herein as the Deenish site). The site is located off Deenish Island, a small island situated approximately 5 km off the Co. Kerry coast between Ballinskelligs Bay and Kenmare Bay (see **Figure 1-1**). The aquaculture licence renewal application for includes a request to **1)** amend the boundaries of the licenced area and **2)** amend the operating conditions attached to the licence.

1) Amendment to Site Boundaries:

The boundaries of the existing are shown in red in **Figure 1-1**. For the aquaculture licence renewal application, the applicant requests that the boundaries of the licensed area be amended to those shown in blue in **Figure 1-1**.

2) Amendment to Licence Operating Conditions:

The existing licence has an annual harvest restriction of 500 tonnes and an allowable input of 400,000 fish. A temporary amendment to the licence was granted in 2011 under special conditions and upheld by ALAB in 2012 to change the licence specification to input 800,000 smolts every second or every other year; i.e. the equivalent number (twice) of smolts as the yearly licence, but on a biannual basis and to replace the annual harvest tonnage to a maximum standing biomass as is appropriate to the smolt input number.

For the aquaculture licence renewal application the applicant requests that the operating conditions of the licence be amended to allow a maximum allowable biomass (MAB) of 2,200t at the site if the environmental protocols show no detriment to the environment.

1.2. Purpose of this Report

Specifically this report has been prepared to address Article 6(3) obligations under the European Community (EC) Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (commonly known the Habitats Directive), which is transposed into Irish legislation under the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

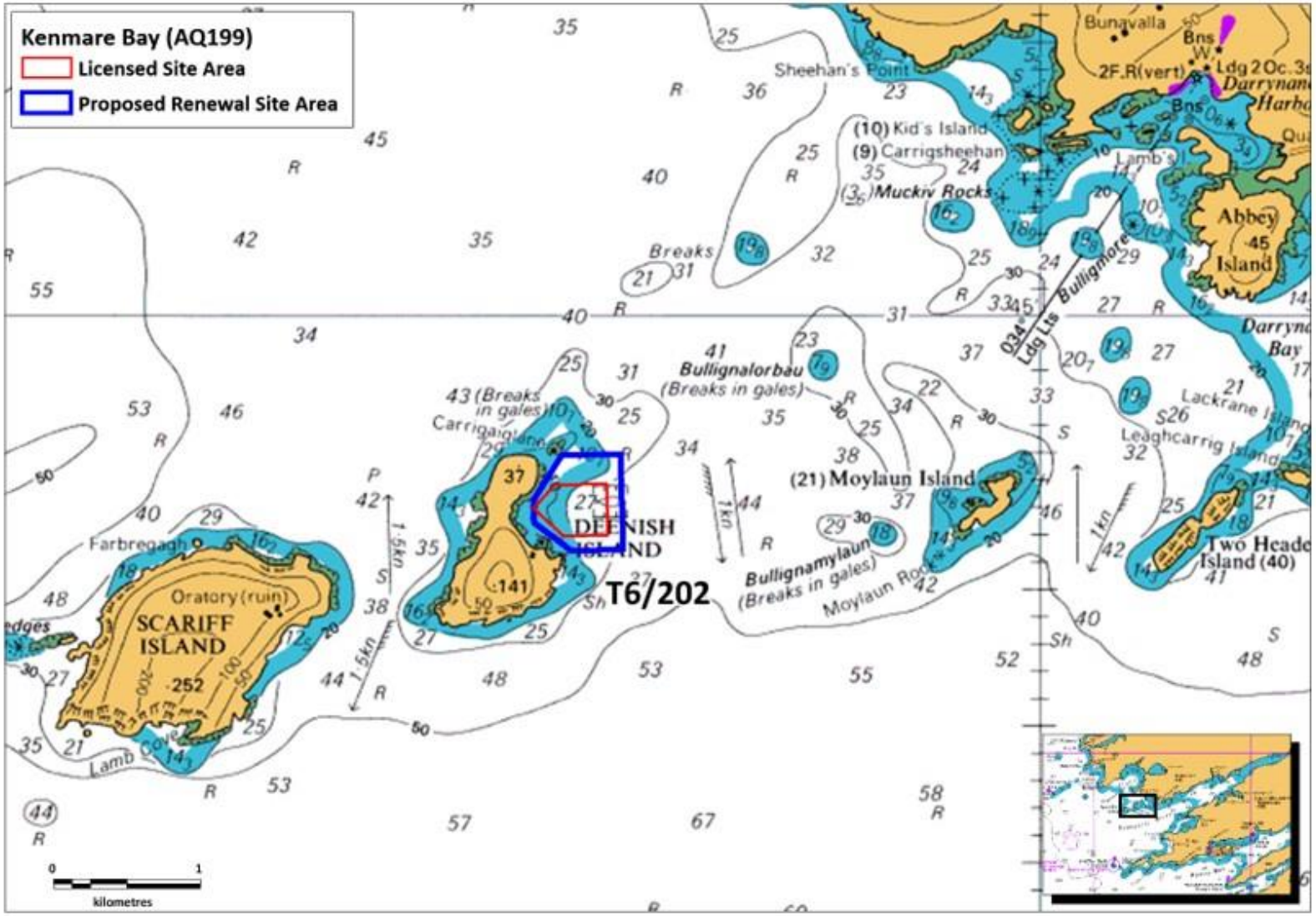


Figure 1-1: Location of the site at Deenish Island. Current site boundaries presented in red, proposed boundaries outlined in blue.

1.3. Appropriate Assessment Process

Articles 3 to 9 of the Habitats Directive provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of protected sites known as Natura 2000 sites. Following the requirements of Article 6(3) of the Habitats Directive, implemented into national law under Regulation 31 of the Habitats Regulations SI 94/1997 and subsequently amended and consolidated in the European Communities (Birds and Natural Habitats) Regulations 2011, if a plan or project is not connected with, or necessary for the management of a protected site and is likely to have a significant effect on the feature for which the site is designated either individually or in combination with other plans or projects, an Appropriate Assessment (AA) is required to assess whether a plan or project will have any adverse effect on the integrity of Natura 2000 site(s) in view of the Conservation Objectives set for the features (habitats and/ or species) for which the sites is designated.

Natura 2000 sites in Ireland that form part of the Natura 2000 network of protected sites include Special Areas of Conservation (SACs) designated due to their significant ecological importance for species and habitats protected under Annexes I and II respectively of the Habitats Directive, and Special Protection Areas (SPAs), designated for the protection of populations and habitats of bird species protected under the EU Birds Directive (Council Directive 2009/409/EEC). Features for which SACs and SPAs are designated are called Special Conservation Interests or Qualifying Interests (collectively referred to herein as Qualifying Features).

The staged assessment process undertaken to meet Article 6 (3) obligations is described in **Section 1.3.1** and **Section 1.3.3** below.

1.3.1. Stage 1 - Screening for Appropriate Assessment

At the Screening for AA stage, all potential impacts resulting from the plan or project which might have a likely significant effect on a Natura 2000 site are considered both in isolation and in combination with impacts from other plans and projects.

The Stage 1 assessment comprises four steps:

1. Determining whether the project or plan is directly connected with or necessary to the management of the site;
2. Describing the project/ plan and other projects/ plans occurring in the area that in combination have the potential for having significant effects on Natura 2000 sites;
3. Identifying the potential effects on Natura 2000 sites; and

4. Assessing the significance of any effects on Natura 2000 sites.

Where significant effects of the plan or project on Qualifying Features (habitat and/or species) can be excluded, a clear, reasoned and scientifically rational explanation is to be provided. A Screening Statement should be provided to reflect this outcome (i.e. the Screening Statement should conclude that significant effects can be excluded as the Stage 1 Screening for AA stage).

Where the likelihood of a significant effect cannot be excluded (screened out) for a Qualifying Feature for which the site is designated on the basis of the objective scientific information, the Screening Statement should reflect this. A precautionary approach to the assessment of potential likely significant effects is fundamental and, in cases of uncertainty, it should be assumed the effects could be significant.

The competent authority carries out the Screening for AA (see **Section 1.3.2** below).

1.3.2. Screening for Appropriate Assessment Determination

The Screening for AA is performed by the competent authority based on the information included in the Screening for AA and any other information considered necessary to reach a conclusion regarding likely significant effects associated with the proposed plan or project.

In the light of the conclusions of the screening assessment of the implications for the site(s), the competent authorities shall agree to the plan or project only after having ascertained that it will not result in likely significant effect to the site(s) concerned.

1.3.3. Stage 2 - Natura Impact Statement

Where the likelihood of a significant effect of a plan or project cannot be screened out, the plan or project must proceed to Stage 2 AA and requires the preparation of a 'Natura Impact Statement' (NIS) to enable the competent authority in carrying out the AA. An NIS is a report comprising the scientific examination of a plan or project and the relevant Qualifying Features of Natura 2000 Sites, to identify and characterise any possible implications of the project individually or in combination with other plans or projects in view of the Conservation Objectives of the site or sites, and any further information including, but not limited to, any plans, maps or drawings, scientific information or data required to enable the carrying out of an AA by the competent authority.

The NIS must include information that addresses the following:

- Identify the likely impacts of the proposed activity; and,

- Assess whether the project would adversely affect the integrity of a Natura 2000 site, and where necessary identify mitigation to avoid, reduce or offset adverse effects.

The competent authority carries out the AA (see **Section 1.3.4** below).

1.3.4. Appropriate Assessment Determination

An AA is performed by the competent authority based on the information included in the NIS and any other information considered necessary to ascertain whether the project will have an adverse effect on the integrity of the Natura 2000 site(s). This process and the conclusions should be clearly documented.

In the light of the conclusions of the assessment of the implications for the site(s) and subject to the provisions of Habitats Directive Article 6(3), the competent authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site(s) concerned.

1.3.5. Purpose of this Report

The purpose of this Screening for AA and NIS report is to provide the competent authority (DAFM) the necessary information required to conduct the AA and determine in view of best scientific knowledge, and in the view of the Conservation Objectives of the site, whether the proposed project, either individually or in combination with other plans and projects is likely to have a significant effect on a Natura 2000 site and, where necessary, to ascertain whether any such effect would adversely affect the integrity of Natura 2000 sites.

The integrity of a Natura 2000 site is defined as the coherence of the site's ecological structure and function, across the whole of its area, which enable it to sustain the habitat, complex of habitats and/ or populations of species for which the site has been designated. An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to Favourable Conservation Status (FCS) for the relevant Qualifying Feature (habitat or species) as it did at the time of designation.

In summary, Stage 1 AA Screening undertaken for the proposed project (see **Section 2** below) concluded that it cannot be excluded on the basis of objective scientific information that the project, individually or in combination with other plans or projects, will have a significant effect on a Natura 2000 site, therefore a Stage 2 AA was required. A NIS has therefore been prepared (see **Section 3**) to provide the relevant scientific information to enable the carrying out the AA by the competent authority to determine whether or not the proposed project activities would adversely affect the integrity of a Natura 2000 site. The NIS objectively concludes following an examination, analysis and

evaluation of the relevant information, including the nature of the predicted impacts from the proposed survey operations and with the implementation of the mitigation measures proposed, that the project, either alone or in combination with other plans or projects, will not adversely affect (either directly or indirectly) the integrity of any Natura 2000 site and there is no reasonable scientific doubt in relation to this conclusion.

An Environmental Impact Assessment (EIA) of the proposed project was undertaken to support the aquaculture licence renewal application. A report[2], which summarises the EIA undertaken, has been prepared and submitted alongside the application.

1.3.6. Previous Appropriate Assessment undertaken by the Marine Institute

The Deenish site is located within Kenmare River SAC (Site Code: 002158). An AA of aquaculture activity in Kenmare River SAC with respect to the Qualifying Features of the site was undertaken by the Marine Institute on behalf of DAFM. A report supporting the AA was prepared in 2017 (Marine Institute 2017[3]), the conclusions of which are summarised in '*Appropriate Assessment Conclusion Statement by Licensing Authority for aquaculture activities in Kenmare River Special Area of Conservation (SAC)*' (Marine Institute 2019[4]) (see **Appendix 1**[5]). The assessment considered the potential impact of aquaculture on the Qualifying Features of the site. Current activities licenced at the T6/202 Deenish site were considered in the AA. The assessment concludes that the level of aquaculture activity (both existing and proposed) at the time of the assessment are consistent with the Conservation Objectives for the Annex I Habitats and Annex II Species, with the following exceptions:

- 'Zostera dominated community', Maerl dominated community and '*Pachycerianthus multiplicatus* community' – An expired licence for the culture of scallops on the seabed

[2] Document File Name: *JN1524 Environmental Impact Assessment - Volume 1 Non-technical Summary, Volume 2 Main Report, Volume 3 Appendices - Licence Renewal of Marine Finfish Licence at Deenish Island, Co. Kerry - Licence Ref: AQ199 – Licence Site Ref: T6/202'.*

[3] Marine Institute, 2017. Report supporting Appropriate Assessment of Aquaculture and Fisheries Risk Assessment in Kenmare River SAC (Site Code: 2158). https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessments/KenmareAAandRAReport171017.pdf

[4] Marine Institute, 2019. Appropriate Assessment Conclusion Statement by Licensing Authority for aquaculture activities in Kenmare River SAC. https://www.agriculture.gov.ie/media/migration/seafood/aquacultureforeshoremanagement/aquaculturelicensing/appropriateassessmentconclusionstatement/2019new/AppAssessmentConStatement%20AquacultureActivitiesKenmareRiverSAC090919.pdf

[5] Appendices included in '*Appropriate assessment Screening and Natura Impact Statement - Volume 2 – Appendices - Licence Renewal of Marine Finfish Farm at Deenish Island, Co. Kerry Licence Ref: AQ199 – Licence Site Ref: T6/202*'.

overlaps these three keystone communities identified within Qualifying Interest habitat for which the SAC was designated. As the culture of scallops on the seabed is deemed disturbing to these community types no overlap with a disturbing activity can be tolerated.

- 'Maerl dominated community' within the SAC boundaries but outside of the Qualifying Interest habitat areas for which SAC was designated. The characterising species of the community, Maerl, is a key contributor to biodiversity and being sensitive to disturbance this community type is afforded a high degree of protection; no overlap with disturbing activity can be tolerated.
- 'Zostera-dominated community'- Zostera is as a key contributor to biodiversity and is sensitive to disturbance. The thresholds for impact on this habitat type is low and any significant anthropogenic disturbance should be avoided.
- 'Harbour seal' – A licenced oyster farm and an application for mussel culture sites are in very close proximity to a seal moulting site that is considered an important location for the species. An expansion of intertidal aquaculture activity to areas in the immediate vicinity of the haul out locations would likely increase the risk of disturbance of the seals during the moulting period. The mussel culture site application is an expansion of existing operations and it is likely that seals will be habituated or tolerant of disturbance from this activity.
- 'Harbour seal' – A mussel farm in Ardgroom Harbour overlaps a seal breeding site.

It should be noted that the above exceptions are not linked to the T6/202 Deenish site, but relate to other licence sites (lapsed, existing and/ or proposed) in the Kenmare Bay area.

1.4. Guidance

This Screening for AA and NIS report has been prepared with regard to the relevant provisions of the EU Council Directive 92/43/EEC and Ireland's EU (Birds and Natural Habitats) Regulations 2011 (as amended).

The layout of this report follows national guidance on the preparation of marine NISs, namely;

- Department of Arts, Heritage and the Gaeltacht – National Parks and Wildlife Service (DAHG_bookmark12 - NPWS) (2012[6]), *Marine Natura Impact Statement in Ireland Special Areas of Conservation, A Working Document*

[6] https://www.npws.ie/sites/default/files/general/Marine%20Assessment%20Working%20Document.pdf

The report has also being prepared following with regard the following:

- *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities, Department of the Environment, Heritage and Local Government*. (DEHLG, 2009, rev. 2010)
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission*. (European Commission, 2000)
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission.* (European Commission, 2001)
- *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission*. (European Commission, 2007)
- *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC.* (European Commission, 2007)
- *Interpretation Manual of European Union Habitats. Version EUR 28. European Commission*. (European Commission, 2013),
- *Chartered Institute of Ecology and Environmental Management (2016), Guidelines for Ecological Impact Assessment in the UK and Ireland*. (CIEEM, 2018)
- *The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.0. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland*. (NPWS, 2013)
- *The Status of EU Protected Habitats and Species in Ireland. Species Assessments Volume 3, Version 1.0. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.* (NPWS, 2013)
- Recent Irish and European case law on the Habitats Directive.

2. Stage 1 - Screening for Appropriate Assessment

This section provides the information required for the competent authority to undertake a Screening for AA and determine whether the proposed project, either in isolation or in combination with other plans and projects, in view of best scientific knowledge, is likely to have a significant effect on any Natura 2000 site. Specifically, it aims to:

- Provide information on, and assess the potential for the proposed project to significantly impact on Natura 2000 sites; and
- Determine whether the activities proposed, alone or in combination with other projects, is likely to have significant effects on Natura 2000 sites in view of their Conservation Objectives.

DAHG - NPWS (2012) guidance on the preparation of marine NISs outlines that the screening assessment process should provide information to address the following elements:

1. Description of the plan or project, and local site or plan area characteristics. The description must include purpose (rationale) of the plan or project and outline whether the plan or project is a standalone or part of a larger programme of development. The description must cover the full scope of the proposed plan or project (i.e. investigation/ development phase and operational phase) and consider whether the proposed plan or project proposal will create a requirement or imperative for future plans or projects to be licensed at this or other sites .
2. Description of the receiving environment. The description must outline the environmental setting of the proposed plan or project and its surrounds. The description must also consider whether Annex I habitats or the habitats of Annex II species are likely to be in the area. The description must also outline the operations/activities already occurring in the area.
3. Identification of relevant Natura 2000 sites, and compilation of information on Qualifying Features and Conservation Objectives.
4. Screening assessment to establish whether the plan or project is likely to have a direct, indirect or in-combination effects on a Natura 2000 site(s) based on a consideration of the likely interactions.
5. Screening statement with conclusions on whether or not an AA is necessary for the relevant a Qualifying Features

For the current Screening for AA elements **1** to **5** are addressed in **Section 2.1** through **Section 2.5** below.

It should be noted that DEHLG guidance (2009, rev. 2010) outlines that all Natura 2000 Sites within the potential zone of impact of the plan or project must be considered in the AA process; to this end, and

following UK guidance on AA[7], Natura 2000 Sites within 15km of a project or plan are considered. It is also noted in the guidance that '*the distance must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects*'. Therefore, for this current report the assessment of likely significant effect takes into account:

- Qualifying Features of SACs and SPAs located within 15km of the project (see **Section 2.3.2**).
- Wide ranging Qualifying Features of SACs and SPAs located more that within 15km from the project that may be found in the vicinity of the project area (see **Section 2.3.3**).

2.1. Description of the Project

The following sections describes the operations that will be undertaken at the site should DAFM approve renewal of the licence and approve the change the site boundary.

2.1.1. General Location

The T6/202 Deenish site is located off the eastern side of the uninhabited Deenish island, which is situated off the coast of Co. Kerry between Ballinskelligs Bay and Kenmare Bay (see **Figure 1-1**). Salmon production has been operating at the site since 1995. Between 1995 and 2004 the operations at the site were undertaken by three operators namely, Silver King Seafoods Ltd., Murpet Fish Ltd. and Gaelic Seafoods (Ireland) Ltd. Since 2008 the site has been operated by MOWI.

2.1.2. Area and Layout of the Proposed Site

The boundaries of the existing licenced area are shown in red in **Figure 2-1** with the new proposed boundaries shown in blue. The spatial extent of the existing site is 14.5ha while the spatial extent of the new proposed site is 33.5ha. Coordinates for the corner points of the proposed site denoted in **Figure 2-1** are presented in **Table 2.1**.

Table 2.1: Coordinates and area of aquaculture site for renewal.

Site Corner	WGS84		Area (Ha)
	Lat	Long	
NW	51 ° 44' 30.814911''	-10° 12' 51.81302''	33.5

[7] Scott Wilson, Levett-Therivel Sustainability Consultants, Treweek Environmental Consultants and Land Use Consultants. 2006. Appropriate Assessment of plans. http://www.landuse.co.uk/Downloads/AppropriateAG.pdf

NE	51° 44' 31.207155''	-10° 12' 30.981764''	
SE	51° 44' 10.19204''	-10° 12' 29.957247''	
SW	51° 44' 9.848952''	-10° 12' 48.182258''	
South Inshore	51° 44' 16.069564''	-10° 12' 1.516496''	
North Inshore	51° 44' 20.919178''	-10° 12' 1.753844''	
NW	51° 44' 30.814911''	-10° 12' 51.81302''	

2.1.3. Site Description

The location of the aquaculture site in the lee of Deenish Island provides shelter to the site from westerly and southerly swells (**Figure 2-1**). The seafloor underneath the northern pens is primarily flat. Sediments in this area are predominantly sands (ranging to fine and medium sand) with varying proportions of coarse shell fragments. Water depths increase toward the southern pens (Boland, 2015). The sea floor under the southern pens is uneven and comprises gravel and boulder and rocky reef.

In Kenmare Bay, to the northeast of Deenish Island bay, the spring tidal range is typically 3.5m while neap tides range from approximately 1.6m to 1.8m. The flooding tide off the headlands of Kenmare Bay runs north northwest and the ebbing tide runs south. Tidal flows in Kenmare Bay are slack particularly on neap tides due to the orientation of the bay and the relatively deep waters in the area particularly at the mouth to Kenmare Bay. The seabed is relatively deep at the main outer channel of Kenmare Bay range from 60m to 75m while depths in the enclosed bays of Ballinskelligs are generally less than 30m. Water depth along the western boundary of the proposed licenced area closest to Deenish is Island is approximately 6m. Depths increase eastward away from the island reaching approximately 30m and 33m respectively on the northern and southern boundaries.

Neap and spring tide drogue surveys of the tidal stream flows at the Deenish site were conducted in 1997. The drogue surveys found that minimum current magnitudes at the site occurred around the turn of the tide and ranged from 0.02m/s to 0.07m/s with a maximum current speed mid-flood period ranging between 0.05m/s and 0.26m/s.

A hydrographic study undertaken at the site in April to May 2010 showed water currents close to the seabed, at mid-water depth and at the surface were 6.3cm sec^{-1}, 7.9cm sec^{-1} and 9.2cm sec^{-1} respectively. Mean current direction was WNW close to the seabed, WNW/ NW at mid-water and NW at the surface (Watermark, 2012). The maximum tidal range was 3.41m on Spring tides. Minimum tidal range was 1.44m.

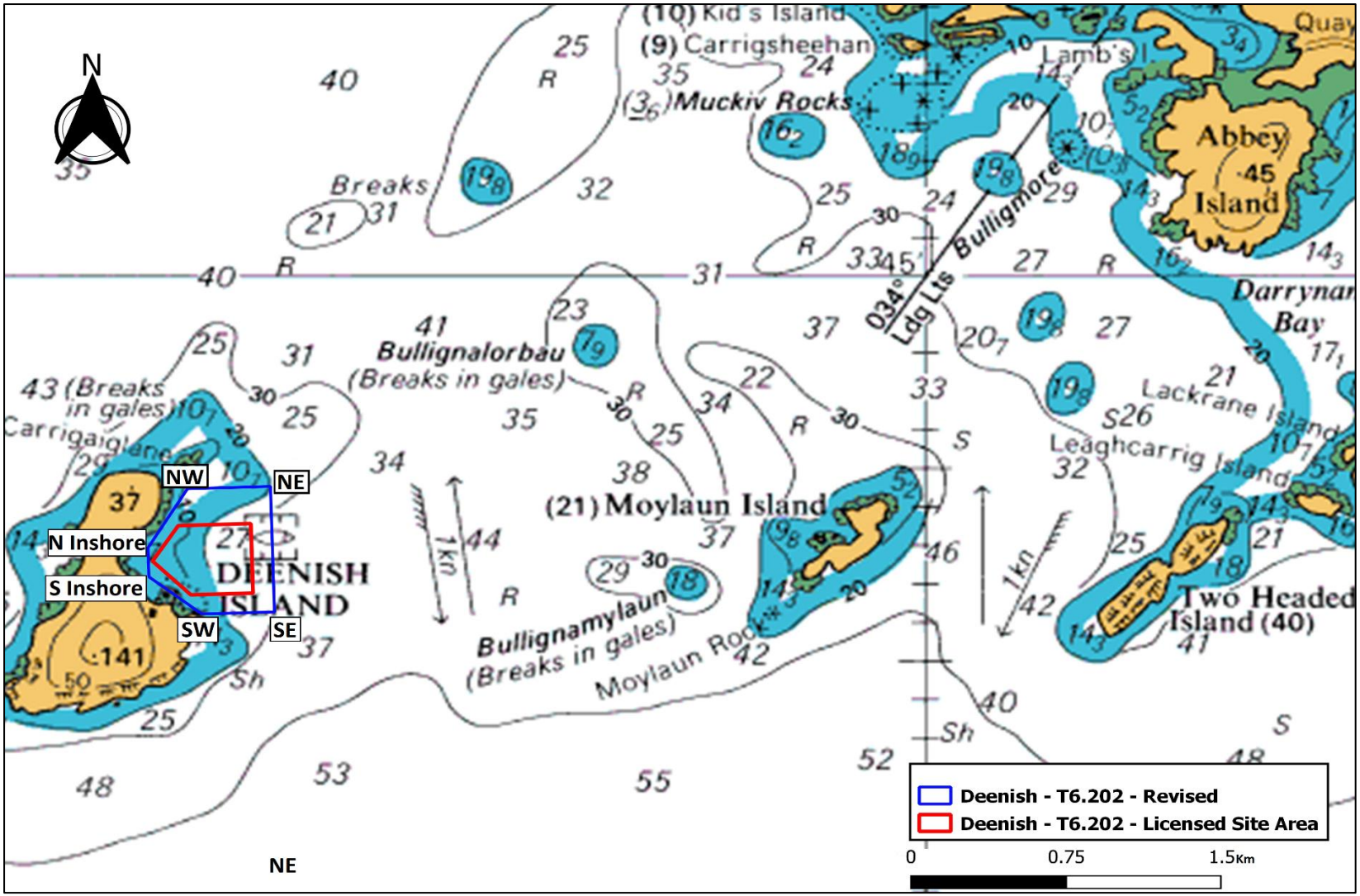


Figure 2-1: Location of the site at Deenish Island, Co. Kerry. Current site boundaries presented in red, proposed boundaries outlined in blue. Coordinates for the corner point of the proposed site are presented in Table 2.1.

2.1.4. Pens

A maximum of 15 Aqualine pens will be deployed at the site. The pens at the site will be set out in a 5 x 3 grid arrangement (see **Figure 2-3**). Corner site buoys with navigational lights (4 sec 2 mile) will be located at the corners of the licenced sites as illustrated in **Figure 2-3** which shows the farm layout.

Two of the pens will have an 8m sidewall, 12m total depth and 126m circumference, which will give a total capacity of 23,607m^3 . The remaining 13 pens will have a 126m circumference, a net wall depth of 11m and adepth to the cone of 20m, which will give a total capacity of 11,803.44m^3.
The overall total capacity of the 15 pens together will be 253,773.82 m^3. These will be supported within heavyduty polyethylene or steel base frames set at regular intervals around the floatation ring, upon which stanchions will be mounted to support the heavy duty handrail that runs around the pen; see**Figure 2-4**. Pen nets, mooring bridles and sinker ropes (if required) and seal nets (if required) will besupported off the base frames of the floatation ring. Sinker tubes will also be used. Fence nets andbird (top) nets will be supported off the handrails and stanchions. There will be radar reflectors onthe pens. The pen layout is shown in **Figure 2-5**. Cross section view of the pens are shown in **Figure2-6** and **Figure 2-7**.

2.1.5. Pen Moorings

The pens will be held to in the mooring grid by mooring bridles attached to the pen floatation rings. The mooring grid is a heavy duty rope-work structure comprising a series of squares, each of which supports a pen. In this case, the mooring grid will be submerged so that farm work vessels can pass freely across it. At every grid square corner, there will be a grid buoy supporting the grid. These are also the points at which the mooring bridles, which support the pen floatation rings within the grid squares, join the grid. The grid is then held in shape, submerged and in tension by moorings which, in turn, are anchored to the seabed. The moorings and anchors at the Deenish are shown in **Figure 2.8** and **Figure 2.9**.

The shape of the grid will be maintained by the tension provided through the grid moorings. Each mooring assembly will comprise a heavyweight braided nylon rope running from each grid corner, which will be attached to a length of heavy duty stud link anchor chain of specified weight, which will join in turn to an anchor of specified design and weight. The purpose of the stud link chain is to maintain the tension on the grid with changing tidal water depths. Mooring bridles will be used to connect the four corners of each grid square to at least eight points on the pen floatation ring. This will maintain the position and shape of the pen floatation ring within the grid square with minimal deformation, even in adverse sea conditions. Radar reflectors and navigational lights (4 sec 2 mile) will be positioned on the four corners of the grid block. Corner site buoys with navigational lights (4 sec 2 mile) will be

located at the corners of the licenced sites. The deployment and mooring of the pens are covered by Standard Operating Procedure (SOP) SOP25462 and SOP26638 (seeAppendix2.1). Grid moored systems require the application of more or less even tension on all moorings to keep the grid taught. Tension is maintained by the use of adequate moorings, anchor chains and anchors, to suit seabed and hydrographic conditions and the dimensions of the system. Grid frame integrity is checked biennially by divers; see *SOP28940* in **Appendix 2.1**.

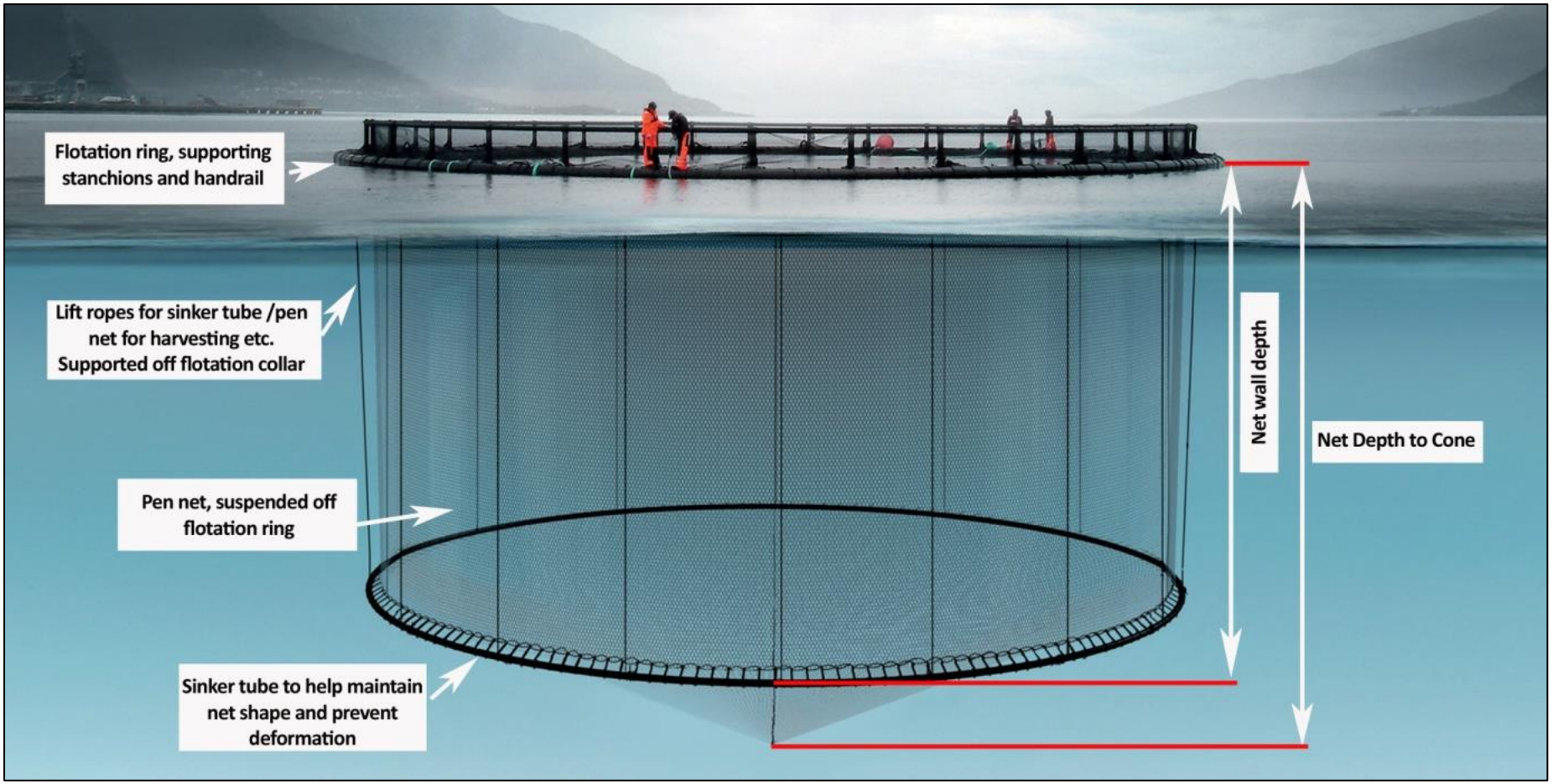


Figure 2-2: Image showing the general nature of the pen type proposed for the site (Source: Akvagroup; modified from www.akvagroup.com).

46298
57495

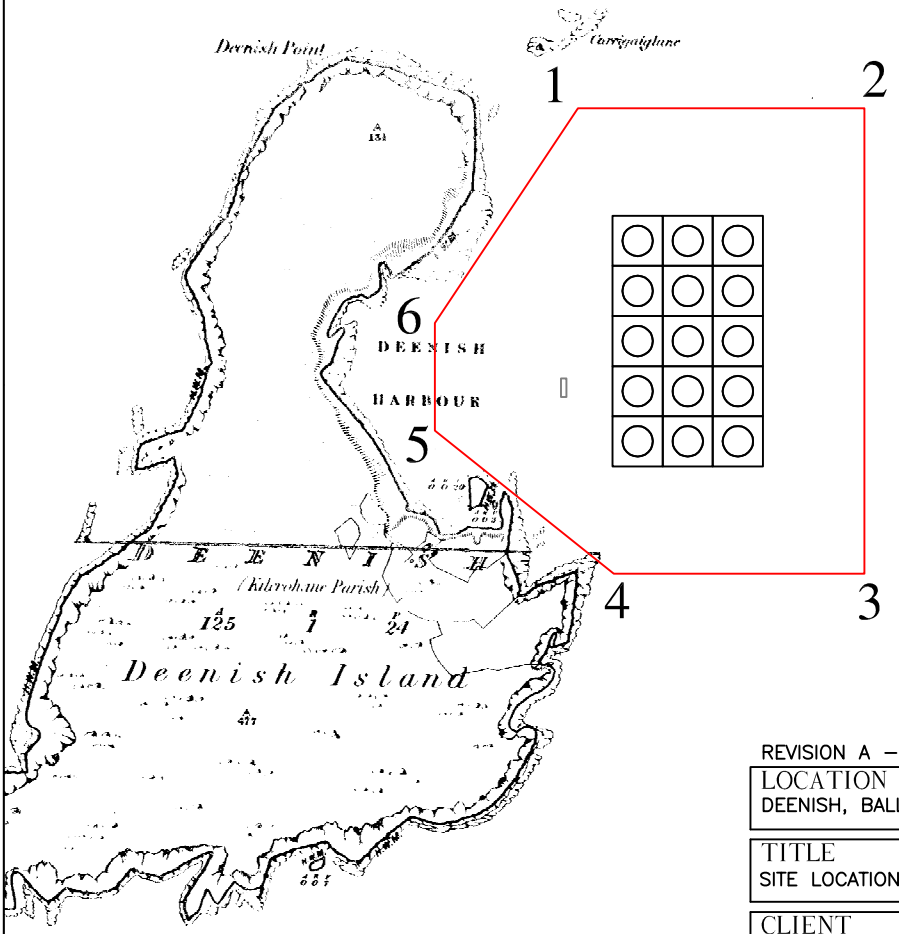
Site Location Map

48115
57595

Salmon Farm Site at Deenish,
Ballinskelligs Bay, Co. Kerry.
Site Location

Site Co-Ordinates (ING) :	Eastings	Northings
1.	47100	56650
2.	47500	56650
3.	47500	56000
4.	47150	56000
5.	46900	56200
6.	46900	56350

Grid Co-Ordinates (ING) :	Eastings	Northings
NW.	47148	56500
NE.	47358	56500
SE.	47358	56150
SW.	47148	56150



REVISION A – DAFM COMMENTS

LOCATION
DEENISH, BALLINSKELLIGS BAY, CO. KERRY.

TITLE
SITE LOCATION MAP

CLIENT
MOWI IRELAND

DRAWING No.	DRAWN BY	SCALE	DATE
H1902-15A	William Gallagher	1:10560@A4	NOVEMBER 2022

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46298
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0 100 200 300 400 Metres
0 150 300 450 600 750 Feet

OUTPUT SCALE: 1:10,560

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ING CENTRE POINT COORDINATES
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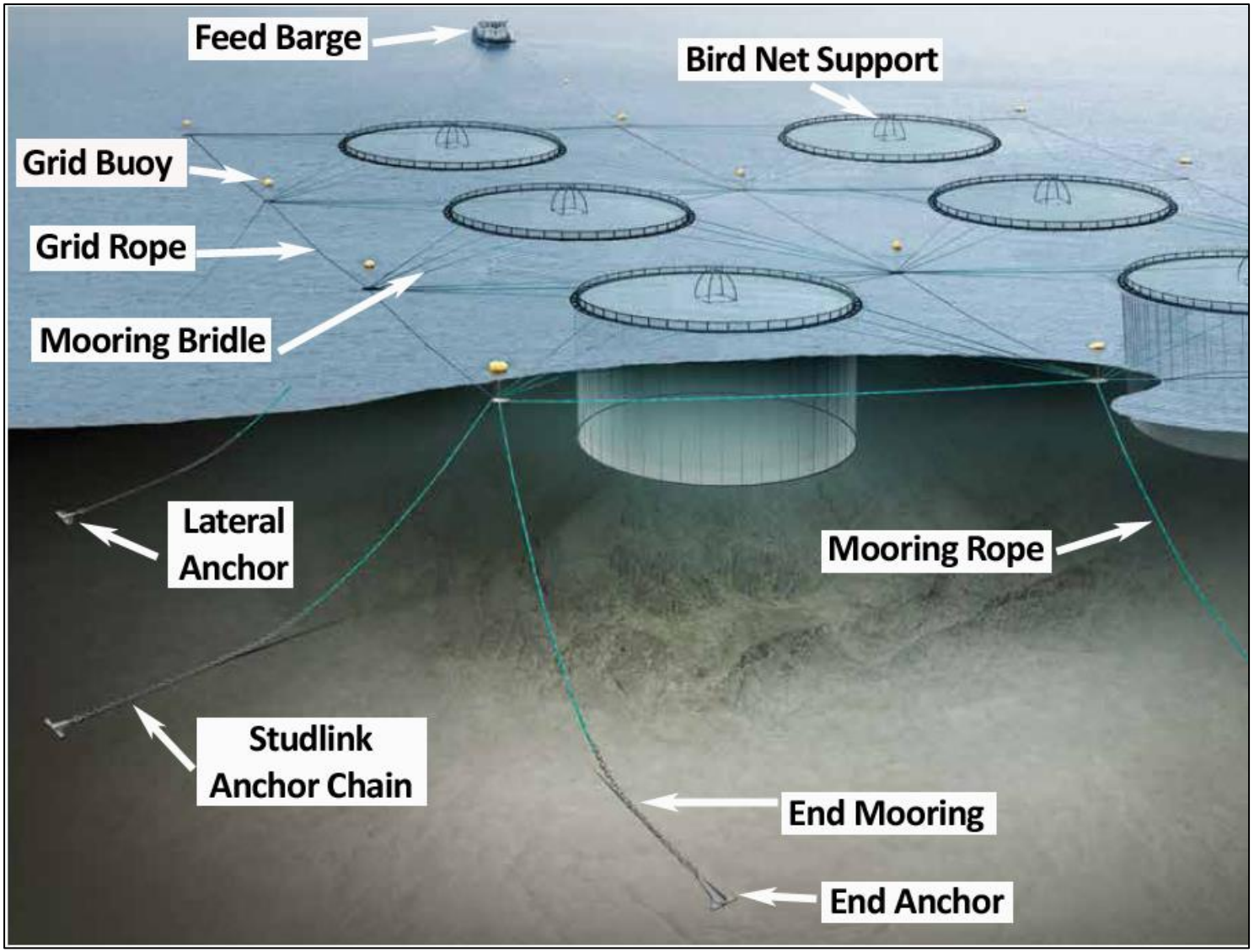

Figure 2-4: Generalised pen and farm layout with associated moorings (Source: Akvagroup; modified www.akvagroup.com).

NOTES -

Site Co-Ordinates (ING) :	Eastings	Northings
1.	47100	56650
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3.	47500	56000
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5.	46900	56200
6.	46900	56350

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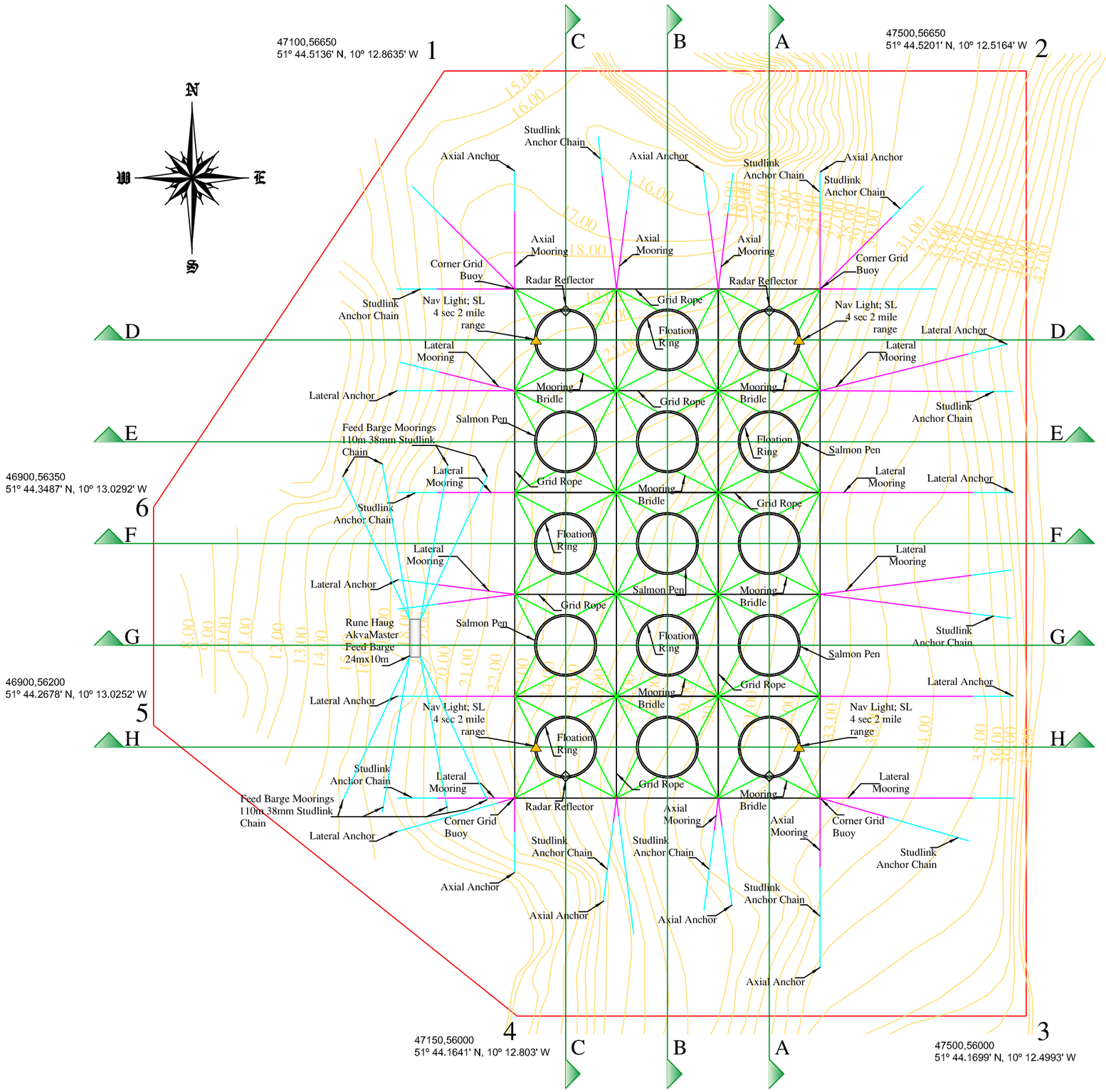

REVISION A – DAFM COMMENTS

NOTE-
LEVELS RELATE TO BELOW LAT

LOCATION
DEENISH, BALLINSKELLIGS BAY, CO. KERRY.

TITLE
OVERALL SITE LAYOUT

CLIENT
MOWI IRELAND

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NOTES -

Site Co-Ordinates (ING) :	Eastings	Northings
1.	47100	56650
2.	47500	56650
3.	47500	56000
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5.	46900	56200
6.	46900	56350
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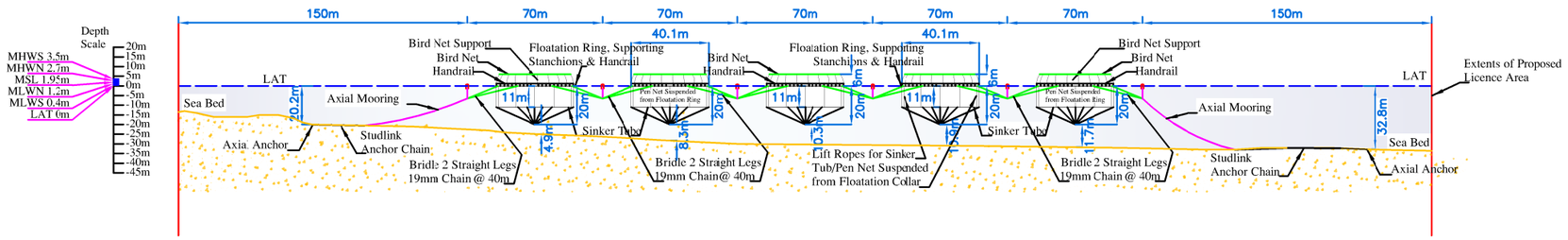

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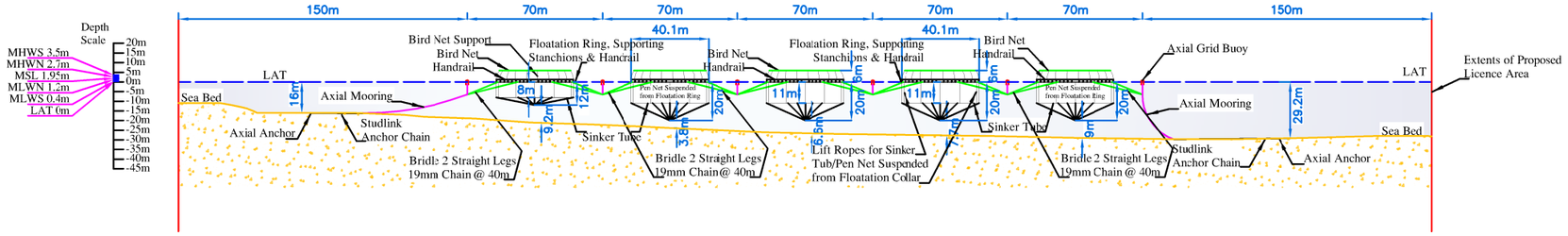

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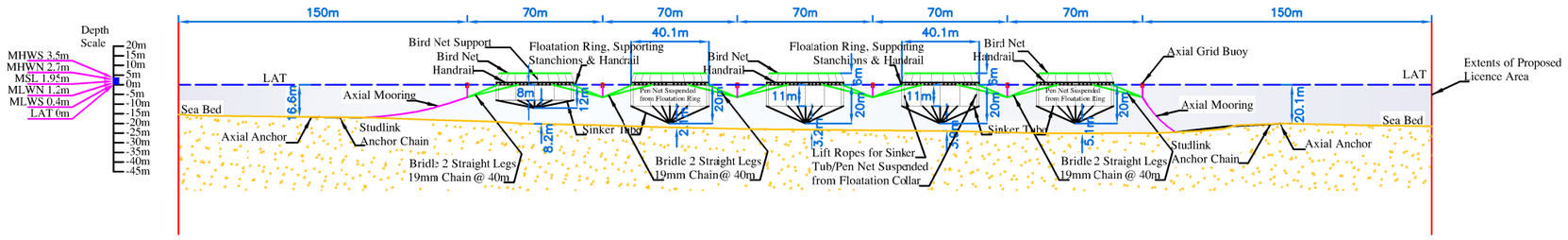

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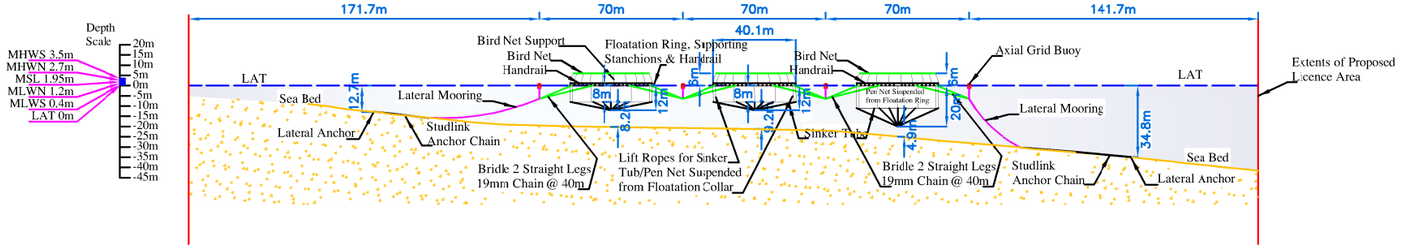

SECTION D-D

REVISION A – DAFM COMMENTS

NOTE-

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LOCATION
DEENISH, BALLINSKELLIGS BAY, CO. KERRY.

TITLE
SITE SECTIONS

CLIENT
MOWI IRELAND

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NOTES -

Site Co-Ordinates (ING) :	Eastings	Northings
1.	47100	56650
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3.	47500	56000
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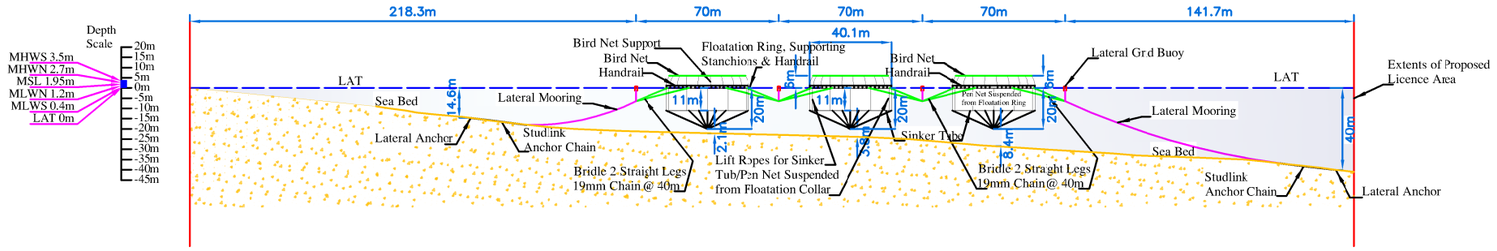

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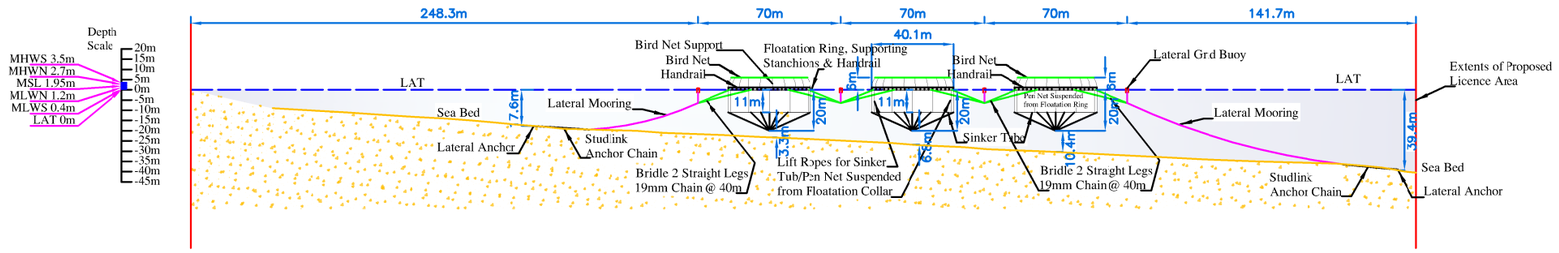

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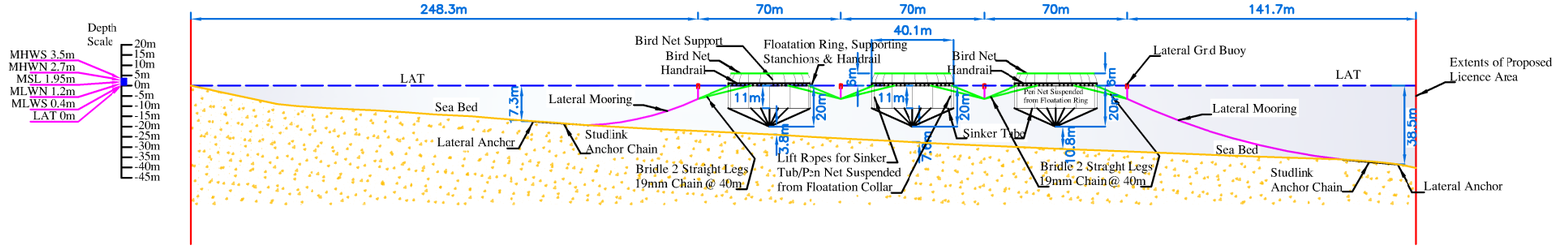

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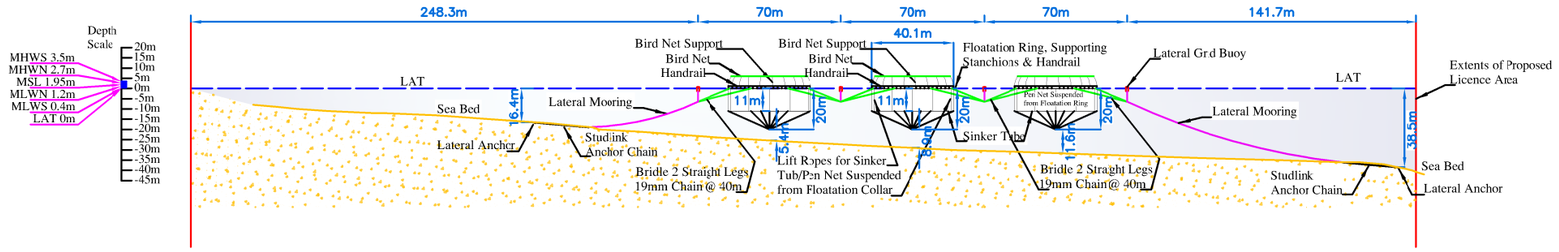

SECTION H-H

REVISION A – DAFM COMMENTS

NOTE-

LEVELS RELATE TO BELOW LAT

LOCATION
DEENISH, BALLINSKELLIGS BAY, CO. KERRY.

TITLE
SITE SECTIONS

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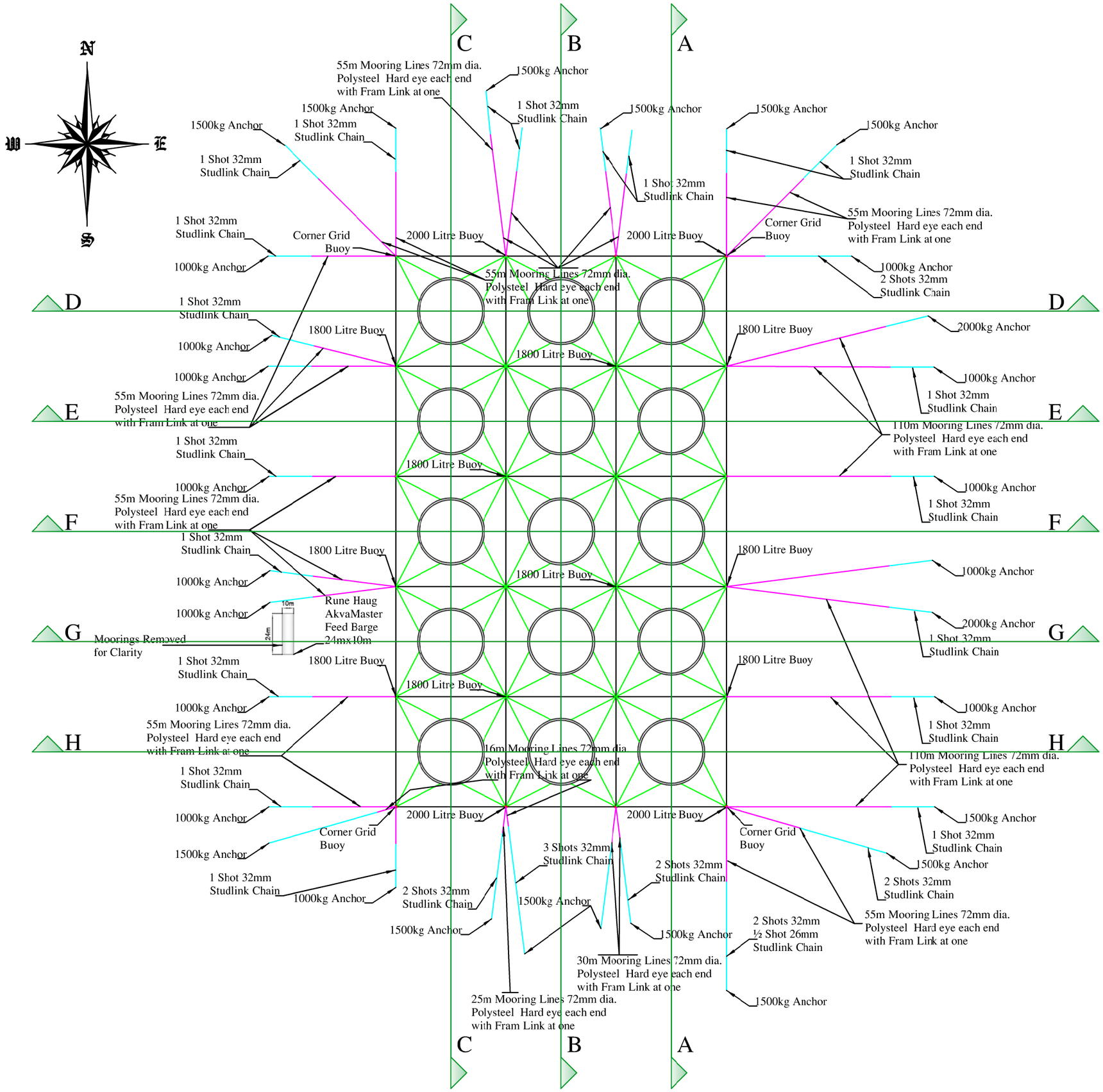

REVISION A – DAFM COMMENTS

NOTE-
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LOCATION
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TITLE
PLAN LAYOUT

CLIENT
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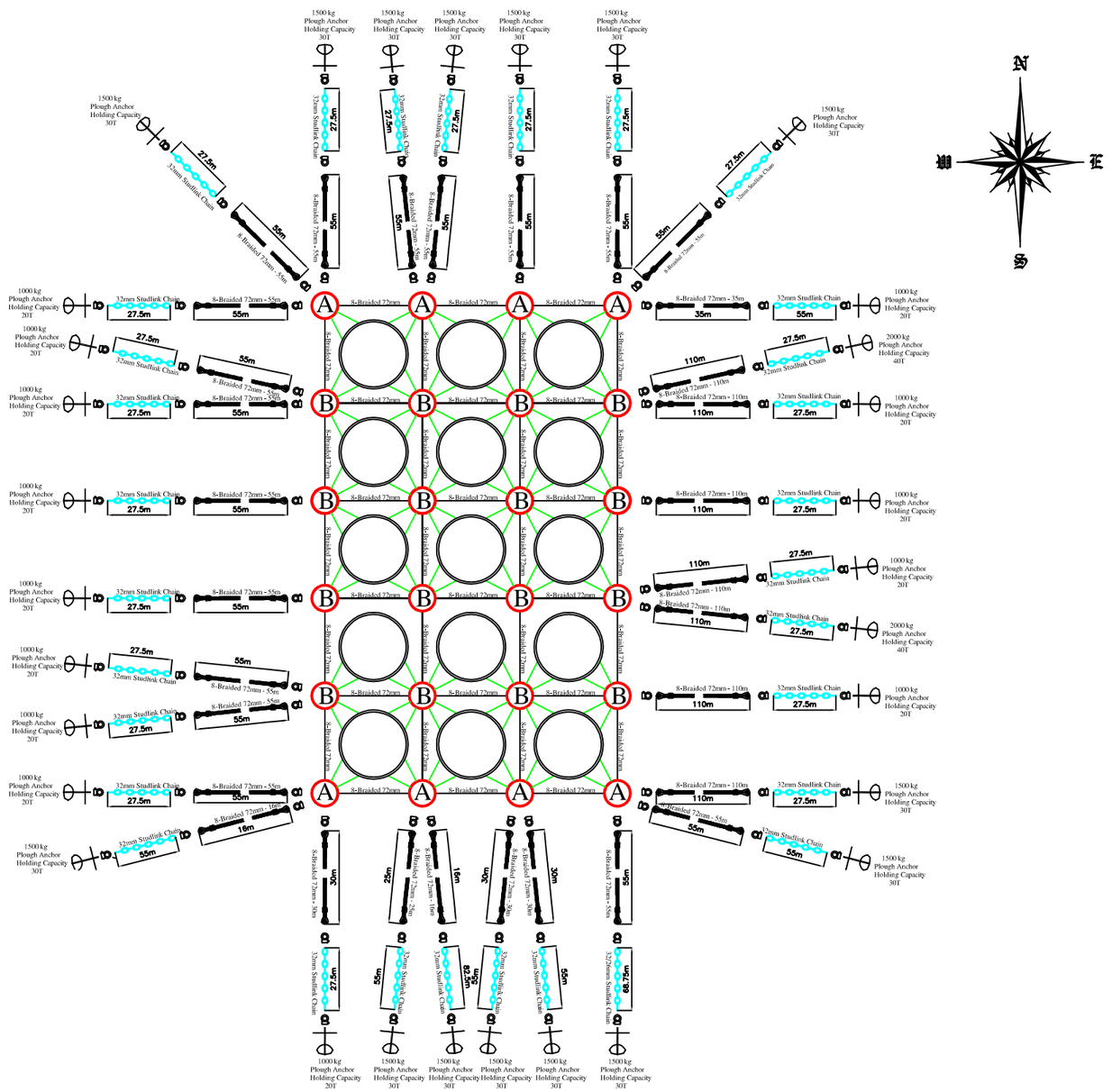
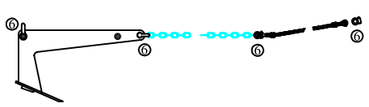
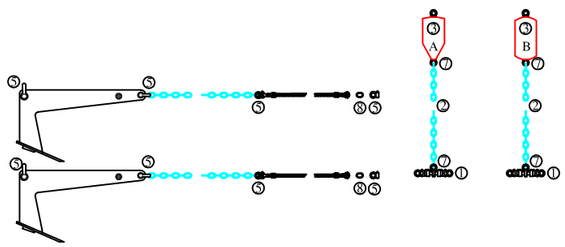
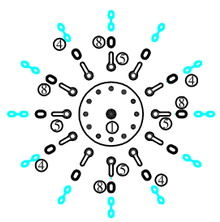




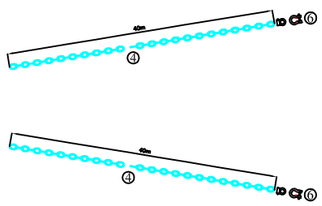
Mooring Line Layout



Details of Grid and Mooring Lines



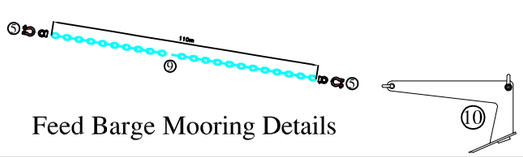
Mooring Plate



Bridle Details

SPECIFICATION REQUIREMENTS

1: Mooring Plate MK 70T
2: Chain for Buoys 22mm 5 metres
3: Buoys
A - 2000 Litre Provinor Aqua 2000 Yellow or similiar
B - 1800 Litre Cipax Cylindrical Buoy CB 1800 Grey or similiar
4: Bridles 19mm Longlinked Galvanised 40 metres
5: Mooring Shackle MBL 60 T
6: Mooring Shackle MBL 40 T
7: Mooring Shackle MBL 28 T
8: Fram Link Blue Line Masterlinks Yellow or similiar
9. 32mm Studlink Chain
10. 1500kg Plough Anchor



Feed Barge Mooring Details

LOCATION
DEENISH, BALLINSKELLIGS BAY, CO. KERRY.

TITLE
COMPONENT DETAILS

CLIENT
MOWI IRELAND

DRAWING No.	DRAWN BY	SCALE	DATE
H1902-14A	William Gallagher	NO SCALE@A3	NOVEMBER 2022

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REVISION A – DAFM COMMENTS

2.1.6. Nets

Nets will be made of knotless nylon sheeting. In compliance with organic standards, no net antifouling treatment will be used. Smolt nets, with a smaller mesh size than grower nets, will be installed at the beginning of the cycle. Specifications for the pen nets and top nets are detailed in the Application Form.

Nets will be cleaned *in-situ* on a regular basis throughout the growth cycle using a 7-head K-188-30 Idema net cleaner, linked to an Idema K-188-399-SD-JD-150, 150hp diesel-powered pressure washer. The cleaning head is raised and lowered up and down the sidewalls of the pen using a jib and capstan, also mounted on the vessel. The net washing system and mode of operation can be seen in **Figure 2-10**.

Net cleaning and Idema washer maintenance are carried out as per *SOP25468* which is included in **Appendix 2.2**. Nets will only be changed when the need arises. Regular diver inspections will check for net damage. Minor repairs are generally made by divers *in situ* whilst washing, disinfection and larger repairs are carried out either in the company's shore-based facility at Ballycrovane Pier or at Dinish Island, Castletownbere. Net checking, changing and mending will be carried out as per *SOP28941*, *SOP26166* and *SOP28646* (see **Appendix 2.2**). At the end of each cycle, the fish pens are recovered to shore for maintenance.

Dark-coloured bird (top) nets will be used to protect the stock against bird predation throughout the life cycle.

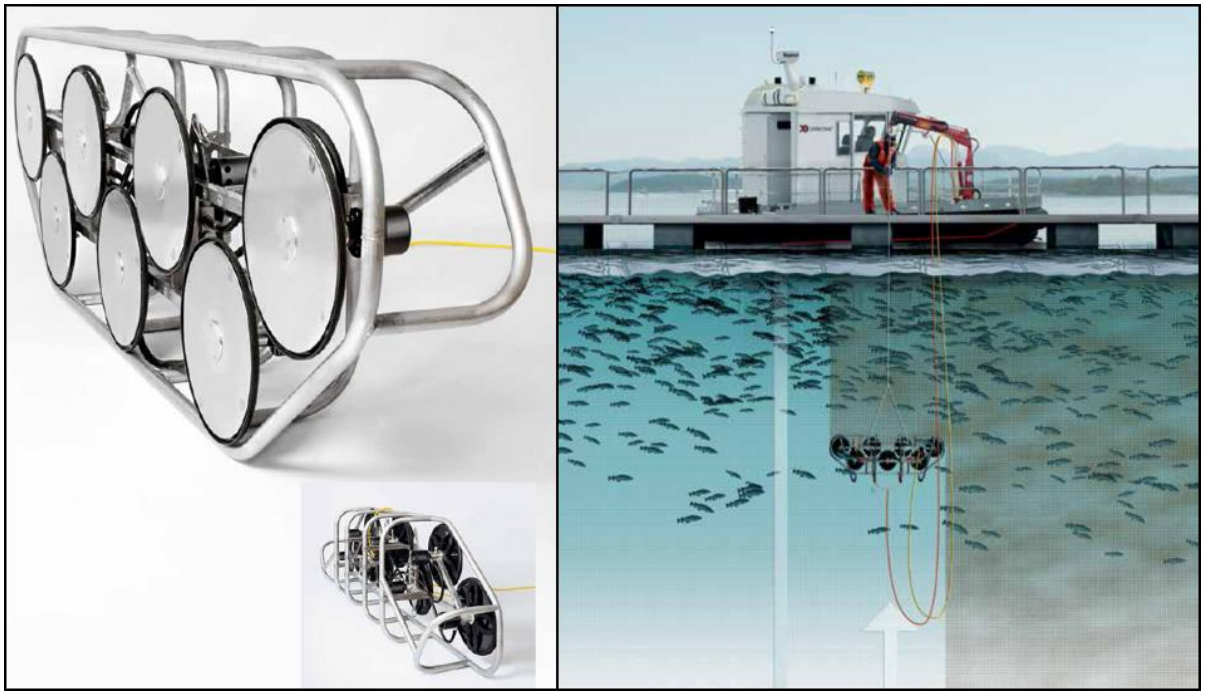


Figure 2-10: Net cleaning with the IDEMA net washer (© Akvagroup; www.akvagroup.com).

2.1.7. Shore Based Facilities

Figure 2-11 shows the access routes to and from the aquaculture site. Feed storage, diving and staff facilities will be located at the Cork County Council pier at Travara (denoted 4 on **Figure 2-11**). Travara pier will also be the main access point for service vessels to and from shore and will serve as the mooring point for vessels when not in use. **Figure 2-11** shows the access routes to Travara pier from the R571 and R575 regional roads which may be used by staff accessing the pier.

Vessels that may be travelling between multiple locations (such as the wellboat) have the potential to transfer Invasive Alien Species (IAS) such as Didemnum, Styela, Undaria etc. from one location to a new location. The MV Grip Transporter Wellboat is chartered for MOWI use only. It is registered on the Aquaculture Animal Transport Register as a 'Specialist Transporter' in compliance with SI No. 261 of 2008 regarding the Health of Aquaculture Animals and products (https://www.fishhealth.ie/fhu/moving-fish-shellfish/transporting-aquaculture-animals). As a specialist transporter, the well boat is obliged to comply with water exchange rules and biosecurity management and cleaning protocols which includes the external surfaces of the vessel.

The size and nature of traffic to and from the site will consist of 7-10 MOWI employees (7 full time on site with remaining fish health, operations/maintenance and admin staff split between 4 other sites) and approximately 11 contracting staff. During harvesting this will increase by a further 6 due to the presence of MOWI harvest crew on the Christina R harvest vessel.

An articulated lorry operated by O'Callaghan transport will bring feed to the site at a minimum of once per week (maximum of four times per week). An approved ABP transporter will collect mortalities a minimum of once per week, the interval depending on the rate of mortality at the sites. Additional traffic will occur during harvesting when an articulated lorry will bring the fish to the processing factory, the regularity depending on the harvest schedule.

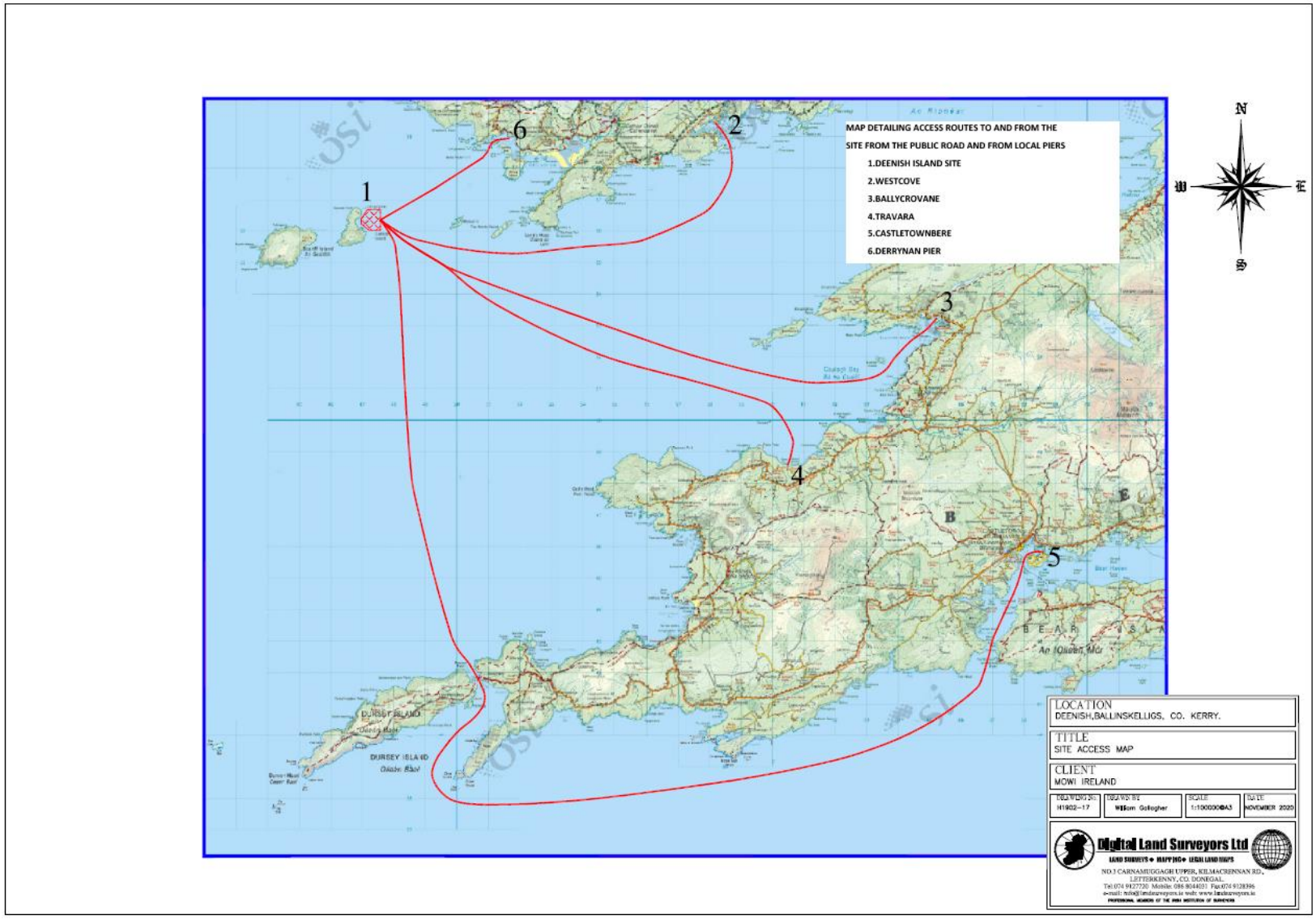


Figure 2-11: Access route to and from site.



Figure 2-12: Access route to and from the onshore facilities from the main R571 and R575 road.

2.1.8. Service vessels

The sites will be serviced by the following vessels:

- 1 x 16m work vessel.
- 1 x 7m work boat.
- 1 x 5m PolarCirkel HDPE boat.

These vessels will be used to transfer feed, equipment and crew and will have the capacity to carry out a wide range of day to day farm tasks including towing, anchor handling and net changing.

The well boat, MV Grip Transporter is under long-term lease to MOWI and is used for smolt transfer, counting, grading, bath treatment and harvesting (see **Figure 2-13**). The MV Grip Transporter was Norwegian built in 1993 and is 60.4 m in length, with a beam of 11m and a draught of 4.45 m. A reduced 969KW Caterpillar main engine powers the vessel, with a 93 KW Caterpillar auxiliary engine. The vessel has a total well tank capacity of 1,250 m^3 for fish containment. It has six circulation pumps, considerable water chilling capacity and a 4-channel, 50 kg per hour oxygen/ozone generation system. For fish moving, counting and grading, the vessel is equipped with two 5,000 litre vacuum pumps, two fish counters with a 200 to 300 tonnes per hour capacity and a 100-300,000 per hour smolt counter plus a ten track, three-way grader with separate counters, capable of grading and counting up to 60 tonnes of fish per hour. It is also fitted with six deck cranes of up to 24 tonne-metre lift. This vessel will be moored at Killybegs, Co. Donegal.



Figure 2-13: The proposed well boat MV Grip Transporter (© Magnar Lyngstad, MarineTraffic.com).

2.1.9. Production Model

The production cycle at the site will be 24 months long that includes fallowing and will operate under a policy of strict separation of generations, with an 'all in all out' model with no movement during the grow-out phase.

Table 2.2 shows the production and harvest models for the Deenish site. Approximately 650,000 smolts with an average weight of 75g will be added to the pens at the beginning of each 24 month cycle (March). The smolts will be S1 (full year) stock of Fanad/ MOWI strain from the Altan and/ or Pettigo smolt units in Donegal.

Smolts will be transferred in accordance with *SOP25478* with stock development monitored in accordance with *SOP25451* (**Appendix 2.3**). Following transfer, the smolts will grow out to an approximate mean weight of 2.5 kg in approximately 13-14 months post transfer. After this time, they will be counted, graded and redistributed in preparation for harvest (fish may not always be counted at grading, particularly if passive grading is employed (*SOP30997*)). The proposed site is projected to hold a maximum total biomass onsite of approximately 2,200 tonnes (model estimate 2,177 tonnes highlighted in yellow in **Table 2.2** at peak stocking density of ≤ 10kg/m^3. Model estimate of 9.5 kg/m^3 illustrated in red text in **Table 2.2**.

Peak biomass will occur between June and July of Year 2 in each production cycle (see **Table 2.2**). Mean harvest weight is expected to range between 4.5kg and 5.6kg. Projected harvest mean fish weight (based on MOWI standard growth data) can be seen in **Figure 2-14** while mean weight growth for one production cycle is shown in **Figure 2-15.** Mortality levels throughout the production cycle are estimated at 19.2%. Harvesting will begin in July of year 2, approximately 17 months after the smolts were transferred to the site. Harvesting will take place on board a harvest vessel at sea (dead-haul) and will then be transferred to the processing factory in Rinmore, Co. Donegal via articulated lorry in insulated 30m^3 Food Grade Tankers. The total harvest weight of 2,672 tonnes (model est. 2,671.9 tonnes) of salmon will be completed by the end of December (month 22), some 6 months later.

The mean cycle Feed Conversion Rate (FCR) for the stock held at the site is projected to be 1.25. Essentially, 1.25 kg of dry, proprietary salmon feed will be required to achieve each 1 kg growth of salmon (as wet weight). This FCR is readily achieved using modern salmon feeds and feed application technology. FCR is the most influential parameter in the growth of stock and in the discharge of organic wastes from salmon farm sites. At a mean FCR of 1.25:1, 3,285.1 tonnes of organic salmon feed will be fed to the stock in each production cycle. This is based on the assumptions that 650,000 smolts weighing 48.8 tonnes are inputted to the system each cycle and that the final harvest weight is 2,671.9 tonnes. This means that the weight of the fish produced (or total fish growth) on the site in each cycle

will be 2,623.3 tonnes (2,671.9 – 48.8 tonnes). The weight of fish produced (2,623.3 tonnes) multiplied by the FCR of 1.25 results in the requirement for 3,285.1 tonnes of feed. **Figure 2-16** shows the mean biomass gain, feed fed tonnes and FCR for one production cycle.

Table 2.2 shows that the intended maximum stocking density of fish at the Deenish site is 9.5 kg/m^3. This is low by international standards and 1/5 of the peak stocking levels used for salmon in the past. This is in line with animal welfare principles and organic salmon farming standards to which MOWI operate their organic units. The advantage of low stocking densities includes benefits to fish health, survival, scale and fin integrity, growth rate and the evenness of fish weight mean distribution in the pen population. In addition, there will be benefits in more diffuse deposition of settleable solids beneath pens as a result of the lower stock biomass standing over each square meter of seabed.

Site T6/2023 will be fallow for 3 months at the end of the harvest period from December of year 2 prior to the input of the next generation of smolts in the following new cycle in March.

Table 2.2: Production cycle for T6/202.

Year	Month	Months growth	Fish number		Mortality		Mean weight gms		Total Biomass T		Mean SD @ pen volume 230,165	Biogain / month T	Harvest			FCR	Feed used T / month
			begin month	end month	per month %	number/ month	begin month	end month	begin month	end month			Number	MW kg	Tonnes		
1	Mar	1	650,000	633,750	2.50	16,250	75	101	48.8	64.0	0.3	15.3	0	0	0	0.95	14.5
1	Apr	2	633,750	624,244	1.50	9,506	101	141	64.0	88.0	0.4	24.0	0	0	0	0.95	22.8
1	May	3	624,244	619,250	0.80	4,994	141	198	88.0	122.6	0.5	34.6	0	0	0	1.00	34.6
1	Jun	4	619,250	616,154	0.50	3,096	198	275	122.6	169.4	0.7	46.8	0	0	0	1.10	51.5
1	Jul	5	616,154	613,073	0.50	3,081	275	375	169.4	229.9	1.0	60.5	0	0	0	1.20	72.6
1	Aug	6	613,073	610,007	0.50	3065	375	505	229.9	308.1	1.3	78.2	0	0	0	1.20	93.8
1	Sep	7	610,007	604,517	0.90	5490	505	670	308.1	405.0	1.8	97.0	0	0	0	1.23	118.8
1	Oct	8	604,517	597,263	1.20	7,254	670	880	405.0	525.6	2.3	120.6	0	0	0	1.25	150.7
1	Nov	9	597,263	588,304	1.50	8,959	880	1,130	525.6	664.8	2.9	139.2	0	0	0	1.27	176.8
1	Dec	10	588,304	574,773	2.30	13,531	1,130	1,417	664.8	814.5	3.5	149.7	0	0	0	1.27	190.1
1	Jan	11	574,773	564,427	1.80	10,346	1,417	1,745	814.5	984.9	4.3	170.5	0	0	0	1.27	216.5
1	Feb	12	564,427	561,041	0.60	3,387	1,745	2,120	984.9	1,189.4	5.2	204.5	0	0	0	1.27	259.7
2	Mar	13	561,041	554,308	1.20	6,732	2,120	2,550	1,189.4	1,413.5	6.1	224.1	0	0	0	1.27	284.6
2	Apr	14	554,308	549,874	0.80	4,434	2,550	3,025	1,413.5	1,663.4	7.2	249.9	0	0	0	1.27	317.4
2	May	15	549,874	546,025	0.70	3,849	3,025	3,540	1,663.4	1,932.9	8.4	269.6	0	0	0	1.27	342.3
2	Jun	16	546,025	539,472	1.20	6,552	3,540	4,036	1,932.9	2,177	9.5	244.4	0	0	0	1.27	310.4
2	Jul	17	539,472	447,999	1.20	6,474	4,036	4,534	2,177	2,031.2	8.8	236.4	85,000	4.500	382.50	1.27	300.2
2	Aug	18	447,999	324,415	0.80	3,584	4,534	4,975	2,031.2	1,614.0	7.0	146.7	120,000	4.700	564.00	1.27	186.4
2	Sep	19	324,415	186,819	0.80	2,595	4,975	5,248	1,614.0	980.4	4.3	75.2	135,000	5.250	708.75	1.27	95.5
2	Oct	20	186,819	80,698	0.60	1,121	5,248	5,420	980.4	437.4	1.9	24.0	105,000	5.400	567.00	1.27	30.4
2	Nov	21	80,698	0	0.50	403	5,420	5,544	437.4	0.0	0.0	12.3	80,295	5.600	449.65	1.27	15.6
2	Dec	22	FALLOW														
2	Jan	23															
2	Feb	24															
Totals						124,705						2,623.2	**525,295**	**5.09**	**2,671.90**		3,285.1

Fish numbers / percent summary		
Fish transferred to grower site Nov	650,000	%
Grower site mortality allowance / %	124,705	19.2
Total fish number harvested	525,295	

Harvest / biogain summary tonnes	
Total weight harvested	2,671.9
Transfer weight in, Nov	48.8
Total biogain	2,623.2

Feeding and feed conversion rate summary	
Growout cycle feed	3,285.1
Biogain	2,623.2
Thus overall feed conversion rate	1.25

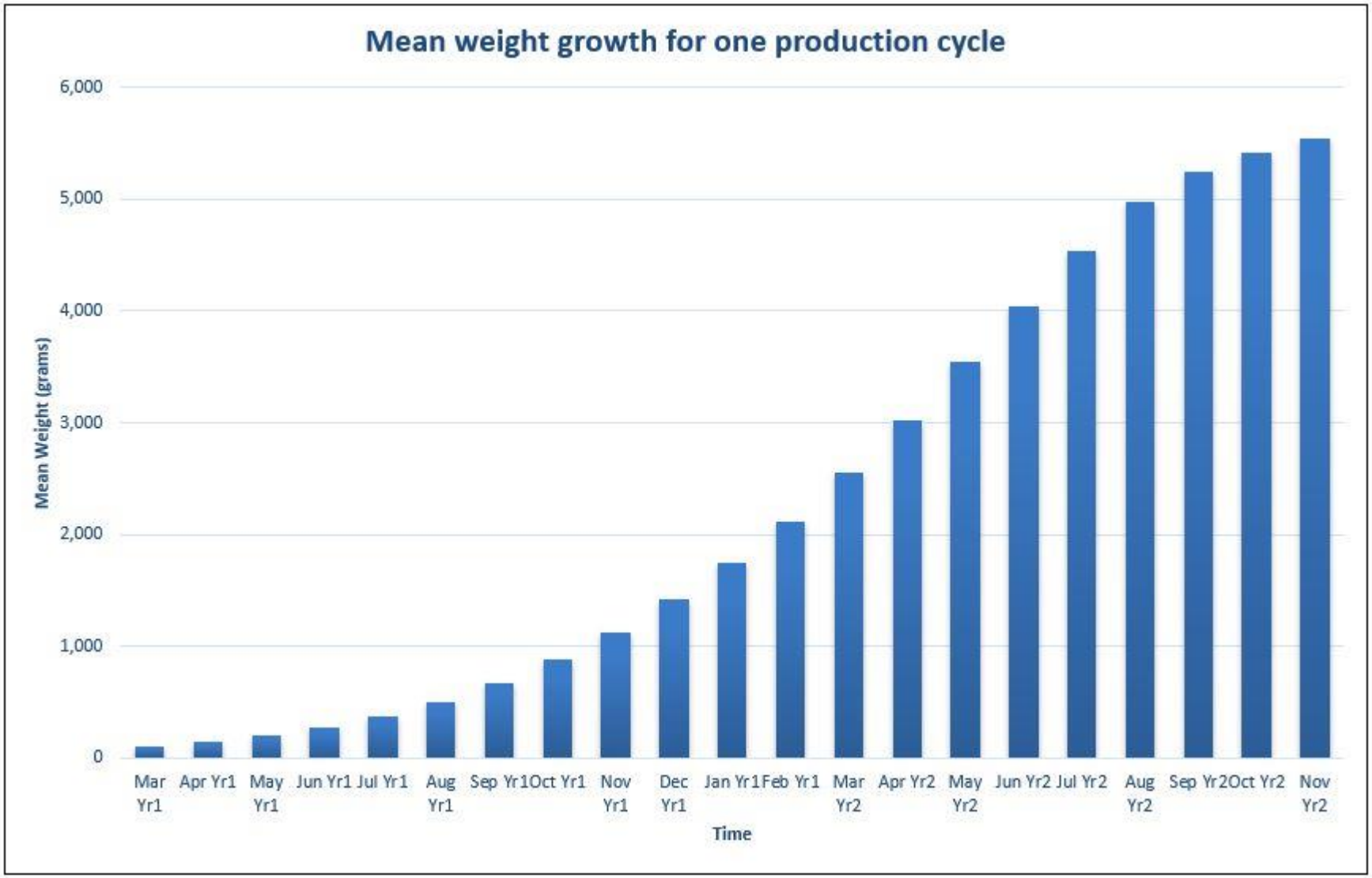


Figure 2-14: Mean weight growth for one production cycle.

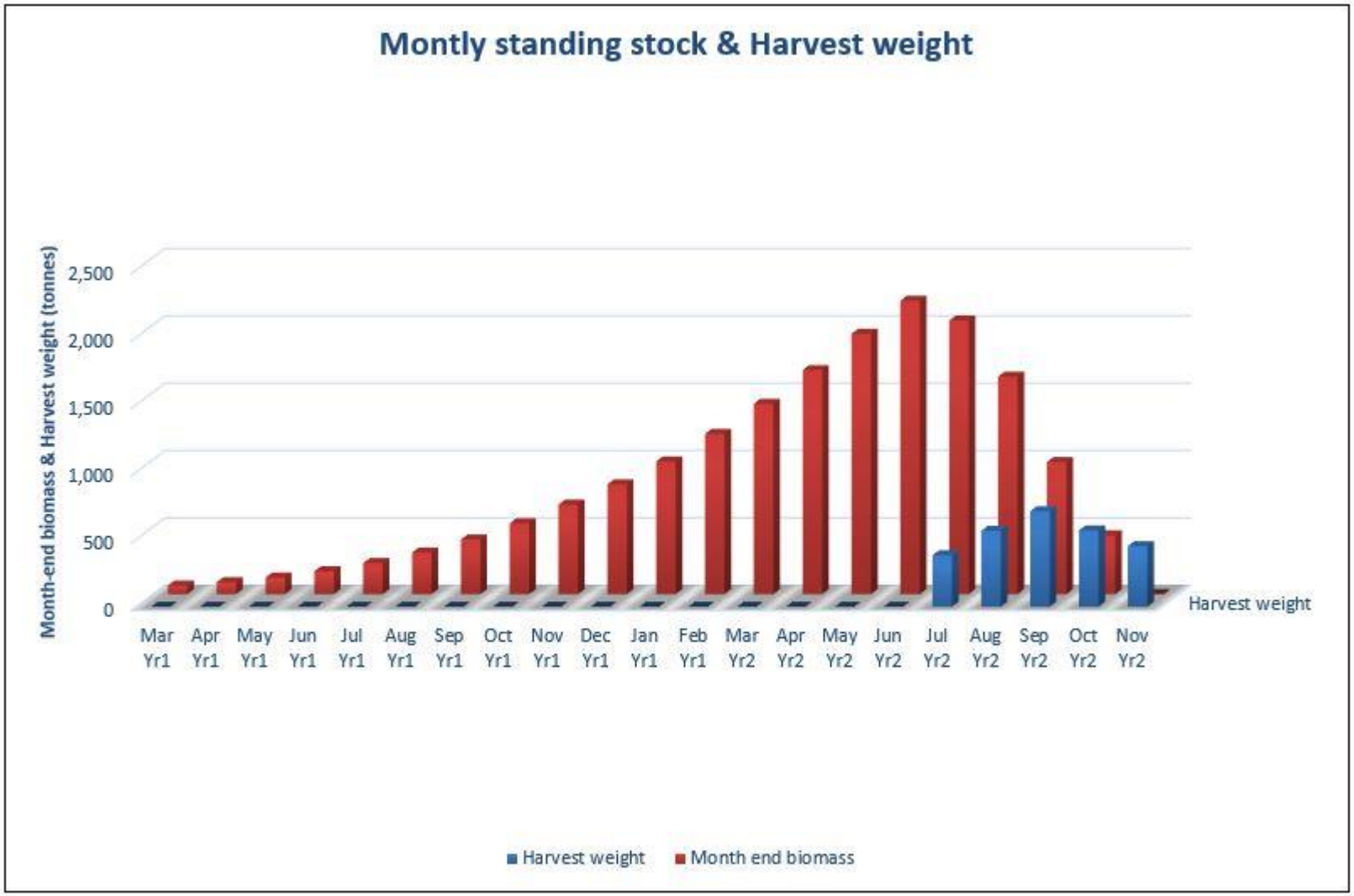


Figure 2-15: Total stock and harvest biomass for one production cycle.

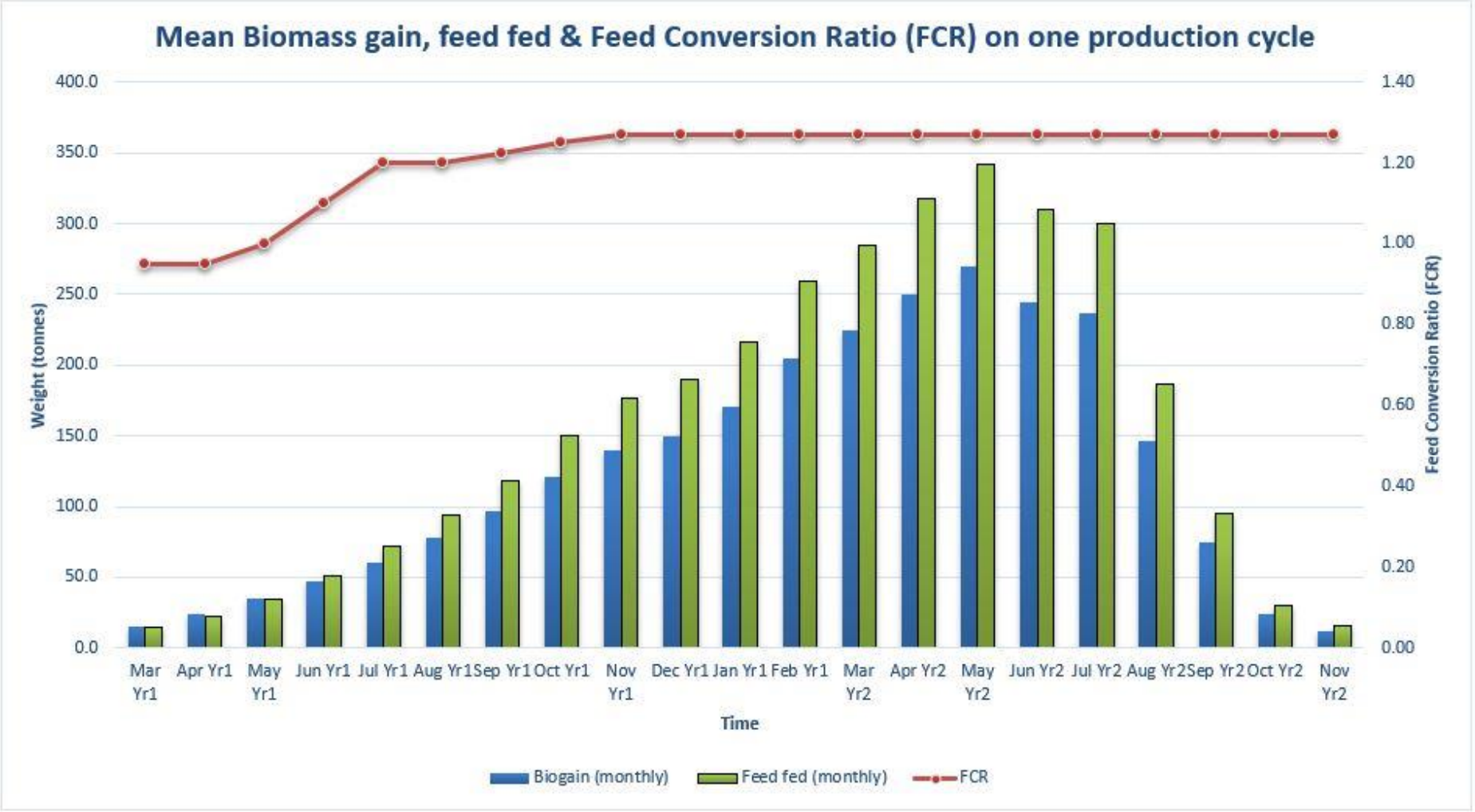


Figure 2-16: Mean Biomass gain, feed fed tonnes and Feed Conversion Ratio (FCR) for one production cycle.

		2018												2019												2020											
Site	Licence No.	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Deenish (Mowi)	AQ 199	Grow out												Grow out																							

Figure 2-17: Proposed stocking and fallowing plan of the Deenish site.

2.1.10. Feed and Feeding

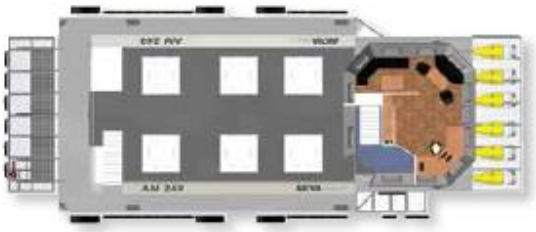
Salmon at the site farm will be fed organic rations that comply with EU Directives 834/2007/EC and 889/2008/EC as amended by 710/2009/EC and are certified to the organic standards set by a number of international organic certifiers e.g. Organic Food Federation (UK), Naturland (Germany) and Agriculture Biologique (France). It is the intention of MOWI to manufacture its own organic rations in the future.

The main components of the organic feed that will be used are: protein 38-46%, lipid/oil 22-32.5%, nitrogen 12-14% and phosphorous 0.9-1%. The constituents of food have changed radically in the last number of years with a higher oil content and lower carbohydrate content which results in a higher digestibility factor and, hence, less waste. In order to meet the requirements of the organic standards, Pearl is produced using a limited selection of raw materials, trimmings derived fish meals and oils, organic plant raw materials, natural pigments, natural antioxidants, and only organic approved vitamins and minerals. In addition, raw materials are specifically sourced in order to meet the full nutritional requirements of the organic fish, without compromising organic approval.

A feed barge/office will be required at the site and the proposed type is the Akva Master 240 Classic or similar (see **Figure 2.17**). The purpose of the feed barge is to feed the stock automatically throughout the day thereby minimising waste and optimising the Feed Conversion Rate (FCR).The feeding barge will be deployed on the shoreward, most sheltered side of the site and will have a length of 24m and a beam of 10m. The total feed storage capacity of the barge will be just over 400m^3, held in 2 x 63m^3, 2 x 65m^3 and 4 x 37m^3 silos, each with its own feed delivery system. Feed will be delivered by road to the shore and from there to the barge.

It is proposed to use automatic Akva feeders to transfer the feed from the barge to the pens. The system proposed is the Akvasmart CCS feed system or similar with rotor spreaders and underwater cameras (see **Figure 2-19** and **Figure 2-20**). This feed system will feed the correct amount of feed, at the optimal rate, on time and it is fully integrated with camera control, pellet and environmental sensors and Fishtalk production control software. The system is designed to handle more than 40 feed lines running in parallel or a combination of feed lines and regular electric feed hoppers. An SOP for feeding can be found in **Appendix 2.3** (*SOP25453*).





Control room and silo deck level



Machine room, silos aft deck

AM 240 Classic - features:

- Feed capacity dimensioned based on customer needs.
- Dimensioned to withstand up to 4,5m significant wave height (Hs).
- Spaceous engine room prepared for the advanced power management system.
- Metallized above waterline to ensure high quality corrosion protection.
- 5 years paint warranty.
- Hull integrated mill tank of high processing capacity.
- Large deck with high loading capacity pr. m².

Capacity	
Feed capacity:	240 tons (6 silos)
Silage:	Up to 30 tons
Diesel tank:	Up to 30 tons
Freshwater tank:	Up to 4m³
Sewage:	Up to 5m³
Main Dimentions	
Length (ex platforms):	21,5m
Breadth:	10m
Hull height:	3,5m
Minimum freeboard:	1,065m







Figure 2-18 Specification of proposed AM 240 Classic feed barge (Source: Akvagroup; www.akvagroup.com).

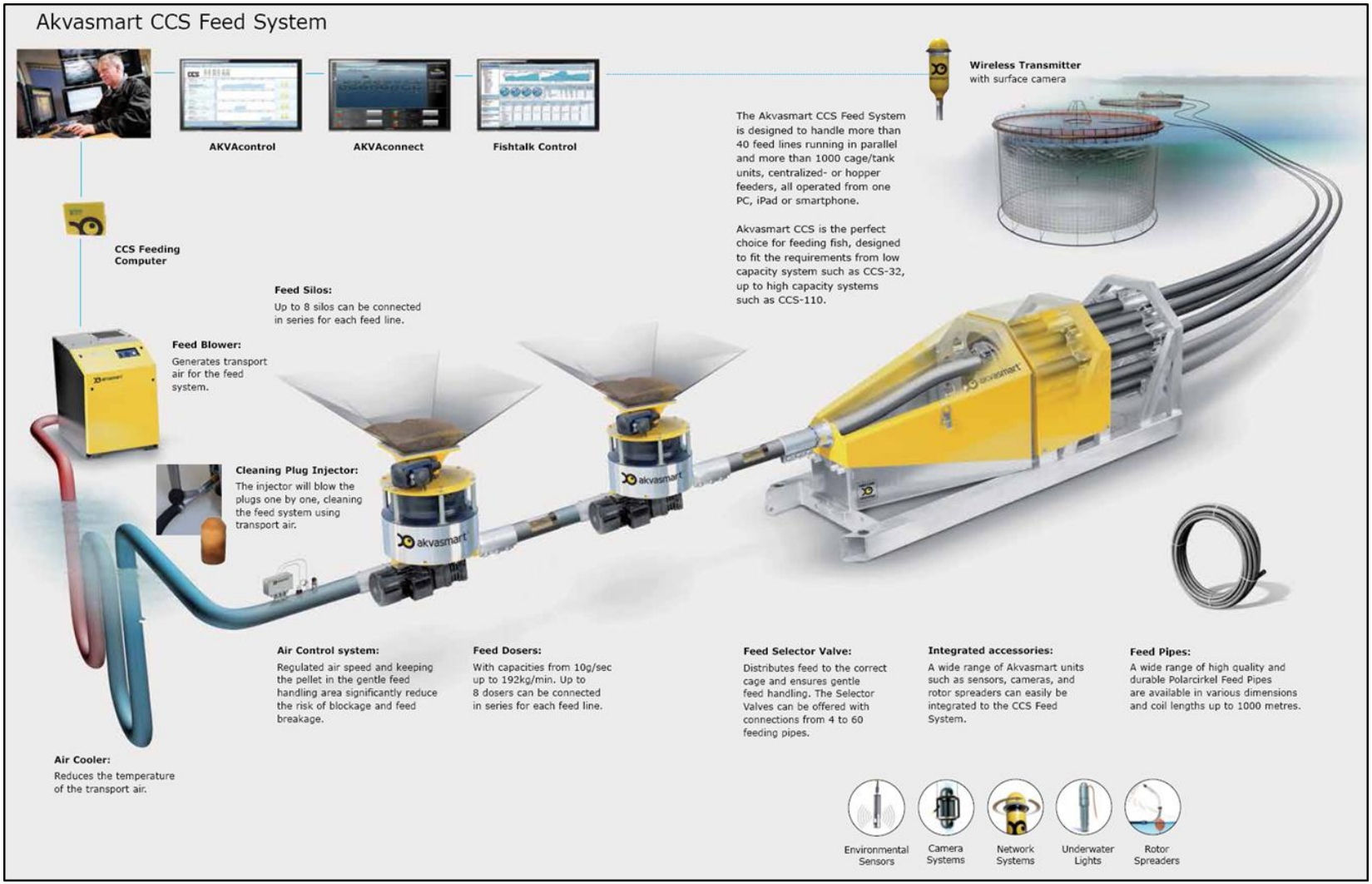


Figure 2-19: Specification of proposed Akvasmart CCS feed system (Source: Akvagroup; www.akvagroup.com).

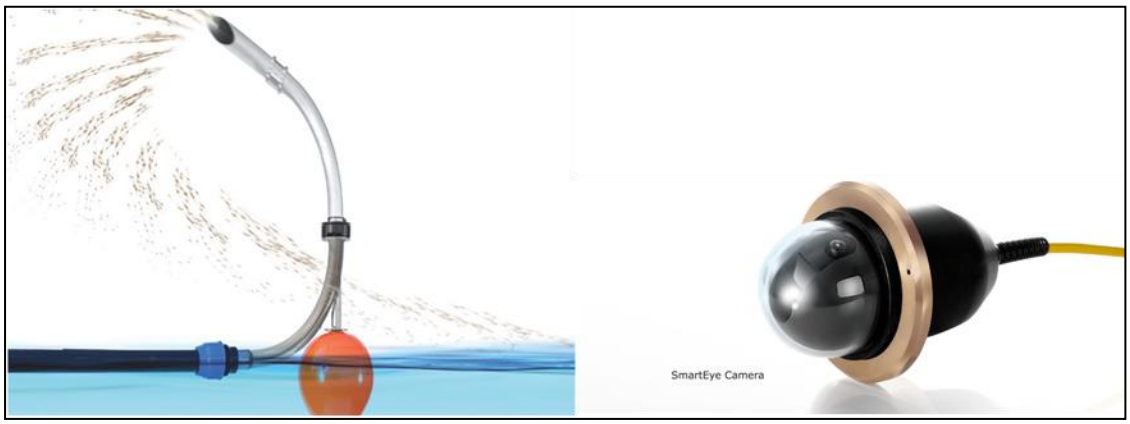


Figure 2-20: Rotor spreader and underwater camera which form part of the automatic feeder system (Source: Akvagroup; www.akvagroup.com).

2.1.11. Husbandry Management

2.1.11.1. Smolt Delivery

Smolts will be size-graded and counted at the hatchery prior to transportation to the Deenish site. Smolt stock for the site will be transported by road tankers from the MOWI smolt units at Lough Altan or Pettigo. They will then be loaded onto the MV Grip Transporter well boat at Travara pier for delivery to the site. Smolt delivery is covered by *SOP25478*; see **Appendix 2.3**. In general, smolts are check-counted as they are released into each pen from the well boat. The prevention of escapes during smolt transfer is dealt with in **Section 2.1.15** (Accidents and Emergencies).

2.1.11.2. Grading

Stock is usually graded by either passive or wellboat methods, at a mean weight of about 2.5kg, which is reached in the winter of the second year, roughly 12 months after transfer. The pens and nets will be lifted to concentrate the fish which will then be pumped into the grader on the deck of the MV Grip Transporter well boat. The fish will be graded by girth (which has a fish mean weight equivalent) and then counted prior to distribution to destination pens. **Figure 2-21** shows fish coming through the grader and being distributed to two pens. The grader is in the foreground and two distribution pipes, supported by cranes, are channelling fish of separate mean weight ranges into two destination pens. If necessary, individual grades can be held in well boat tanks to await the emptying of source pens prior to redistribution. Grading helps with the accounting of fish stocks, interrupts the development of peer groups within the pen, reduces aggression, improves feeding, promotes more even growth and improves the evenness of fish weight at harvest. The SOP for fish grading (*SOP23009*) is given in **Appendix 2.3**.

Another grading procedure, passive grading will be used in preparation for harvest. This will employ a passive grading panel with specifically sized "slots" to retain the selected size of fish required. This is stitched into a seine net or similar. The slots in the panel are generally made of flexible pieces of plastic piping which are woven into a mesh to prevent damage to the fish as they are retained or pass through the panel. The passive grader will be introduced into a pen where a good proportion of the fish are close to or have reached the appropriate harvest mean weight. The fish will be left behind the grading panel usually overnight. The smaller fish will swim through the passive grader, leaving pre-harvest-sized fish ready for removal from the pen. The SOP for passive grading (*SOP30997*) is given in **Appendix 2.3**. Fish for harvest are then removed by well boat to an additional pen where they will remain on a ration diet until harvest weight is reached.



Figure 2-21: The proposed well boat MV Grip Transporter distributing fish to two pens (© Magnar Lyngstad, MarineTraffic.com).

2.1.11.3. Harvesting & Processing

The harvesting period for stock at the proposed Deenish site will run between months 17 and 22 of the production cycle. Harvesting is the final process in the cycle requiring the use of a well boat. Fish already selected for harvest by passive grading will be pumped into the well boat holding tank and through a de-watering unit from where they will make their way to the percussion unit (SI-5 model; flow-through humane stunning system). The stunned fish will then be carried on to the bleeding table by means of a conveyor belt. They will then be manually cut through one gill arch only. At Travara pier stunned and bled fish will then be pumped into insulated steel road containers containing a mixture of seawater and ice for transport to the MOWI Packing and Processing Station at Rinmore, County Donegal. The prevention of escapes during harvesting is dealt with in **Section 2.1.15** (Accidents and Emergencies).

2.1.11.4. Site Discharges

Table 2.3 and **Table 2.4** shows the proximate analysis and digestibility of this organic feed.

Table 2.5 shows the projected feed requirements for one production cycle based on growth and feed data outlined in **Table 2.2** in **Section 2.1.9** (Production Model).

Based on proximate analysis (i.e. determination of the values of the macronutrients in the rations) and digestibility of the feed (see **Table 2.3** and **Table 2.4**), a breakdown of the feed into its soluble and settleable waste components is presented in **Table 2.6**.

Projected feed requirements of one production cycle (**Table 2.5**) and the soluble and settleable waste components of feed used (**Table 2.6**) are used to calculate the following;

1. monthly total BOD of discharges (see **Figure 2-22**);
2. monthly solids (see **Figure 2-23**);
3. monthly carbon discharges (see **Figure 2-24**);
4. monthly nitrogen discharges (see **Figure 2-25**); and
5. monthly phosphorus discharges (see **Figure 2-26**)

Based on these outputs, growth and discharge parameters will increase monthly, from input until the peak site standing stock of 2,200 tonnes is reached, at which point harvesting will commence in June/July of the second year.

The growth of the fish remaining in the pens will continue for some months until the peak harvest mean weight of 5,600g is reached and the balance of the fish will then be harvested from the system.

All discharge parameters will decrease steadily once harvest has commenced, as the total number of fish and standing stock will decrease, to reach zero, at the end of the harvesting period. The next cycle will commence, after the fallowing period, when the pens are empty. There will be no discharges from the site during the fallowing period.

Following each production cycle, the Deenish site will lie fallow for a minimum of one month following the completion of harvest. It is critical that the fallowing period occurs over the winter months as this is when the site is at its most hydro-active, leading to relatively rapid dispersal of any solids that may have accumulated under the pens during the production cycle, allowing the entire site sufficient time to rejuvenate, before the commencement of next cycle.

Table 2.3: Proximate analysis, digestibility and feed carbon content of organic ration.

Ration size (mm)	Mean fish weight range (g)	Gross energy (MJ/kg)	Digestible energy (MJ/kg)	Feed digesti-bility (%)	Oil (%)	Protein (%)	Phos-phorus (%)	Digesti-ble protein (%)	Protein digesti-bility (%)	Potential FCR	Carbohyd rate (%)	NFE %	Ash %	Moisture %
2.0	15-50	22.2	18.5	83.33	22	46.0	1.0	40.4	87.83	0.70	14.00	12.00	11.00	5.00
3.0	50-150	22.2	18.5	83.33	22	46.0	1.0	40.4	87.83	0.70	14.00	12.00	11.00	5.00
4.5	150-500	22.7	18.8	82.82	24	44.0	1.0	38.2	86.82	0.78	14.00	12.00	10.00	5.00
6.5	500-1000	23.3	19.2	82.40	26	42.0	0.9	36.1	85.95	0.80	16.00	14.00	9.00	5.00
9.0	1000-2000	24.1	20.2	83.82	32.5	37.9	0.9	34.4	90.77	0.98	17.00	14.00	8.50	5.00
12.0	2000+	24.1	20.2	83.82	32.5	37.9	0.9	34.4	90.77	1.05	17.00	14.00	8.50	5.00

Table 2.4 Feed carbon content of organic ration.

Protein C (%)	Fat C (%)	CHO C (%)	Total C (%)
25.30	16.50	5.60	47.40
25.30	16.50	5.60	47.40
24.20	18.00	5.60	47.80
23.10	19.50	6.40	49.00
20.85	24.38	6.80	52.02
20.85	24.38	6.80	52.02

Table 2.5: Projected feed requirements and specifications for one production cycle.

Month ending	Bio gain Tonnes	FCR	Average weight month end (g)	Feed specification							Feed and nutrient content tonnes / month					Digestibility (%)	
				Type	Size (mm)	Protein (%)	Oil (%)	Phos. (%)	CHO (%)	Total C (%)	Feed fed	Feed protein	Total N	Total P	Total C	Total feed	Protein
Mar	15.3	0.95	101	Ecolife	3	46	22	1	14	47.4	14.5	6.7	1.1	0.1	6.9	83.3	87.8
Apr	24.0	0.95	141	Ecolife	3	46	22	1	14	47.4	22.8	10.5	1.7	0.2	10.8	83.3	87.8
May	34.6	1	198	Ecolife	4.5	44	24	1	14	47.8	34.6	15.2	2.4	0.3	16.5	82.8	86.8
June	46.8	1.1	275	Ecolife	4.5	44	24	1	14	47.8	51.5	22.7	3.6	0.5	24.6	82.8	86.8
July	60.5	1.2	375	Ecolife	4.5	44	24	1	14	47.8	72.6	31.9	5.1	0.7	34.7	82.8	86.8
Aug	78.2	1.2	505	Ecolife	4.5	44	24	1	14	47.8	93.8	41.3	6.6	0.9	44.8	82.8	86.8
Sept	97.0	1.225	670	Ecolife	6.5	42	26	0.9	16	52.02	118.8	49.9	8.0	1.1	61.8	82.4	86.0
Oct	120.6	1.25	880	Ecolife	6.5	42	26	0.9	16	52.02	150.7	63.3	10.1	1.4	78.4	82.4	86.0
Nov	139.2	1.27	1130	Ecolife	9	37.9	32.5	0.9	17	52.02	176.8	67.0	10.7	1.6	92.0	83.8	90.8
Dec	149.7	1.27	1417	Ecolife	9	37.9	32.5	0.9	17	52.02	190.1	72.0	11.5	1.7	98.9	83.8	90.8
Jan	170.5	1.27	1745	Ecolife	9	37.9	32.5	0.9	17	52.02	216.5	82.1	13.1	1.9	112.6	83.8	90.8
Feb	204.5	1.27	2120	Ecolife	12	37.9	32.5	0.9	17	52.02	259.7	98.4	15.7	2.3	135.1	83.8	90.8
Mar	224.1	1.27	2550	Ecolife	12	37.9	32.5	0.9	17	52.02	284.6	107.9	17.3	2.6	148.0	83.8	90.8
Apr	249.9	1.27	3025	Ecolife	12	37.9	32.5	0.9	17	52.02	317.4	120.3	19.2	2.9	165.1	83.8	90.8
May	269.6	1.27	3540	Ecolife	12	37.9	32.5	0.9	17	52.02	342.3	129.7	20.8	3.1	178.1	83.8	90.8
June	244.4	1.27	4036	Ecolife	12	37.9	32.5	0.9	17	52.02	310.4	117.6	18.8	2.8	161.5	83.8	90.8
July	236.4	1.27	4534	Ecolife	12	37.9	32.5	0.9	17	52.02	300.2	113.8	18.2	2.7	156.2	83.8	90.8
Aug	146.7	1.27	4975	Ecolife	12	37.9	32.5	0.9	17	52.02	186.4	70.6	11.3	1.7	96.9	83.8	90.8
Sept	75.2	1.27	5248	Ecolife	12	37.9	32.5	0.9	17	52.02	95.5	36.2	5.8	0.9	49.7	83.8	90.8

Month ending	Bio gain Tonnes	FCR	Average weight month end (g)	Feed specification							Feed and nutrient content tonnes / month					Digestibility (%)	
				Type	Size (mm)	Protein (%)	Oil (%)	Phos. (%)	CHO (%)	Total C (%)	Feed fed	Feed protein	Total N	Total P	Total C	Total feed	Protein
Oct	24.0	1.27	5420	Ecolife	12	37.9	32.5	0.9	17	52.02	30.4	11.5	1.8	0.3	15.8	83.8	90.8
Nov	12.3	1.27	5544	Ecolife	12	37.9	32.5	0.9	17	52.02	15.6	5.9	0.9	0.1	8.1	83.8	90.8
Dec	**Fallow**																
Total/Av.	**2,623.15**										**3,285.1**	**1,274.5**	**203.9**	**29.9**	**1,696.5**	**83.4**	**89.3**

Table 2.6: Projected soluble and settleable waste discharge budget including BOD discharges.

Month ending	Feed Values		Settable Solids (tonne)			Settleable solids carbon			Nitrogen discharge			Phosphorus discharge			Total BOD discharge			Total solids BOD (ton)
	BOD5 (ton)	S Solids (ton)	Feed waste (ton)	Faeces (ton)	Total solids (ton)	Feed waste C (ton)	Faecal C (ton)	Total solids C (ton)	Settleable N (ton)	Soluble N (ton)	Total N (ton)	Settle-able P (ton)	Soluble P (ton)	Total (ton)	N BOD (ton)	C BOD (ton)	Total BOD (ton)	
Mar	2.88	0.62	0.41	2.23	2.64	0.20	1.27	1.46	0.05	0.51	0.56	0.03	0.04	0.07	2.58	8.43	11.00	4.14
Apr	4.53	0.97	0.65	3.50	4.15	0.31	1.99	2.30	0.08	0.81	0.89	0.04	0.07	0.11	4.05	13.26	17.31	6.52
May	7.09	1.59	0.99	5.48	6.46	0.47	3.05	3.52	0.12	1.17	1.29	0.07	0.11	0.18	5.92	21.66	27.57	9.94
Jun	11.47	2.96	1.47	8.16	9.62	0.70	4.54	5.24	0.19	1.89	2.08	0.11	0.18	0.29	9.52	35.30	44.81	14.87
Jul	17.68	5.31	2.07	11.49	13.55	0.99	6.39	7.38	0.29	2.83	3.11	0.16	0.27	0.43	14.23	53.29	67.52	21.02
Aug	22.86	6.86	2.67	14.85	17.52	1.28	8.26	9.54	0.37	3.65	4.02	0.21	0.35	0.56	18.39	68.88	87.27	27.17
Sep	29.60	9.22	3.39	19.26	22.65	1.76	11.39	13.15	0.44	4.34	4.78	0.23	0.37	0.60	21.87	101.95	123.81	37.13
Oct	38.38	12.39	4.30	24.44	28.73	2.23	14.45	16.68	0.57	5.58	6.15	0.29	0.48	0.77	28.11	130.94	159.05	47.14
Nov	45.80	15.21	5.04	26.36	31.40	2.62	16.95	19.57	0.57	5.56	6.13	0.35	0.57	0.92	28.01	155.03	183.04	54.83
Dec	49.24	16.35	5.42	28.35	33.76	2.82	18.22	21.04	0.61	5.98	6.59	0.37	0.61	0.98	30.12	166.70	196.82	58.96
Jan	56.09	18.62	6.17	32.28	38.46	3.21	20.76	23.97	0.69	6.81	7.51	0.43	0.70	1.12	34.30	189.87	224.18	67.16
Feb	67.28	22.34	7.40	38.73	46.13	3.85	24.90	28.75	0.83	8.17	9.00	0.51	0.83	1.35	41.15	227.75	268.90	80.55
Mar	73.73	24.48	8.11	42.44	50.55	4.22	27.28	31.50	0.91	8.96	9.87	0.56	0.91	1.47	45.09	249.58	294.67	88.27
Apr	82.22	27.30	9.04	47.32	56.37	4.70	30.43	35.13	1.02	9.99	11.00	0.62	1.02	1.64	50.28	278.32	328.60	98.44
May	88.69	29.45	9.76	51.05	60.81	5.08	32.82	37.90	1.10	10.77	11.87	0.67	1.10	1.77	54.24	300.24	354.48	106.19
Jun	80.41	26.70	8.85	46.28	55.13	4.60	29.76	34.36	0.99	9.77	10.76	0.61	1.00	1.61	49.18	272.19	321.37	96.27
Jul	77.79	25.83	8.56	44.77	53.33	4.45	28.79	33.24	0.96	9.45	10.41	0.59	0.96	1.56	47.57	263.32	310.89	93.13
Aug	48.28	16.03	5.31	27.79	33.10	2.76	17.87	20.63	0.60	5.86	6.46	0.37	0.60	0.97	29.53	163.44	192.96	57.81
Sep	24.75	8.22	2.72	14.24	16.97	1.42	9.16	10.57	0.31	3.01	3.31	0.19	0.31	0.49	15.14	83.77	98.91	29.63
Oct	7.88	2.62	0.87	4.54	5.40	0.45	2.92	3.37	0.10	0.96	1.05	0.06	0.10	0.16	4.82	26.68	31.50	9.44

Month ending	Feed Values		Settable Solids (tonne)			Settleable solids carbon			Nitrogen discharge			Phosphorus discharge			Total BOD discharge			Total solids BOD (ton)
	BOD5 (ton)	S Solids (ton)	Feed waste (ton)	Faeces (ton)	Total solids (ton)	Feed waste C (ton)	Faecal C (ton)	Total solids C (ton)	Settleable N (ton)	Soluble N (ton)	Total N (ton)	Settle-able P (ton)	Soluble P (ton)	Total (ton)	N BOD (ton)	C BOD (ton)	Total BOD (ton)	
Nov	4.04	1.34	0.44	2.32	2.77	0.23	1.49	1.72	0.05	0.49	0.54	0.03	0.05	0.08	2.47	13.66	16.13	4.83
Dec	**Fallow**																	
Total	840.66	274.37	93.62	495.88	589.50	48.35	312.67	361.02	10.84	106.57	117.41	6.51	10.62	17.13	536.56	2,824.25	3,360.82	1,013.4

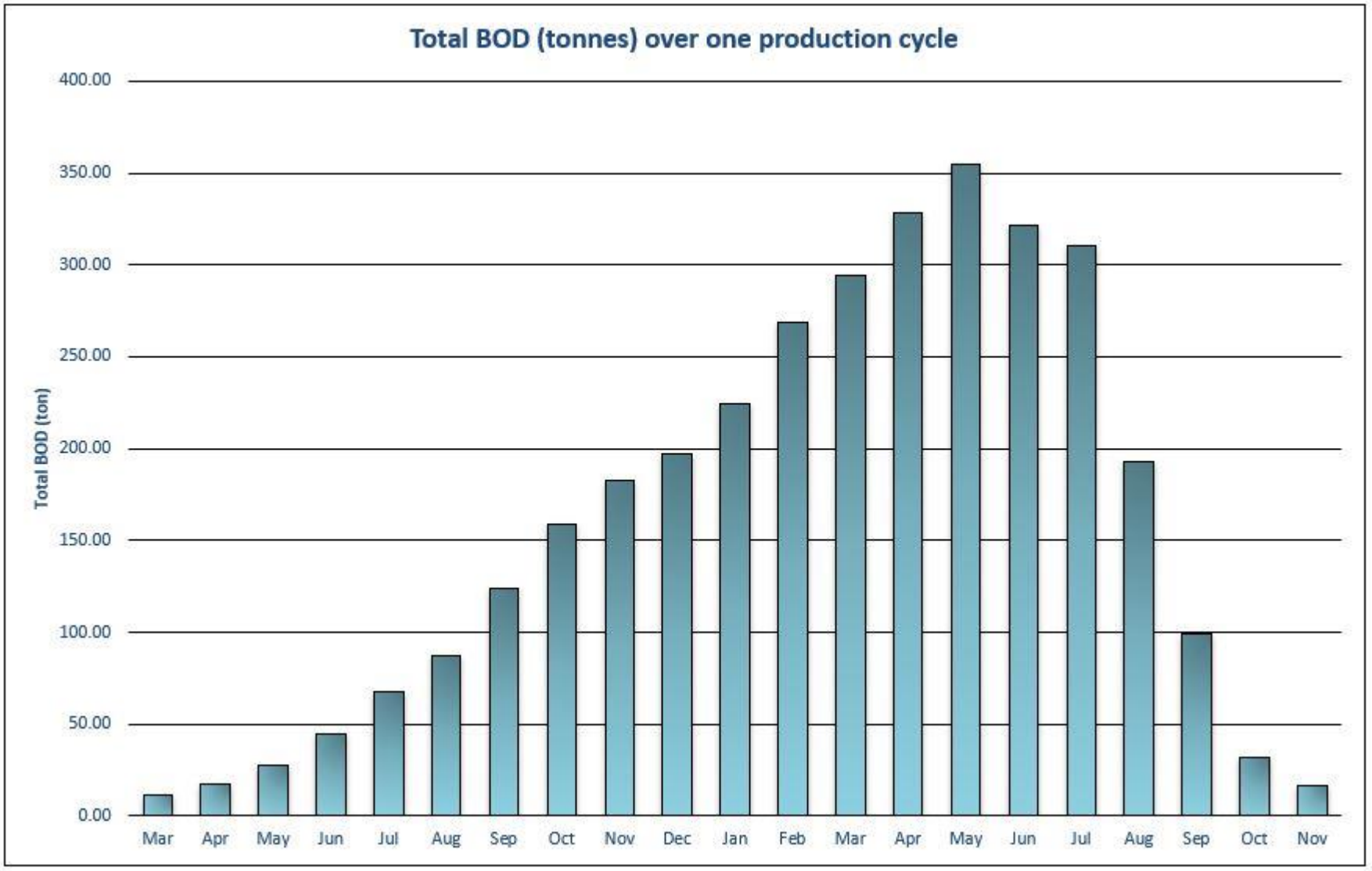


Figure 2-22 Total BOD of waste discharges (tonnes per month) for one production cycle.

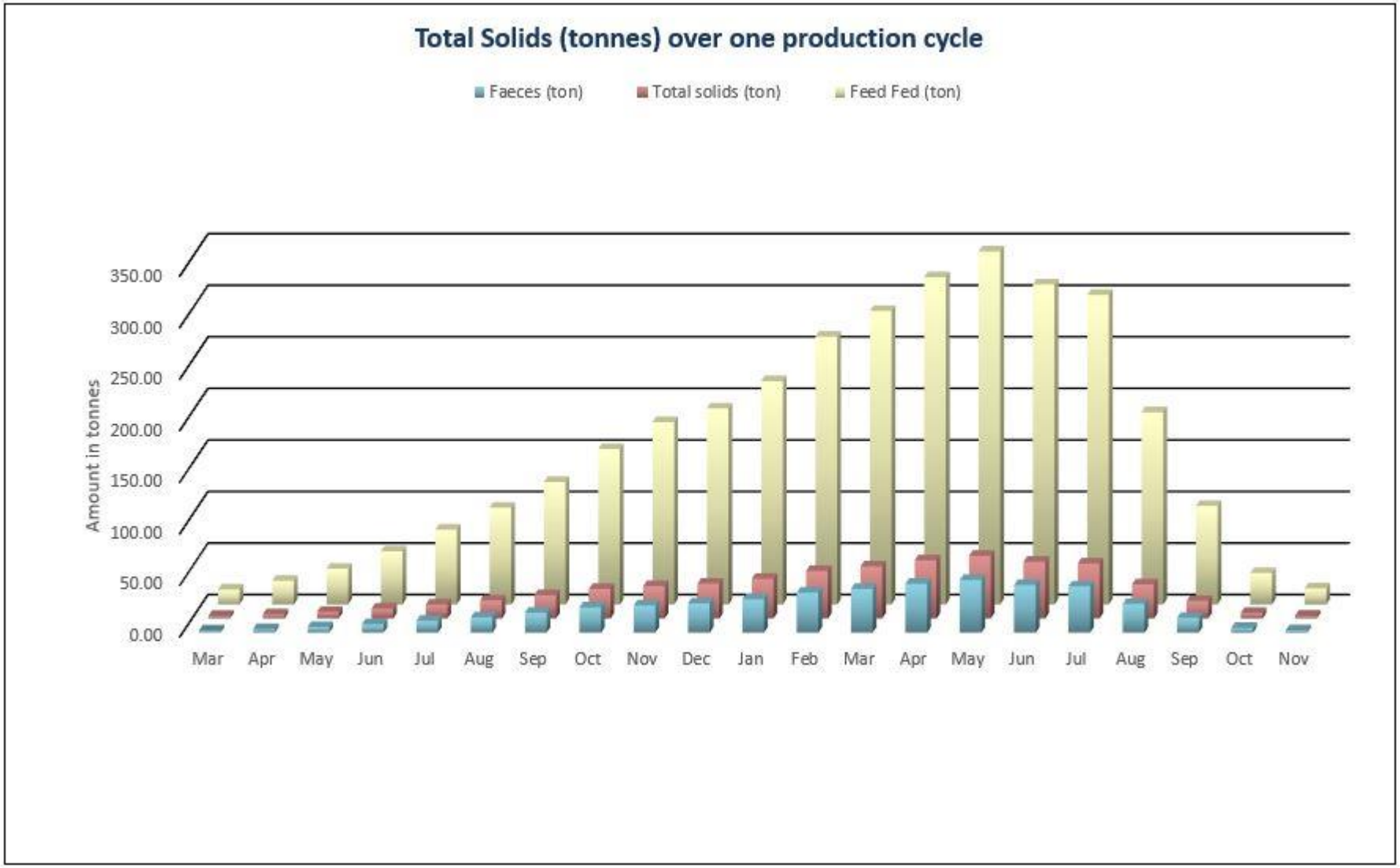


Figure 2-23 Total solids discharge (tonnes per month) for one production cycle.

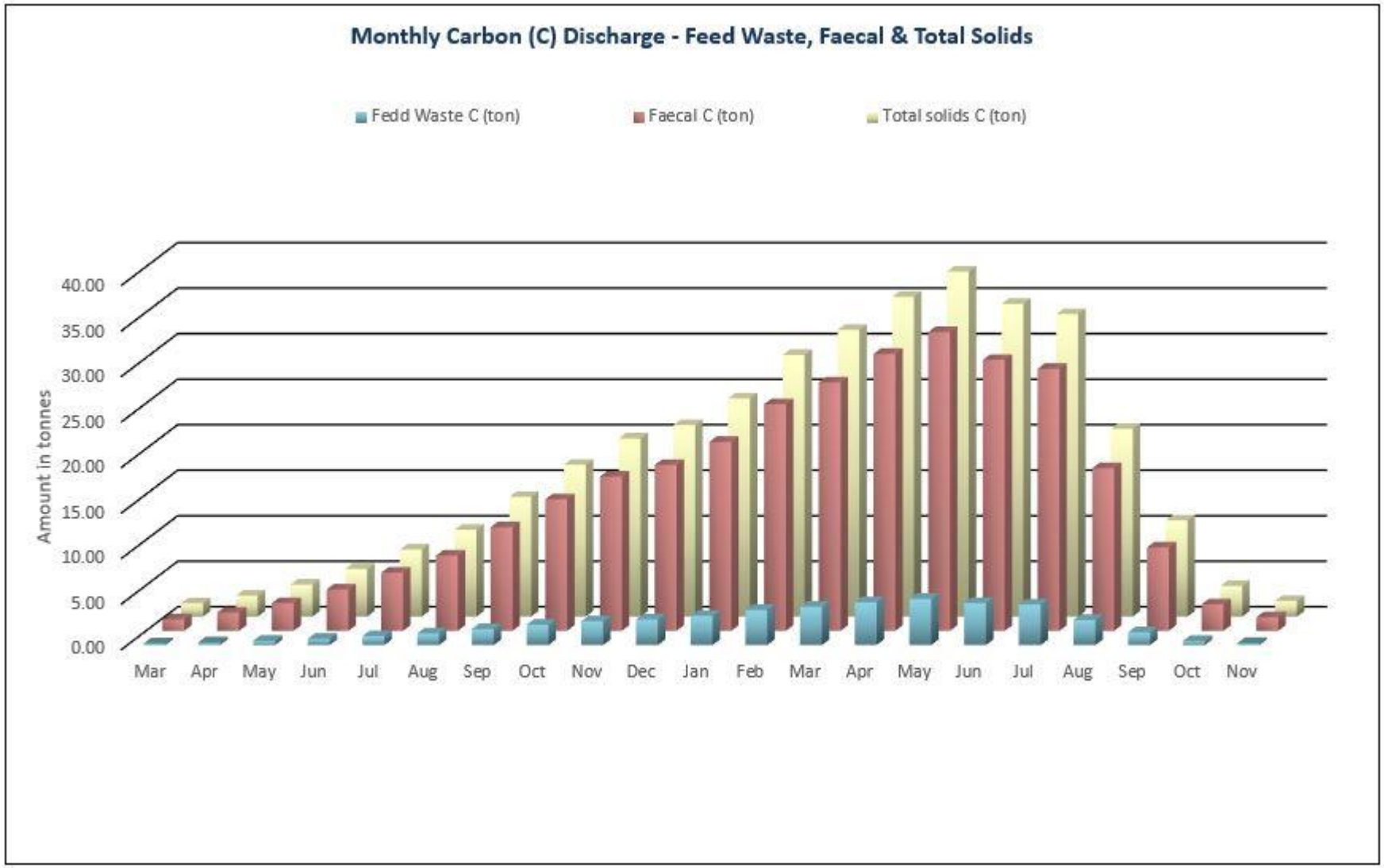


Figure 2-24 Total Carbon discharge (tonnes per month) for one production cycle.

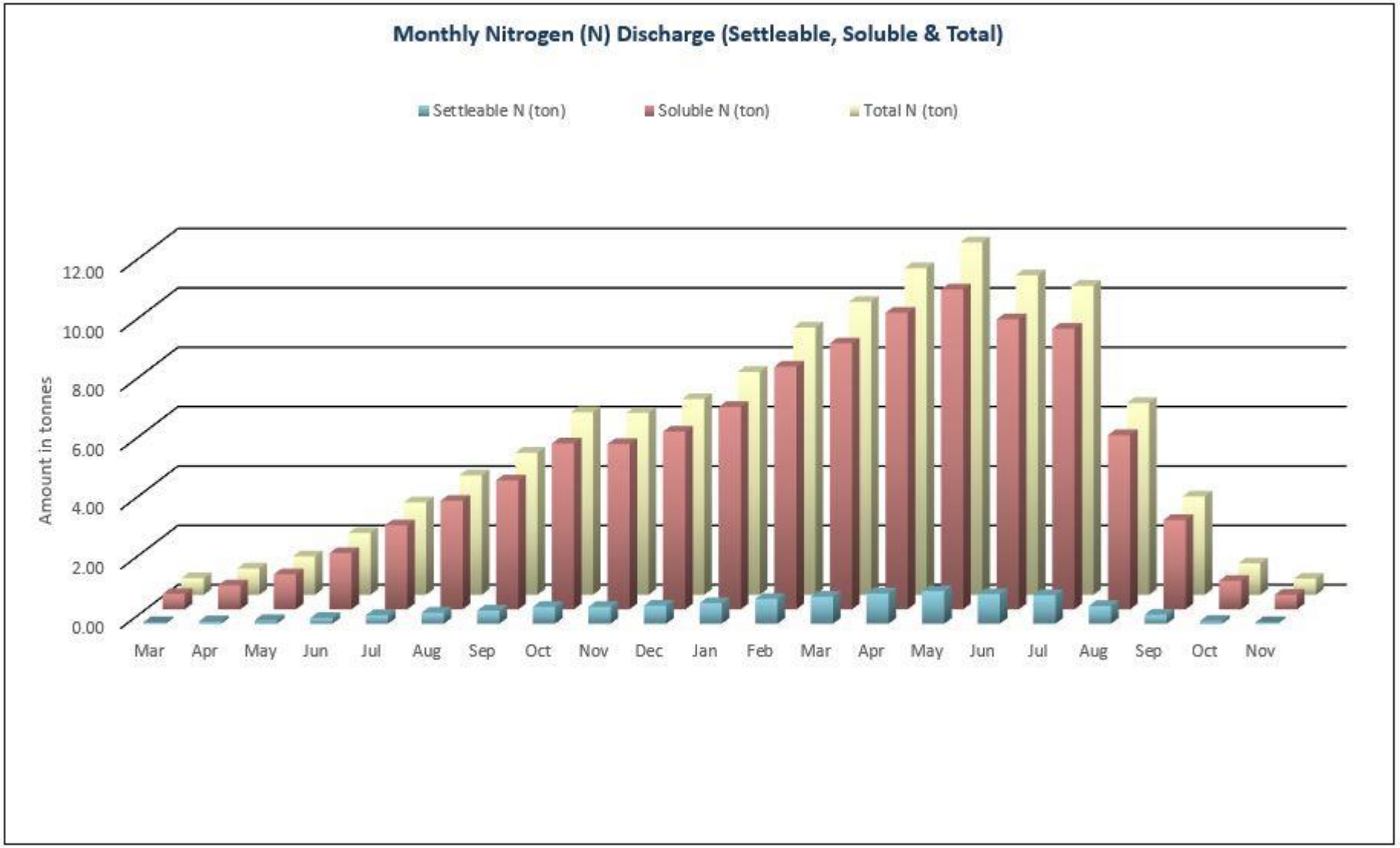


Figure 2-25 Total nitrogen discharge (tonnes per month) for one production cycle.

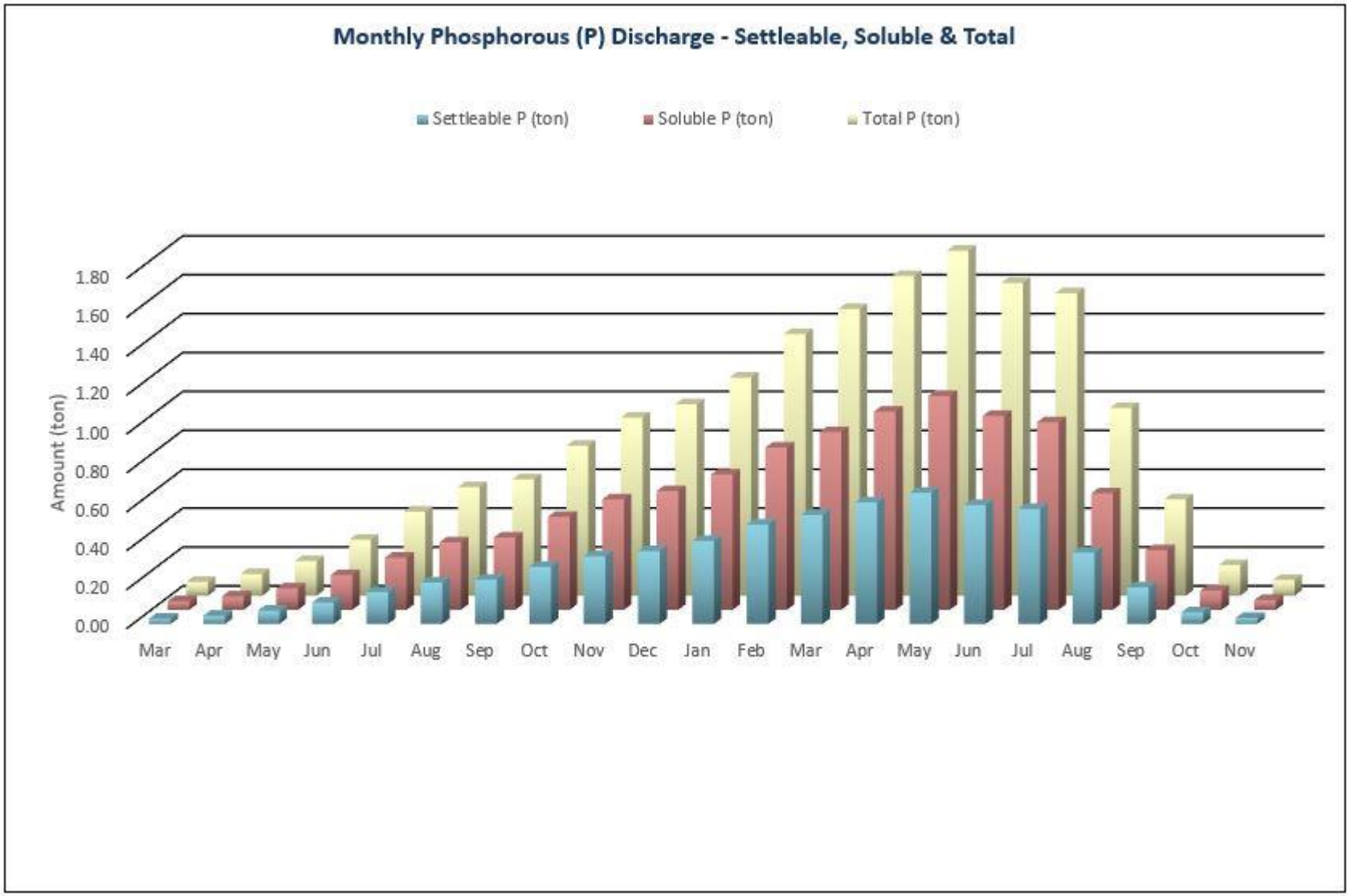


Figure 2-26 Total phosphorus discharge (tonnes per month) for one production cycle.

2.1.12. Waste Management

2.1.12.1. Harvesting Waste

After stunning and bleeding of harvested fish, the dead fish are collected in closed steel road tankers at Travara pier. The tankers will contain an ice/seawater slurry. The blood water is collected with the fish and the fish will continue to bleed out into the sealed collection tanks. The tanks are then transported by road to Rinmore Processing plant in Fanad, Co. Donegal for processing.

All harvest effluent (i.e. blood water, wash water, melted ice etc.) is collected outside of and within the processing plant by means of underground drains and sumps. All filtered waste water is then treated by means of chemical precipitation (flocculation) followed by dissolved air flotation. All sludge collected at the effluent treatment plant will be sent to an approved rendering plant for final disposal.

All filtered waste water is then treated by means of chemical precipitation (flocculation) followed by dissolved air flotation. Offal and trimming waste arising from the processing facility is collected continuously from the process. Daily accumulations of waste from stocks that do not have listed diseases are managed in the following ways:

- Offal is pumped into an ensiling chamber and mixed with formic acid to produce silage with pH<4. This silage is sold as Rest-Raw-Material to third parties for oil and protein extraction.
- Offal and trimmings which is not ensiled is transported to approved ABP processing plants for rendering.

If a listed disease is identified in any batches of slaughtered fish, then all solid waste arising from processing is sent to a licensed facility for high temperature rendering.

2.1.12.2. Mortality Disposal

MOWI will ensure that mortalities will be disposed of in a manner limiting risk of disease to healthy stocks, contamination of water, as well as smell and introduction of pests. All animal by-product waste will be managed in accordance with the European animal by-products Regulations

Routine mortalities will be disposed of under the Standard Operating Procedure for Waste and Waste Management (*SOP25564*; see **Appendix 2.3**), which covers the matter of the management and disposal of all routine wastes from MOWI installations. Mortalities will be removed from pens by divers at least once a week, or more frequently subject to observed mortality trends. Collected mortalities will be taken for incineration at an approved animal by-product rendering plant, as required by DAFM guidelines.

Culled fish and mass mortalities are dealt with under a separate SOP (*SOP25560*; see **Appendix 4**).

2.1.13. Health Management

Heath management on all MOWI sites is conducted according to MOWI's '*Fish Health Management Plan*'. The plan underpins the company's obligations under EU and national legislation, namely:

- European Communities (Health of Aquaculture Animals and Products)regulations 2008 (S.I. No 261 of 2008), as amended by the European Communities (Health and Aquaculture Animals and Products) (Amendment) Regulations 2010 (S.I. No 398 of 2010), 2011 (S.I. No 430 of 2011) and 2015 (S.I. No 23 of 2015).
- EC Council Directive 2001/82/EC and SI 144 of 2007 (Animal Remedies Regulations).
- Commission Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation).
- Commission Regulation (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council.

The main goals of the *Fish Health Management Plan* for MOWI Ireland are as follows:

- To prevent and control fish diseases and ensure the maintenance of a high level of fish health and welfare;
- To minimise environmental impact; and
- To rear salmon in accordance with industry guidelines and the current best practices of the industry.

The primary actions of the health plan are:

- Vigilance and regularity in stock monitoring against key performance indicators;
- Disciplined and detailed record keeping;
- Official notification in the event of disease outbreaks; and
- Application of therapy under veterinary supervision / prescription, in strict adherence to the organic standards that will apply at the site.

The health plan lays down that observation of the stock, from which all remedial actions will stem, will comprise:

- Daily (surface) observations of fish behaviour by site managers and feeding operatives, as well as during routine operations such as feeding and net changing;

- Professional diver observation of behaviour and general fish health at least weekly or more frequently, subject to mortality trends, with recording of all mortalities by number and likely cause of death;
- A minimum of bimonthly clinical examination of all stocks by the MOWI veterinarian; and
- The stock performance (e.g. feeding rate, mortality rates) will be assessed at least once a week by the Production Manager for any indications of disease or abnormalities in the stock.

2.1.13.1. Treatment of Disease

The Production Manager shall notify the Fish Health Unit of the Marine Institute within 48 hours of the suspected appearance of any abnormal losses or mortalities and shall carry out instructions issued by the Fish Health Unit Manager as a result of notification including instructions relating to the treatment, disposal and destruction of diseased stocks. In addition, the AFMD section of the DAFM will also be notified of any abnormal losses or mortalities.

The medication of fish for the treatment of disease is covered by *SOP24337*; see **Appendix 2.5**. The MOWI Ireland Positive Medications List describes medicines approved for use in farmed salmon in Ireland (see **Appendix 3.1**). The majority of the medicines permitted are supplied on the advice of the company's veterinary surgeons, on prescription. MOWI takes a preventative approach to the susceptibility of stock to exposure to the most common infectious diseases, by the use of vaccines prior to transfer to seawater. Vaccine selection is based on a destination site risk assessment. Vaccines are selected from the following permitted list;

- Alphaject 2-2; manufactured by Pharmaq Ltd. A bivalent IP injectable fish vaccine, protecting against the commonest, endemic bacterial diseases, Furunculosis (causative agent *Aeromonas salmonicida*) and IPNV (Infectious pancreatic necrosis);
- Norvax Compact PD (pancreatic disease) manufactured by MSD Animal Health. An IP injectable fish vaccine, containing inactivated PD virus, to promote immunity against PD virus (causative agent Salmonid alphavirus (SAV) subtypes 1 and 3)
- ALPHA JECT micro® 6; manufactured by Pharmaq. An IP injectable fish vaccine to promote immunity against Furunculosis, Vibriosis, Coldwater Vibriosis, Winter sore and infectious pancreatic necrosis (IPN);
- Aquavac PD3 manufactured by MSD Animal Health. IP injection for active immunisation of Atlantic salmon to reduce clinical signs (heart lesions and pancreas lesions), viremia, viral shedding and mortality from infection with salmon pancreas disease virus (SPDV) and to reduce mortality from infections with infectious pancreatic necrosis (IPNV) and *Aeromonas salmonicida subsp. salmonicida* (Furunculosis);

- Aquavac PD7 manufactured by MSD Animal Health. An IP injectable fish vaccine to promote immunity against SPDV strain F93-125, IPNV serotype SP, *Aeromonas salmonicida* subsp. *salmonicida*, *Vibrio salmonicida, Vibrio anguillarum* serotype O1 and O2a and *Moritella viscosa*;
- ALPHA JECT micro 1 PD; manufactured by Pharmaq. An IP injectable fish vaccine to promote immunity against SPDV.

As a generalisation, farmed fish are affected by a small range of "domestic" diseases, much as other domesticated stock. Some are indigenous to local wild fish species. Fish are vaccinated for the most common bacterial and viral diseases. If required, clinical outbreaks are treated with medicines approved for salmon aquaculture, under the relevant SOPs (e.g. *SOP24337*, see **Appendix 3.1**).

Although new or unrecognised diseases do occur, their antecedents can, more often than not, be found in other salmon farming areas such as Norway or Scotland. However, such occurrences are unusual, and, in consequence, occurrences are treated with the utmost urgency by both the company and its veterinary consultants. Industry experience, over many years, is that disease is frequently preceded by stock stress, caused, for example, by overcrowding, high temperature / low oxygen, poor nutrition or stock predation. Farming to organic standards reduces or eliminates many of these stressors which has led to a radical reduction in disease outbreaks and in the frequency of treatment.

In the event of an outbreak of bacterial disease, which is normally indicated by fish behaviour, or other symptoms, such as appearance of indicative lesions, moribund fish or mortality, the standard operating procedure entails isolation of the pathogen from a standard range of tissues and testing against a range of antibiotics to establish a sensitivity pattern so that the best treatment can be selected. Frequently however, treatment must start on the best available information before completion of sensitivity testing in order to limit losses. Treatments for fish disease take one of two forms. They can be applied in medicated feed, in which case the prescription medicine, supplied as a powder, is surface dressed onto a standard feed ration. These are generally mixed to veterinary prescription by feed manufacturers. Alternatively, soluble treatments can be applied to the fish in a medicated bath. In the past such treatments have been carried out in shallowed, skirted pens. However, in MOWI's case, bath treatments are generally applied using well boat tanks or completely enclosed treatment tarpaulins. This reduces the quantity and cost of medication required and also greatly reduces the release of spent medication into the wider environment on completion of the treatment. Whilst antibiotics are generally applied in medicated feeds, for sea lice parasites both in-feed and bath type lice treatments are available; see **Section 2.1.13.2.3**. For gill parasites such as amoeba the only effective treatment

currently available is a freshwater bath (*SOP36945*, **Appendix 3.1**). **Table 2.7** shows the disease medications used at the site between the year 2010 and 2017.

Table 2.7: Medications used for the treatment of diseases at Deenish (T6/202) from 2010 – 2018.

		Slice®		Maracycline		Alphamax		Hydrogen Peroxide		Dates
Generation	Year	Total Quantity (Kg)	AI g	Total Quantity (Kg)	AI g	Total Quantity (ml)	AI ml	Total Quantity (L)	AI L	
10S1	2010					4750	47.5			14th Dec 2010
11S1	2011			470	470					17th – 31st Dec 2011
12S1	2012	70	140							28th Sept – 4th Oct 2012
12S1	2012							24000	8400	June – July 2012
13S1	2013			160	160					10th – 20th Oct 2013
15S1	2016	150	300							9th – 15th Jan 2016
15S1	2016					40000	400			11th – 13th Mar 2016
15S1	2016							57000	27930	19th - 22nd May 2016
17S1	2016	65	130							May 2017
AI = Active Ingredient										

2.1.13.2. Parasite Control

Sea lice are natural parasites of both wild and farmed fish. Two sea lice species are major parasites of European salmonids. The marine louse, *Caligus elongatus* parasitises many marine fish species including salmon. The salmon louse, *L. salmonis* is more euryhaline in habit and is a parasite specific to salmonids in brackish to fully marine conditions (25 to 35‰). *L. salmonis* is the more problematic of the two species for both wild and farmed salmonids.

Amoebic Gill Disease (AGD) is caused by a microscopic protozoan parasite (amoeba) *Neoparamoeba perurans.* The parasite colonises the gills causing severe gill pathology which appears as pale grey/ white swellings and patches which can develop and spread over the gill surface. AGD monitoring carried out by MOWI is outlined in *SOP33878* in **Appendix 3.3**.

2.1.13.2.1. Treatments

In recent years, MOWI has developed a new non-medicinal strategy to control sea lice using cleaner fish. Cleaner fish are species which display a natural behaviour of removing parasites and dead skin from other fish species in the wild. The main interest is in wrasse of the genus Labroides, of which there are a number of species indigenous to European waters. The Lumpsucker, *Cyclopterus lumpus*, are also used for this purpose.

MOWI intend to stock the Deenish site with cleaner fish. This will involve the stocking of hatchery-reared wrasse and lumpsucker at a rate of 6% of the salmon pen population. Cleaner fish are already deployed in MOWI farms in Ireland with good success. MOWI use a combination of wrasse (summer months only) and lumpsuckers (winter months). The wrasse are caught locally in Kenmare Bay. The lumpfish are hatchery reared – at present the supply is from Weymouth. Results to date illustrate that cleaner fish will maintain ovigerous lice levels on salmon in pens at or below 0.1 lice per fish. It also has the beneficial effect of radically reducing the use of chemical treatments and, therefore, treatment dispersal. It is MOWI's objective to have 100% supply of hatchery-reared cleaner fish available to all sites by 2021.

In Deenish, cleaner fish will be deployed from the first June post transfer at a ratio of 7 cleaner fish per 100 salmon These will be supplemented with locally caught wrasse during summer months. Cleaner fish can be re-captured using baited lobster pots or creels. As a precaution, cleaner fish are removed from the pens before size-grading of salmon, bath treatments and when fasting salmon prior to harvest. Guidelines for the culture, capture and subsequent maintenance of cleaner fish for use in salmon culture are included in *SOP39773* (See **Appendix 3.3**). The site is currently fallow and will be stocked with smolts in early 2023. These smolts will be stocked with hatchery reared lumpfish and wild caught wrasse from Kenmare Bay. The stock is scheduled to receive Slice, if necessary.

2.1.13.2.2. Monitoring

Regular sea lice monitoring is carried out in Kenmare Bay for the current operations and will continue under any new licence granted. Statutory monitoring is carried out by the Marine Institute and follows the mandatory lice monitoring and control protocols described in Department of the Marine and Natural Resources (DMNR) guidance (DMNR, 2000a; b). This comprises the inspection and sampling of fish on every salmonid farm site in each Single Bay Management Area a minimum of fourteen times per annum. Inspections are carried out monthly, with the following exceptions:

- During the "susceptible Spring period" for migrating wild salmonid smolt especially sea trout smolt, during March to May, when there are two inspections per month and treatment trigger levels are set at an average of 0.5 ovigerous female *L. salmonis* lice per fish;
- Over the two-month period of December to January lice growth is slow and therefore only one inspection is required. Treatment trigger levels are set at an average of 2 ovigerous female *L. salmonis* per fish.

On each inspection, two samples of 30 fish are taken, under standard conditions. The first sample is taken from a standard pen, sampled on every inspection, whilst the second is taken from another pen, selected at random. Further details on sea lice monitoring can be found in **Appendix 3.3** (*SOP25450*).

In addition to the statutory monitoring of sea lice, MOWI Ireland will examine at least 10 fish from each salmon pen, every week. During the susceptible spring period, if levels of ovigerous female *L. salmonis* numbers reach an average of 0.5 per fish then a treatment is mandatory, at all other times of the year the treatment trigger level is 2.0 ovigerous lice per fish.

Marine Institute National Sea lice counts of three growth cycles (15S1/2 and Atlantic Salmon 2017) are described below and presented in **Table 2.8.** *L. salmonis* counts recorded during inspections are presented alongside treatment trigger levels in place at the time.

S1/2 2015

Marine Institute sea lice counts indicates that ovigerous female *L. salmonis* lice at the Deenish T6/202 site did not exceed the threshold levels (0.5 and 2 throughout the entire production cycle for the 2015 origin S1/2 fish. The only date where there was a spike in numbers was during week 33 and week 42 of 2016 where a maximum of 0.48 ovigerous sea lice per fish was recorded this being under the threshold level of 2. Coinciding with this spike in ovigerous female lice was an increase in Juvenile and mobile sea lice. It is assumed that these spikes can only have arisen from a flush of wild-origin

copepodids in the bay which settled on farmed stock, which then required treatment (see **Table 2.8**). A Treatment of Slice, Alphamax (Deltamethrin) and Hydrogen Peroxide were successfully administered as ovigerous sea lice counts of *L. salmonis* did not exceed the threshold level of 0.5 and 2 during the 15S1 growth cycle.

Atlantic Salmon 2017

Marine Institute sea lice counts indicates that ovigerous female lice on the Deenish T6/202 site did not exceed the threshold levels (0.5 and 2 throughout the entire production cycle for 2017 Atlantic Salmon). The only date where there was a spike in ovigerous females was during week 25 and week 30 of 2018 where a maximum of 0.21 ovigerous sea lice per fish was recorded, this being a non-significant spike that was far below the threshold level of 2. Coinciding with this spike in ovigerous female lice was an increase in Juvenile and mobile sea lice. It is assumed that these spikes can only have arisen from a flush of wild-origin copepodids in the bay which settled on farmed stock (see **Table 2.8**).

Table 2.8 Records of sea lice infestation at the Deenish since 2015 (O'Donoghoe et al. 2015 – 2018).

Year	Week Number	Date	*Lepeophtheirus salmonis*				*Caligus elongatus*			Total Lice
			Treatment Trigger Level	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Lepeophtheirus salmonis*	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Caligus elongatus*	
2015	**Atlantic Salmon 2015 15S1/2**									
	11	13/03/2015	0.5	0.00	0.03	0.03	0.10	0.14	0.24	0.27
	12	19/03/2015	0.5	0.00	0.04	0.04	0.07	0.17	0.24	0.28
	15	09/04/2015	0.5	0.02	0.01	0.03	0.16	0.06	0.21	0.24
	17	21/04/2015	0.5	0.00	0.04	0.04	0.14	0.19	0.33	0.37
	20	14/05/2015	0.5	0.00	0.01	0.01	0.21	0.13	0.34	0.35
	22	26/05/2015	0.5	0.00	0.03	0.03	0.38	0.28	0.66	0.69
	25	18/06/2015	2	0.00	0.15	0.15	0.08	0.14	0.22	0.37
	29	15/07/2015	2	0.00	0	0.00	0.62	0.56	1.18	1.18
	33	11/08/2015	2	0.02	0.02	0.04	1.07	1.09	2.16	2.2
	38	15/09/2015	2	0.00	0.02	0.02	0.09	0.06	0.15	0.17
	44	29/10/2015	2	0.11	0.07	0.18	0.00	0.02	0.02	0.2
	48	23/11/2015	2	0.10	0.39	0.49	0.21	0.23	0.44	0.93
2016	4	27/01/2016	2	**Missed due to weather**						
	5	03/02/2016	2	0.11	0.51	0.62	0.00	0	0.00	0.62
	11	14/03/2016	0.5	0.02	0.04	0.06	0.00	0.02	0.02	0.08
	12	23/03/2016	0.5	0.04	0.07	0.11	0.00	0.02	0.02	0.13
	15	12/04/2016	0.5	0.10	0.19	0.29	0.00	0.05	0.05	0.34

Year	Week Number	Date	*Lepeophtheirus salmonis*				*Caligus elongatus*			Total Lice
			Treatment Trigger Level	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Lepeophtheirus salmonis*	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Caligus elongatus*	
	17	25/04/2016	0.5	0.10	0.21	0.31	0.02	0	0.02	0.33
	19	11/05/2016	0.5	0.15	0.53	0.68	0.05	0.15	0.20	0.88
	21	25/05/2016	0.5	0.00	0.08	0.08	0.00	0	0.00	0.08
	23	09/06/2016	2	0.00	0.15	0.15	0.00	0	0.00	0.15
	29	21/07/2016	2	0.04	0.02	0.06	0.36	0.58	0.94	1
	33	18/08/2016	2	0.32	0.55	0.87	3.81	6.82	10.63	11.5
	38	19/09/2016	2	0.03	0.07	0.10	0.00	0.03	0.03	0.13
	42	19/10/2016	2	0.48	0.57	1.05	4.43	7	11.43	12.48
	Harvested Out									
	Atlantic Salmon 2017 –									
2017	18	04/05/2017	0.5	0.00	0.29	0.29	0.01	0.09	0.10	0.39
	22	30/05/2017	0.5	0.00	0.28	0.28	0.02	0	0.02	0.3
	24	13/06/2017	2	0.00	0.13	0.13	0.00	0.01	0.01	0.14
	30	26/07/2017	2	0.00	0.02	0.02	0.15	0.12	0.27	0.29
	33	15/08/2017	2	0.00	0.18	0.18	0.38	0.46	0.84	1.02
	39	25/09/2017	2	0.00	0.05	0.05	0.08	0.19	0.27	0.32
	43	27/10/2017	2	0.07	0.02	0.09	2.63	2.74	5.37	5.28
	44	02/11/2017	2	0.09	0.18	0.27	4.41	3.32	7.73	7.46
2018	5	29/01/2018	2	0.00	0.04	0.04	0.18	0.39	0.57	0.61

Year	Week Number	Date	*Lepeophtheirus salmonis*				*Caligus elongatus*			Total Lice
			Treatment Trigger Level	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Lepeophtheirus salmonis*	Ovigerous Female Lice	Juvenile & Mobile Lice	Total *Caligus elongatus*	
	7	13/02/2018	2	0.04	0.35	0.39	2.02	0.88	2.90	3.29
	10	09/03/2018	0.5	0.04	0.38	0.42	0.44	0.52	0.96	1.38
	13	26/03/2018	0.5	0.05	0.17	0.22	0.27	0.23	0.50	0.72
	14	04/04/2018	0.5	0.03	0.11	0.14	0.02	0	0.02	0.16
	17	27/04/2018	0.5	0.04	0.05	0.09	0.04	0.11	0.15	0.24
	19	09/05/2018	0.5	0.07	0.33	0.40	0.07	0.1	0.17	0.57
	21	23/05/2018	0.5	0.05	0.07	0.12	0.00	0.02	0.02	0.14
	25	21/06/2018	2	0.13	0.2	0.33	0.05	0.08	0.13	0.46
	30	25/07/2018	2	0.21	0.22	0.43	0.67	0.77	1.44	1.87

2.1.13.2.3. Treatments

The treatments that will be employed by MOWI at the proposed site are as follows:

Slice® in-feed treatment

Slice® was developed and licenced specifically as an oral treatment against salmonid lice infestation. It has superseded a range of earlier oral and bath treatments because of its ease of use, effectiveness against all lice parasitic stages, and environmental acceptability, resulting from its rapid degradation post-treatment and required short pre-sale withdrawal time.

Slice® is a proprietary pre-mix containing 0.2% Emamectin Benzoate (EmBZ), for surface coating onto salmon feed, at a rate of 5kg Slice® / tonne of feed. Slice® is supplied in 2.5kg sachets of pre-mix, containing 5g of EmBZ in an inert matrix. Thus one sachet of pre-mix is sufficient for wet-coating or dry-coating onto feed pellets, to produce 500kg of medicated feed. The recommended rate is 50µg EmBZ per kg fish biomass per day for seven consecutive days. Thus, each tonne of biomass requires 5kg of medicated feed per day (that is at a feed rate of 0.5% body weight per day) for the seven-day treatment period. Feed medicated with Slice® is generally supplied via the feed manufacturer, using the appropriate quantity of Slice® pre-mix, supplied to them under veterinary prescription.

Slice® acts on the lice by binding to specific high-affinity binding sites, resulting in increased membrane permeability to chloride ions and disruption of a number of physiological processes, most notably neurotransmission. Slice® protects fish against lice for ten or more weeks, subject to temperature. It has been determined that 10% of the EmBZ dose is excreted during the treatment period. Of the remaining 90% of the chemical, approximately 99% is excreted over the subsequent 216 days. This excretion has an exponential decay profile such that 50% of the chemical remaining in the fish is released, on average, over each ensuing 36 to 37 day period, that is, approximately 2.5 Spring / Neap tidal cycles, although this varies with water temperature. It has been determined that EmBZ breaks down into “non-toxic” subcompounds with a half-life period of 250 days.

Schering-Plough, the manufacturers of Slice®, state that no withdrawal period is necessary post-treatment, prior to human consumption, on the condition that salmon are not treated more than once in the 60-day period prior to the fish being harvested.

Despite this recommendation, the Norwegian Government recommends that a minimum withdrawal period of 175 degree days be used from treatment to first harvest for human consumption. This is approximately two weeks at 12°C to 14°C. This withdrawal period will be applied at the Kenmare Bay site.

See *SOP26077* in **Appendix 3.3** for procedural information on the application of Slice®. If required, MOWI shall apply one Slice® treatment to T6/202 stocks in the spring of the first input year. This will at the latest be applied in April. Maximum Treatable Biomass for the site will be 123 tonnes.

Alphamax® bath treatment

Alphamax® is manufactured by Pharmaq Limited. Its active ingredient is the synthetic pyrethroid Deltamethrin. Pyrethroids are a group of natural and synthetic chemicals which act on insects and related organisms (such as sea lice) by blocking neural transmission pathways. Deltamethrin does not bioaccumulate in fish and, if released into the environment (for example if in-pen treatment is employed), less than 10% persists (and this part widely dispersed) after 10 days, whilst its half-life in sediments under treated pens has been found to be 140 days, with 90% biodegraded by 12 months. However, these are not issues for MOWI who will use enclosed well boat tanks for bath treatments. Treatment dosage and time is 0.2ml Alpha Max® (=2µg Deltamethrin) per m^3 seawater in the well tank for 40-45 minutes.

See *SOP29142* in **Appendix 3.3** for procedural information of the application of Alphamax. The well boat MV Grip Transporter, which will be used for Alphamax® treatments, has two 600m^3 tanks. These require a total dose of 120ml of Alphamax®, containing 1.2mg of Deltamethrin, per tank, per treatment. The well tanks have the combined capacity to treat 100 tonnes of fish per treatment. Alpha Max® treatment by well boat is conducted on a 24-hour-day basis, with each treatment period lasting a maximum of four hours, from the crowding and pumping of the fish from the fish pens into the well tanks, to their release, post treatment, back to the pens. Thus, in the worst-case scenario, to treat the total of 2,177 tonnes, a total of 22 four-hourly treatment periods would be required, lasting a total of 88 hours (3.7 days).

MOWI will also implement a treatment efficacy monitoring procedure to determine the efficacy of treatments and identify if a treatment was optimal or sub-optimal. If a treatment is considered sub-optimal (<80% effective in 1 or more pens), the potential factors that may have led to the treatment being sub-optimal will be analysed with the goal of devising follow-up plans to ensure that such factors are avoided or minimised in the future. The details of sub-optimal lice treatment can be found in *SOP26074* in **Appendix 3.3**.

Table 2.9 shows the sea lice treatment summary for T6/202 since 2010. These treatments are administered to make sure that ovigerous females sea lice numbers do not exceed the threshold levels of 0.5 (march – may) and 2 (June – February) sea lice per fish **Table 2.8.**

Table 2.9 Sea lice treatments at site since 2010.

Crop	Product	Active Ingredient	Administration Date	Active Ingredient (quantity)
2010 input (10S1)	Alphamax	Deltamethrin	14th December 2010	47.5ml
2011 input (11S1)	Maracyline	Oxytetracycline hydrochloride	17th to 31st Dec 11	470g
2012 input (12S1)	Paramove	Hydrogen Peroxide	June – July 2012	8,400L
	Slice	Emamectin Benzoate	28th Sept-04th Oct'12	140g
2013 (13S1)	Maracyline	Oxytetracycline hydrochloride	10 - 20th Oct 13	160g
2016 input (15S1)	Slice	Emamectin Benzoate	9th -15th January 2016	300g
	Alphamax	Deltamethrin	11th – 13th March 2016	400ml
	Paramove	Hydrogen Peroxide	19th - 22nd May 2016	27,930L
2016 input (17S1)	Slice	Emamectin Benzoate	May 2018	130g

2.1.14. Predator Control

Predator control includes bird netting to prevent bird predation on salmon. Pen netting is weighted to prevent seal predation. No acoustic deterrents will be used at the site as seal predation on penned salmon has not been an issue at this licenced site. Predation control is covered by *SOP29575* (see **Appendix 3.4**).

2.1.15. Accidents and Emergencies

Emergency plans apply to eventualities, which, as a result of circumstance or unforeseen occurrence, may fall temporarily out of the control of the operator. It must be emphasised at the outset that such eventualities are extremely rare; none of those listed has occurred on MOWI sites to date and are not known to have occurred on any other local aquaculture installation in the last six years. That said, such hazards exist and cannot be ignored. In many cases it is their infrequency and lack of familiarity, which are the primary causes of loss of control. Consequently, adequate emergency plans must be in place to deal with such eventualities. Insofar as is possible, the risk of hazard or consequential event is mitigated or reduced by:

- Site selection.
- Use of adequately specified equipment and structures.
- Installation of appropriate management systems.
- Standard registration of all farm operational data.
- Employment of staff suitably qualified for job specified.
- Diver qualification to a minimum of HSE Part 4 diver's certificate; all divers to be accompanied underwater.
- Regular equipment inspection.
- Regular servicing of vessels, vehicles and other moving plant.
- Regular inspection of safety aids (life rafts, fire extinguishers, life jackets, navigation lights, winkies).
- Regular inspection and testing of diving equipment.
- Provision of guards over moving plant.
- Marine safety and rescue training.
- Wearing of lifejackets for all staff at sea.
- First aid training and availability of first aid kits.
- Availability of emergency flare kits.
- Fitting of life rafts to all main vessels.
- Disciplinary procedures.
- Ready availability of radios, telephones and emergency numbers lists.
- Protective clothing where necessary.
- Prohibition of unaccompanied access to company equipment and vessels by contractors, representatives, public servants and private individuals, who must be also provided with waterproofs and safety equipment as necessary when on company property.

Much of this information is enshrined, as required, in the Company's SOPs relating to health and safety (see **Appendices 4**) which set out the lines of responsibility for overseeing all operational health and safety systems and procedures.

In salmonid farming, the list of potential hazards, or circumstances which may lead to consequential hazardous events or loss can be summarised as follows:

- **Staff:** Injury, man overboard, illness at work, poisoning, fire.
- **Vehicles:** Breakdown, collision, fire.
- **Vessels:** Loss of power, capsize, collision, grounding, fouling, loss of radio contact, fire.
- **Fish farm installations:**

- Fish mass mortality: May result from asphyxiation, disease, predator attack, poisonous blooms, oil leakage or other contamination.
- Mass fish escape: May result from loss of net integrity (predator attach), wear and tear, storm damage or collision.
- Normal weather eventualities: Collision with vessel, loss of net integrity, fish escape, net fouling, poisonous blooms, predator attack, contamination or oil leakage.
- Storm weather eventualities: Structural or net damage, loss of moorings, fish escape, pen adrift.

2.1.15.1. Staff

The MOWI Occupational Health and Safety management system is certified to OHSAS 18001:2007. All staff are instructed to wear life jackets or floatation suits at all times when at sea. All vessels will carry first aid kits, radios or mobile telephones and flare kits. Staff will undergo routine training in first aid and rescue, including BIM courses in marine safety, first aid and radio use. In the event of an emergency, the attending personnel must contact the relevant base station, stating the nature of the event, position and other relevant details. The base station will then contact any required emergency service. In the case of staff at sea, nearby vessels must also be contacted, as required. In the event of accident at work, a report must be submitted to the local Health and Safety Authority Office.

2.1.15.2. Vehicles

Any event involving vehicles, which is hazardous or may lead to a hazard, is dealt with following a similar procedure as to what is stated in **Section 2.1.15.1**. Radio or telephone contact to the relevant base station must be used to raise in-house support or emergency services as required.

2.1.15.3. Vessels

Vessels carry first aid kits, radios or mobile telephones and flare kits. Larger inboard vessels must carry radios, fire extinguishers, asbestos blankets and life rafts/ lifebelts. Any injury arising must be dealt with using standard first aid procedures, involving contact to shore base, and onward to emergency service as required. In the event of vessel damage, capsize or loss of power, contact is made to the base station with position and nature of event, with a request for assistance. Further actions are taken as necessary to ensure staff and public safety and minimise the risk of loss of vessel or consequential loss. In the case of events involving vessels, depending on the seriousness of the incident, a report must also be submitted to the Department of Transport, Marine Safety Directorate, Marine Survey Office. A fire emergency evacuation procedure *SOP28074* in **Appendix 4**). Fuel oils are the principal hazardous

chemicals associated with an aquaculture site. **Appendix 4** contains MOWI Ireland's emergency plan for chemical spills (*SOP26162*).

2.1.15.4. Fish Farm Installations

Barring serious human accidents on or around farm installations, the main, albeit rare, hazards associated with salmon farm units are:

- Mass fish mortality may occur as a result of collision / net collapse, disease, asphyxiation, storm damage, poisonous phytoplankton, jellyfish caused mortality, predator attack, oil leakage and other contamination.
- Mass fish escape, which may follow as a loss of net integrity in storm or even normal weather conditions or follow other structural damage to the pen structures (for example by collision).

These are considered the main hazards because they carry the greatest risk of widespread consequences. Other possible hazards are those involving collision between moving vessels and pen structures, loss of moorings and drifting of pens. These eventualities are dealt with separately below.

2.1.15.5. Mass Fish Mortality

Mass mortality events have greatly reduced in number with the maturation and increased experience base of the industry. The most predictable causes of mass mortality are associated with disease and asphyxiation. Mass mortality can often be brought on by stress, associated with high stocking density, fouled nets and warm weather, also the primary cause of asphyxiation. In the case of the site, the most potent strategies for the avoidance of a mass mortality are low stocking densities required for organic farming, the experience of the staff and the full adoption of single bay management.

Appropriate site selection, regular net inspection, anti-fouling and cleaning will also all assist in avoiding these problems. Vaccination, regular veterinary inspection and appropriate action on the first signs of stock distress can greatly reduce the risks of disease outbreak. Whatever the cause, the primary risks in a fish mortality event are disease transmission to other pens (in a disease-based event) and pollution. Once the mortality has been registered, the company plan comprises the use of all hands, divers and boat-mounted, crane-operated brailers and fish pumps to remove the mortalities, with counting, into harvest bins as quickly as possible. Standing arrangements exist with renderers for the disposal of mass mortalities in such an emergency. Following mortality removal, diver must check the fish remaining in the pen on ensuing days to remove any additional mortalities. Once the event has passed, the fish remaining in the pen must be moved and counted into new accommodation, in order to determine the total number of fish in the pen and to confirm the level of the mortality. The quicker the mortalities

and moribund fish are removed, the lower the chance of consequential pollution or disease hazard. *SOP25560* (**Appendix 4**) outlines the procedures to be followed during a mass mortality.

2.1.15.6. Fish Escapes

No farmed escapees have been reported at the site since MOWI began operating T6/202. MOWI have in place a fish escape prevention policy (see *SOP36708* **Appendix 4**) which is implemented at all its sites. The stock in the farm pens is the stock in trade of the company. As well as being fully aware of the potential impact risks of escapees on local wild fisheries (subject to species in question and season), it is essential to the company's commercial viability to contain its fish for harvest. Thus, the guidelines set out below to avoid fish escapes are adhered to as a matter of commercial necessity as well as in the interests of the environment. In respect of fish farm escapes, MOWI will follow the guidelines on containment of farmed salmonids, drawn up between the North Atlantic Salmon Organisation (NASCO) and the International Salmon Farmers Association (ISFA) (NASCO, 2010).

These guidelines first set out preventative measures, which are observed by the company, in respect of:

- Site selection.
- Equipment and structural specification.
- Preventative strategies, inspection and maintenance.
- Staff training.

Under these guidelines, the selection of the site has considered fish escape risk, which increases, for example, in areas exposed to excessively heavy seas or heavy boat traffic. All floating pen equipment, nets and associated structures will be specified to withstand local current and wave climate conditions. Mooring systems will be designed to withstand predicted 50-year local wave climate conditions and thus to protect the integrity of the pens. Preventative strategies include guidelines for the use of vessels around pens and the provision of adequate navigational lighting and radar reflectors to prevent damage arising due to navigational errors by non-company vessels. lice, break down

Net Inspection (by diver and on net-changing; see **Appendix 2.2**; *SOP28941* and *SOP26166*) as well as maintenance of nets and other pen and grid components (see **Appendix 2.2** *SOP28646* and **Appendix 2.1** *SOP28940*) are carried out on a routine basis. All nets are number-coded, the net stock is rotated, and usage recorded.

Nets are cleaned and dried prior to storage and are stored off the ground in vermin-free conditions. Nets are inspected before use and regularly renewed. Spare nets are always available. Members of staff are trained in preventative net inspection and maintenance. All farm activities which may increase

the risk of fish escape are carried out by staff aware of the risks and trained for the task in hand. The majority are also covered by SOPs, these include:

- Fish sampling;
- Fish movements for smolt transfer, grading, relocation and harvesting;
- Net changing; and
- Use of vessels in the vicinity of pens.

The practice of moving fish by pen towing is not now used under current best practice, the preference being to use well boats, in the interests of both fish health and safety. In readiness for any escape event, the company has a contingency plan and a registration and verification procedure. Any indication of escape, such as loss of loss of net integrity, will be immediately followed up by repair or net change, as required, subject to weather conditions. Once an escape has been confirmed, the event must be reported to the AFMD in Clonakilty and to Inland Fisheries Ireland (IFI) and the Marine Institute. The fish remaining in the pen must be transferred and counted into a new enclosure and the extent of the escape verified. The event is then fully reported, stating species, strain, hatchery of origin, age, mean weight and length of stock, escape number and likely level of maturation in the year of escape. This information must be provided to the AFMD, IFI and DAFM within 24 hours of the incident. The company will co-operate with any program attempting to recapture the stock, which may be mounted or ordered by the relevant authorities. *SOP25561* (**Appendix 4**) outlines the procedures to be followed for fish escapes.

A similar verification and reporting procedure must be also undertaken in the event of unexplainable reductions in stock numbers discovered, for example, during normal transfer, grading or harvesting procedures. Under these circumstances, the pen structures occupied by the stock in question must be fully inspected following discovery of the shortfall.

2.1.16. Single Bay Management/ Coordinated Local Area Management Schemes

The site is part of the Single Bay Management/ CLAMS (Coordinated Local Area Management Schemes).

Single Bay Management arrangements for fin-fish farms are designed to co-ordinate husbandry practices in such a way that best practice is followed and that stocking, fallowing and treatment regimens on individual farms are appropriately coordinated with the neighbouring farms. The goal is to ensure that practices on individual farms act synergistically to enhance the beneficial effects to the bay as a whole. An important component in this process is establishing effective lines of communication between the operators. The non-confrontational environment of Single Bay

Management meetings between licenced operators has proved a valuable forum in the process of conflict resolution and avoidance both within the industry and between the industry and its neighbours. The Single Bay Management process has proved very effective in enhancing the efficacy of lice control and in reducing the overall incidence of disease in the stocks. Single Bay Management plans are subject to revision for each production cycle. This arises out of changes in production plans related to:

- New Licence applications;
- In response to changing markets;
- New husbandry requirements; and
- Both internal company restructuring and inter-company agreement.

Crucial elements in the success of this plan are identified as;

- separation of generations;
- annual fallowing of sites;
- strategic application of chemotherapeutants;
- good fish health management; and
- close co-operation between farms.

Appendix 5 contains the Integrated Pest Management / Single Bay Management Plan. The synchronised production and fallowing in single bay areas is essential to ensure the breaking of disease and parasite life cycles. This requires the use of single year classes in each bay area. MOWI Ireland use single generation site occupancy in Kenmare Bay and stock only with S1 fish.

MOWI will focus its lice treatment regime around the pre-winter treatment for all fish in Deenish (under the CLAMS/ Single Bay Management group) which will be over-wintered. During the months of January to May, numbers of ovigerous female and total *L. salmonis* will be maintained as close to zero as possible using cleaner fish and appropriate treatments where necessary. Where two sites are stocked in the Bay, treatments will be carried out on both during the same time period and with the same chemical class and in consultation with other fin fish farmers in the Bay. Currently, however, the MOWI sites is the only stocked finfish site in the bay.

In Kenmare Bay there are five sites licenced for the culture of Atlantic Salmon[8] (including the Deenish site) (see **Table 2.10**). The sites at Doon Point and Kilmakilloge Harbour are currently unstocked and

[8] Further detail on aquaculture operation in Kenmare Bay is included in Section 11 of *JN1524 Deenish EIA - Volume 2 - Main Report*.

have been so for some time. MOWI are currently operating the Deenish site and the Inishfarnard site, under the respective licenses AQ199 and AQ198. MOWI will coordinate the timing and class of treatments used at the Inishfarnard and the Deenish sites.

Table 2.10: Salmon aquaculture licences in Kenmare Bay.

Licence reference	Site Name	Distance to Deenish Site
T06/064/7	Doon Point, Kenmare River	16.5km east
T06/064A	Kilmakilloge Harbour	27.3km northeast
T06/064B	Kilmakilloge Harbour	28.3km northeast
T05/233	Inishfarnard Island	14.0km southeast

2.1.17. Decommissioning

At the end of their lifespan or during certain maintenance tasks, fish pens have to be dismantled. This task is only carried out after the fish pen has been taken ashore, and likely adjacent Travara pier. The pen must be beached on a hard surface out of water and away from rising/ falling tide. When a decision is taken to decommission a floating farm site and all related equipment, a precise method of steps must be followed. These include removal of netting, ropes, chain mooring bridles; transport of the pens ashore; dismantling and recycling of pens; removal of moorings and buoys and the removal of anchors. The methodology of decommissioning floating farm installations is described in *SOP36887* in **Appendix 2.1**.

2.2. Receiving Environment

This section briefly summaries the physical and biological characteristics (or aspects) of the marine environment at Deenish Island and surrounds. Further detail on these aspects and the socio-economic character of the receiving environment of the project is presented in the report on the EIA[9] of the proposed project that accompanies this report and the application for renewal of aquaculture licence AQ199; specifically the report identifies aspects of the project that may result in direct, indirect and/ or cumulative (in-combination) impacts to environmental receptors. This Screening for AA and NIS

[9] *Document File Name: JN1524 Environmental Impact Assessment - Volume 1 Non-technical Summary, Volume 2 Main Report, Volume 3 Appendices - Licence Renewal of Marine Finfish Licence at Deenish Island, Co. Kerry - Licence Ref: AQ199 – Licence Site Ref: T6/202'.*

focuses on the assessment of likely significant effects to Natura 2000 sites and associated Qualifying Features for which sites are designated.

2.2.1. Bathymetry

As outlined in **Section 2.1.1** Deenish Island is located off the Co. Kerry coast between Ballinskelligs Bay and Kenmare Bay. Ballinskelligs Bay is a shallow south-west facing bay. The main river discharging into Ballinskelligs is the River Inny. Kenmare Bay is a long, narrow, south-westerly facing bay approximately 12km wide at its mouth and 55km long. At the head of the Kenmare Bay the Roughty River joins the bay. Kenmare Town is located on the north side towards the head of the bay. Along the north and south shorelines of Kenmare numerous mountain streams and rivers discharge to the bay.

The seabed at the main outer channel of Kenmare Bay ranges from 60m to 75m while depths in the enclosed bays of Ballinskelligs are generally less than 30m. Water depth at the western edge of the proposed licenced area closest to Deenish is Island is approximately 6m. Depths increase eastward away from the island reaching approximately 30m and 33m respectively on the northern and southern boundaries. Further detail of bathymetry at the site is presented in **Section 2.1.3** above.

2.2.2. Hydrography

Tidal flows in Ballinskelligs Bay and Kenmare Bay are slack particularly on neap tides due to the orientation of the bays and the relatively deep waters in the area particularly at the mouth of the bays. In Kenmare Bay, to the northeast of Deenish Island, the spring tidal range is typically 3.5m while neap tides range from approximately 1.6m to 1.8m. The flooding tide off the mouth of Kenmare Bay runs north northwest and the ebbing tide runs south. Neap and spring tide drogue surveys of the tidal stream flows at the Deenish site found that minimum currents at the site occurred around the turn of the tide and ranged from 0.02m/sec to 0.07m/sec while maximum current speeds occurred at mid-flood period and ranged between 0.05m/sec and 0.26m/sec. At the site water currents range between 6.3cm/sec close to the seabed, 7.9cm/sec at mid-water depth and 9.2cm/sec at the surface (Watermark, 2012) (further detail of hydrography at the site is presented in **Section 2.1.3** above).

2.2.3. Habitats

The site is located on the eastern flanks of Deenish Island and is sheltered from westerly and southerly swells (**Figure 1-1** and **Figure 2-1**). The seabed underneath the northern pens is primarily flat and is characterised by sandy sediments (ranging to fine and medium sand) with varying proportions of coarse shell fragments. The seabed bathymetry to south-west deepens. The seabed is characterised by gravel and boulder and rocky reef (see **Section 2.1.3** above for further details).

The Deenish Island site is located in the Kenmare River SAC (Site code: 002158). The bay is a long, narrow, south-west facing glacial valley which is exposed to winds and swells from the south-west at the mouth that diminish towards the head of the bay (NPWS 2016). Numerous islands and inlets along the length of the bay provide areas of additional shelter.

The exposed coast to ultra-sheltered areas support a wide variety of habitats and communities. The site contains three Annex I marine habitats namely reefs (1170), large shallow inlets and bays (1160) and submerged or partially submerged cave (8330). The site overlaps a number of community types identified in Annex I benthic habitats 1170 and 1160 namely; Coarse sediment dominated by polychaetes community complex; Intertidal reef community complex; Laminaria-dominated community complex; Subtidal reef with echinoderms and faunal turf community complex.

In relatively exposed areas the sublittoral sediment is composed mainly of coarse shelly sand and gravel which support sparse bivalves, including *Lutraria* sp, while soft mud sand habitats in sheltered area are dominated by borrowing megafauna, including Norwegian Prawn (*Nephrops norvegicus*) and the burrowing sea cucumber *Neopentadactlya mixta* and macrofaunal polychaetes, crustaceans and brittlestar echinoderms. The SAC also supports the rare burrowing anemone P*achycerianthus multiplicatus* and communities characterised by burrowing brittlestars including the uncommon *Ophiopsila annulosa*.

The living red carcareous algae ‘maerl’ is reported in several the sheltered bays. Notable faunal groups associated with maerl included crustaceans while associated flora included red and brown algae. Infralittoral and circalittoral rocky reef areas occur at the head of the bay.

Coarse and mobile sand beaches in outer parts bay support typically intertidal sand faunal communities dominated by sand hoppers in the high shore and polychaete worms in the low shore.

The SAC also supports a sea caves that back into cliff faces. The communities characterising the caves include encrusting sponges, ascidians and bryozoans.

Good examples of perennial vegetation of stony banks occur at two locations within Kenmare River SAC - Pallas Harbour and Rossdohan Island. Characteristic species recorded here include thrift, common scurvygrass, rock samphire and sea campion.

2.2.4. Marine Mammals Species

The National Biodiversity Centre (NBC) online database records sightings and strandings of marine mammal species around the Irish coast. A total of 17 seal, whale and dolphin species have been recorded in the waters coastal waters of Ballinskelligs Bay, Deenish Island and Kenmare Bay[10] (see **Table 2.11**)

Table 2.11: Marine mammals recorded in Kenmare Bay and nearby coastal waters (source BiodiversityIreland).

Pinnipeds
Common Seal (*Phoca vitulina*)*
Grey Seal (*Halichoerus grypus*)*
Odontocetes (toothed whales and dolphins)
Atlantic White-sided Dolphin (*Lagenorhynchus acutus*)
Bottle-nosed Dolphin (*Tursiops truncatus*)*
Common Dolphin (*Delphinus delphis*)
Common Porpoise (*Phocoena phocoena*)*
Cuvier's Beaked Whale (*Ziphius cavirostris*)
Killer Whale (Orcinus orca)
Long-finned Pilot Whale (*Globicephala melas*)
Pygmy Sperm Whale (*Kogia breviceps*)
Risso's Dolphin (*Grampus griseus*)
Striped Dolphin (*Stenella coeruleoalba*)
True's Beaked Whale (*Mesoplodon mirus*)
White-beaked Dolphin (*Lagenorhynchus albirostris*)
Mysticetes (baleen whales)
Fin Whale (*Balaenoptera physalus*)
Humpback Whale (*Megaptera novaeangliae*)
Minke Whale (*Balaenoptera acutorostrata*)
* Habitats Directive Annex II Species for which a number of Irish SACs are designated

[10] Biodiversity Ireland - https://maps.biodiversityireland.ie/Map (accessed 27/01/2020)

2.2.5. Pinniped Species

Common seals and grey seals are resident species commonly found throughout Irish waters. Common seals and grey seals have terrestrial colonies (haul-out sites) along all coastlines of Ireland. The species use haul-out sites to rest, rear young, engage in social activity, etc. The species leave the haul-out sites to forage and move between sites.

Common seal (or harbour seal) (*Phoca vitulina*):

Kenmare Bay is of regional and national importance in terms of its harbour seal population (NPWS, 2012a). Surveys undertaken at a total of 26 sites in Kenmare Bay in August 2003 recorded a total 391 individuals (Cronin et al., 2004). Surveys were undertaken at the Kenmare River and at Illaunsillagh (outer Kenmare River) in 2009, 2010 and 2011. Counts recorded at Illaunsillagh sites in the years 2009, 2010 and 2011 were 21, 32 and 37 in 2009, 2010 and 2011. The river and bay forms part of the Kenmare River SAC (Site code: 002158) which is designated for harbour seal. Kenmare River SAC holds an important population of Common Seal (maximum count of 391 in the all-Ireland survey of 2003) (NPWS, 2016). Further detail of the Kenmare River SAC is provided in **Section 2.3.2.2** below.

A total of 13 SACs (including Kenmare River SAC) are designated for common seals distributed around the west, south-west and east coast of Ireland (see **Table 2.12**). The shortest pathway by water[11] and the shortest linear distance[12] of the SACs to the project area is presented in **Table 2.12**.

A study undertaken on common seal foraging behaviour indicated that while common seal were site-faithful individuals may travel considerable distances (Sharples et al., 2016). In summary, the study assessed movement in seals at seven locations around the coast of Britain; namely the Moray Firth, St Andrews Bay, the Orkney Islands, the Shetland Islands, the western Outer Hebrides, The Wash and the Thames estuary. The study reported a large degree of variation in seal movements. On average, seals in the Moray Firth made the longest foraging trips (100.6 km). Some seals from The Wash were reported to make repeated foraging trips of more than 200km while an individual from the Orkney site, moved repeatedly between Orkney and Shetland, a distance of more than 220km each way.

[11] Shortest pathway by water between the sites and the project. Where the pathway between the sites and the project was interrupted by land the shortest straight-line distance around such lands was used to calculate the shortest pathway which would be likely to be utilised by a species to reach marine waters at the project.

[12] Shortest linear distances are the shortest straight-line distance (i.e. as the 'crow flies')

In order to establish the sites that lay within the foraging range of 220km, measures of the shortest pathway by water between the sites and the project were used. SACs designated for the species within the foraging range of the project are:

- Kenmare River SAC (002158) (project within SAC)
- Glengarriff Harbour and Woodland SAC (000090) (66.9km from project)
- Kilkieran Bay and Islands SAC (002111) (184.1km from project)
- Galway Bay Complex SAC (000268) (204.0km from project)

The above listed SACs were considered in the Stage 1 Screening for AA and the Stage 2 AA. Conservation Objectives for Common seal at the above SACs are included in **Appendix 6**.

Grey seal (*Halichoerus grypus*):

Grey seals are a widespread species around the Irish coast, with greatest concentrations on the south-west, west and north-west coasts. The two closest SAC sites designated for the species to the project are Blasket Islands SAC (Site code: 002172) to the north and Roaringwater Bay and Island SAC (Site code: 000101) to the south east. The Blasket Islands SAC has a large grey seal population (648-833 breeding in 2005; one-off moult count of 989 seals in 2007) (NPWS, 2013). A grey seal minimum population was estimated in the Roaringwater Bay and Islands SAC in 2005 at 116-149 (NPWS, 2014).

Cronin et al. (2011) investigated grey seal movement on Irelands' continental shelf. Of the total of 529 foraging trips recorded, the furthest foraging trip was 511km. Given this wide ranging behaviour and the potential that individuals may occur in the project area, the Stage 1 Screening for AA and Stage 2 AA considered all Irish SACs designated for the species. The SACs designated for the species are:

- Blasket Islands SAC (002172) (39.9km from project)
- Roaringwater Bay and Island SAC (000101) (61.1km from project)
- Slyne Head Islands SAC (000328) (195.9km from project)
- Inishbofin and Inishshark SAC (000278) (217.8km from project
- Duvillaun Islands SAC (000495) (270.9km from project)
- Inishkea Islands SAC (000507) (273.2km from project)
- Saltee Island SAC (000707) (282.4km from project)
- Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190) (393.7km from project)
- Horn Head and Rinclevan SAC (000147) (470.3km from project)
- Lambay Island SAC (000204) (453.2km from project)

Conservation Objectives for Grey seal in the above SACs are included in **Appendix 6**.

Table 2.12: SACs designated for marine mammals

SAC (Site code)	Location	SAC shortest pathway by water (km)	Qualifying Feature (Qualifying Feature Code)			
			Phoca vitulina (Harbour Seal) (1365)	*Halichoerus grypus* (Grey Seal) (1364)	*Phocoena phocoena* (Harbour Porpoise) (1351)	*Tursiops truncatus* (Bottlenose Dolphin) (1349)
Kenmare River SAC (002158)	South-west coast	0 (project within SAC)	✓			
Glengarriff Harbour and Woodland SAC (000090)		66.9	✓			
Blasket Islands SAC (002172)		39.9		✓	✓	
Roaringwater Bay and Island SAC (000101)	South coast West coast	61.1		✓	✓	
Lower River Shannon SAC (002165)		102.6				✓
Galway Bay Complex SAC (000268)		204.0	✓			
Kilkieran Bay and Islands SAC (002111)		184.1	✓			
West Connacht Coast SAC (002998)		205.0				✓
Slyne Head Islands SAC (000328)		195.9		✓		
Inishbofin and Inishshark SAC (000278)		217.8		✓		
Clew Bay Complex SAC (001482)		262.2	✓			

SAC (Site code)	Location	SAC shortest pathway by water (km)	Qualifying Feature (Qualifying Feature Code)			
			Phoca vitulina (Harbour Seal) (1365)	*Halichoerus grypus* (Grey Seal) (1364)	*Phocoena phocoena* (Harbour Porpoise) (1351)	*Tursiops truncatus* (Bottlenose Dolphin) (1349)
Duvillaun Islands SAC (000495)		270.9		✓		
Inishkea Islands SAC (000507)		273.2		✓		
Killala Bay/Moy Estuary SAC (000458)		368.5	✓			
Ballysadare Bay SAC (000622)		395.9	✓			
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627)		389.5	✓			
Donegal Bay (Murvagh) SAC (000133)		343.7	✓			
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190)	North-west coast	393.7		✓		
West of Ardara/Maas Road SAC (000197)		417.8	✓			
Rutland Island and Sound SAC (002283)		425.3	✓			

SAC (Site code)	Location	SAC shortest pathway by water (km)	Qualifying Feature (Qualifying Feature Code)			
			Phoca vitulina (Harbour Seal) (1365)	*Halichoerus grypus* (Grey Seal) (1364)	*Phocoena phocoena* (Harbour Porpoise) (1351)	*Tursiops truncatus* (Bottlenose Dolphin) (1349)
Horn Head and Rinclevan SAC (000147)		470.3		✓		
Saltee Island SAC (000707)	South-east coast	282.4		✓		
Slaney River Valley SAC (000781)		324.6	✓			
Rockabilll to Dalkey Island SAC (Site code:003000)	East coast	428.4			✓	
Lambay Island SAC (000204)		453.2	✓	✓		

2.2.6. Cetacean Species

2.2.6.1. Odontocetes (toothed whales and dolphins)

Atlantic White-sided Dolphin (*Lagenorhynchus acutus*):

This dolphin often occurs in groups from ten's to hundreds, and can occur in groups of up to 1,000, most often offshore. Their distribution in northwest Europe is predominantly clustered in an area from west of Ireland, to the north and north-west of Britain. Smaller numbers occur around the west of Ireland. It is possible that they follow mackerel as the spawn off the south-west of Ireland's coast in February/ March. One stranding event was reported on the south shore of Kenmare Bay at Ballydonegan on the Beara Peninsula in 1989. Strandings were also recorded at Allihies Bay on the Beara Peninsula in 1989, 1995 and 1997. Strandings of individuals were recorded at Waterville, Ballinskellig Bay in 1986 and 1990.

Bottle-nosed Dolphin (*Tursiops truncatus*):

Bottle-nosed dolphins are found off all Irish coasts with inshore animals moving around the entire Irish coastline and between the UK and Ireland (Wall et al., 2013). Strandings of the species events were recorded at Waterville in 2006, 2007 and 2012. A pod of 8 individuals was reported in western Ballinskelligs Bay in 2013. South west of Bolus Head a pod of 10 was sighted in 2013 There are 5 records of the species in the Derrynane Bay/ Kenmare Bay area reported in the NBC database; 1 sighting of a pod of 8 individuals in inner Kenmare Bay in 2013, 3 sightings of small pods of 2 to 5 individual in 2012 and a single sighting of a pod of 3 individuals in 2013.

In Ireland two SACs have been designated for the species; namely Lower River Shannon SAC (002165) and West Connacht Coast SAC (002998). The population of bottle-nosed dolphin in the Lower River Shannon SAC is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland (NPWS, 2013c). The population is estimated (in 2006) to be 140 ± 12 individuals. The West Connacht Coast SAC is thought to support a minimum of 123 dolphins, with possibly up to 150-200 individuals or more (NPWS, 2014b). Bottle-nosed dolphin are a wide ranging species.

Given the wide ranging behaviour and the potential that individuals from the SACs may occur in the project area the Stage 1 Screening for AA and Stage 2 AA considered both the Lower River Shannon SAC (002165) and West Connacht Coast SAC (002998). Conservation Objectives for Bottle-nosed Dolphin in the above SACs are included in **Appendix 6.**

Common dolphin (*Delphinus delphis*):

Common dolphin is the most widespread and abundant dolphin species in Ireland, occurring throughout all Irish waters to varying densities with the bulk of the records from offshore waters on the Irish Shelf off the south and southwest coasts (Wall et al., 2013). Recorded all year round, the highest densities were recorded off the south and south-west coasts in the summer and autumn. Extremely large pods (100 - 1000's) can occur in the southern approaches of the Irish sea in spring and summer. The NBC database includes a total of 6 stranding events in inner Kenmare bay and along the north and south shore of the middle bay. A total of 4 stranding events are recorded at Ballydonegan and Allihies Bay on the Beara Peninsula. Individual strandings were recorded at Waterville in 2007, 2013 and 2014 and in western Ballinskelligs bay in 2013 and 2015. Individuals and small pods were sighted south of Bolus Head in 2009, 2010 and 2011 and to the west of Deenish Island in 2016.

Common (or Harbour) Porpoise (*Phocoena phocoena*):

The harbour or common porpoise is the smallest (average body length of <1.5 m) and most abundant cetacean in north-western coastal shelf waters. It is a common inshore species found across the entire Irish coast. In offshore areas, the harbour porpoise occurs in its greatest density outside of the survey area within the Irish Sea and its northern and southern channels. Porpoises are common off the south coast of Ireland throughout the year. Their relative abundance within the Irish Sea shows little seasonal variation. Monitoring has indicated an offshore movement in early summer, most likely linked to calving. Harbour porpoises have been frequently recorded throughout Ballinskelligs Bay and Kenmare Bay. The NBC database includes over 40 records of the species in the greater area. Typically, the species is recorded in small groups ranging from 2 to 10 individuals.

Three SACs have been designated for the species; namely Blasket Islands SAC (002172) (NPWS, 2013b), Roaringwater Bay and Islands SAC (000101) (NPWS, 2014) and Rockabill to Dalkey Island SAC (003000) (NPWS, 2014). The SACs are considered in the Stage 1 Screening for AA and Stage 2 AA.

Cuvier's Beaked Whale (*Ziphius cavirostris*):

Little data exists for the distribution of Cuvier's Beaked Whale. The majority of beaked whale sightings in Irish waters are in slope and canyon habitats of the Rockall Trough, but also in the deeper waters of the central Rockall Trough. Beaked whales are thought to migrate to southern temperate waters in summer and early winter, then returning to colder northern waters in early spring. One stranding event was reported on the south shore of Kenmare Bay at Ballydonegan on the Beara Peninsula in 2005.

Killer Whale (*Orcinus orca*)

The killer whale is the largest dolphin species, reaching up to 9.5 m in length, also being the most widespread cetacean on earth, occurring in areas from the polar ice pack, to the warm waters of the tropics. Within the UK and Ireland, they are most commonly sighted off northern and western Scotland, also occurring west and south of Ireland. Data correlated for presentation in the Atlas indicate sighting predominantly in inshore waters of the northeast, north, west and south coasts. Smaller numbers of sightings have occurred in offshore waters over the Irish Shelf. Two killer whales were recorded in 2012 off Puffin Island to the north west of Ballinskelligs Bay.

Long-finned Pilot Whale (*Globicephala melas*):

The long-finned pilot whale is one of the largest dolphins, with lengths averaging 6.7m for males and 5.7m for females, they have a square bulbous head with a lightly protruding beak. The body is dark grey to black with a grey-white anchor shaped patch on the chin. The species is typically found in water depth of 200 - 3,000 m beyond the Irish shelf edge where bottom relief is greatest but can also swim into coastal bays and fjords. They are often seen with other cetaceans, notably bottlenose dolphins. Most often, pilot whales occur in large pods (approximately 20 individuals), and large numbers of up to 1,000 have been observed off the British Isles during April, coinciding with the start of peak conception. Strandings of the species were recorded in Ballinskelligs Bay in 1983, 2007 and 2015 while five strandings have been recorded in Kenmare Bay area and south east of Deenish Island.

Pygmy Sperm Whale (*Kogia breviceps*)

This rare species has been reported throughout the tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans. The species is rarely reported sighted at sea with the vast majority of records based on strandings. The NBC includes a total of 10 strandings of the species recorded, one of which was reported in Kenmare Bay in 2009.

Risso's Dolphin (Grampus griseus)

This large robust dolphin, typically around 3.5 m, is to be found in small to medium sized groups (5-20 individuals, but often considerably higher). They are a comparatively uncommon species. Risso's dolphins have been recorded on a regular but infrequent basis around the entire Irish coast. While they are most often sighted at depths of greater than 200m in areas over continental shelf slopes or the slopes of oceanic islands elsewhere in the world, the dolphin seems to display a preference for inshore shelf waters in Ireland. Relative abundances off the north and northwest coasts are low. They have been recorded in Irish waters from April to November, peaking in the summer months and largely absent from Irish waters from December to March. In the NBC database stranding events of the species

was reported in 2011 at Eyeries on the south Kenmare shore and at Ballinskelligs Bay in 1933. A single individual was spotted southeast of Bolus Head in 2010. Single individuals were also reported in 2011 and 2013 in outer Kenmare bay while a small group of 8 was recorded in 2013.

Striped Dolphin (*Stenella coeruleoalba*)

These dolphins are sleek in appearance, with a body coloration consisting of dark grey cape extending from the beak to the dorsal fin, lighter grey flanks, leading to a pink-white underside. Sightings of striped dolphin in Ireland are very rare. By-catch data indicate their presence in the deep waters to the southwest of the Irish Shelf. This data is insufficient to infer seasonal or temporal trends. The NBC database includes a number of 3 recorded strandings record of the species in Kenmare Bay; 1 along the north shore in 1998, 1 on the south in 2008, and 1 on the north shore in the outer bay in 2013. The species was also recorded stranded at Allihies Bay Beara Peninsula, Co. Cork. In Ballinskelligs Bay strandings have been recorded in 1986, 2005, 2009, 2013 and 2014

True's Beaked Whale (*Mesoplodon mirus*)

Little is known of the True's beaked whale global distribution; they occur in the warm temperate Atlantic waters, with Ireland marking their most northerly limit. One stranding is recorded in 1972 in Ballinskelligs Bay.

2.2.6.2. Mysticetes (baleen whales)

Fin Whale (*Balaenoptera physalus*)

The second largest of the baleen whales, the fin whale is Ireland's most common large baleen whale, reaching a length of between 17.5 and 20.5 m. They are classed as being an endangered species. Most often they occur alone or in pairs, but also form larger pods of 3-20. They prefer deep waters, 400m - 2,000m, beyond continental shelf's and areas with variations in bathymetry. They are primarily distributed along or beyond the 500 m depth contour, in areas like Rockall Trough and Porcupine Bight. They are commonly sighted off the Irish coast, with the highest relative abundance being off the south coast, inshore to the deeper waters of Labadie Bank in the south and Celtic Deep in the east. In the NBC database there are strandings records of the species at Derrynane Bay in 1914 and in outer Kenmare Bay 1984.

Humpback Whale (*Megaptera novaeangliae*)

Present in Irish waters from June to February, with little sightings from March to May when they are assumed to have migrated to tropical breeding grounds. Foraging animals were most frequent off the south coast from late July to February. These whales show a high-level of site fidelity off the south

coast. They also peak in abundance in the western Irish Sea in early spring and summer. A single sighting of the species west of Deenish Island in 2010.

Minke Whale (*Balaenoptera acutorostrata*)

The minke whale is the most likely whale species to be seen in inshore Irish waters (Berrow et al., 2010). The highest relative abundances of minke whale have been recorded off the south and southwest coasts of Ireland in the autumn and in the western Irish Sea in spring (Wall et al., 2013). In Ballinskelligs Bay and Kenmare Bay minke whales have been commonly recorded. Numerous sighting of individuals have been reported off Deenish Island.

2.2.7. Otter

Kenmare River SAC is designated for Otter (*Lutra lutra*). The inner bay is noted as being well used by otters, with vegetation providing lying up spots and holts. Kenmare River SAC is designated for Otter (*Lutra lutra*). The SAC and it Qualifying Feature Otter is considered in the Stage 1 Screening for AA and the Stage 2 AA.

2.2.8. Migratory Fish

Habitats Directive Annex II migratory fish species designated for Irish SACs are:

- *Salmo salar* (Atlantic salmon)
- *Lampetra fluviatilis* (River lamprey)
- *Petromyzon marinus* (Sea lamprey)
- *Alosa fallax fallax* (Twaite shad)

Irish SACs for which the above species are designated are listed in **Table 2.13**. Given the nature of the proposed project and the cultivation of salmon there is potential that wild populations of salmon may be affected by the proposed project. The closest SAC designated for *Salmo salar* (Atlantic salmon) (NPWS, 2014), Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site code: 000365), is considered in the Stage 1 Screening for AA and Stage 2 AA. The SAC (000365) is a very large site that encompasses the mountains, rivers and lakes of the Iveragh Peninsula, and the Paps Mountains which stretch eastward from Killarney towards Millstreet (NPWS 2013). The Blackwater River with a catchment area of 88km^2, is located on the southern side of the Iveragh peninsula and is approximately 38.43km in total flowing north to south traversing through the SAC before entering the Kenmare River estuary.

The Blackwater (Kerry) in the upper most section of Kenmare Bay is a salmonid fishery river. The river is managed by Inland Fisheries Ireland and is utilised for salmon fishing each year from 15th March to

30th September with approximately 1,500 salmon and grilse entering the river annually. Trout fishing also takes place from 15th March to 12th October. The river is currently operating on a catch and release basis for the 2019 season (http://www.fishinginireland.info/salmon/southwest/blackwater.htm).

In a 2014 salmonid survey conducted by IFI on the Blackwater (Kerry), the method of depletion fishing demonstrated that salmon 0+ had an overall mean abundance of 0.416 fish per m^2 and salmon 1+ at 0.208 fish per m^2 (IFI 2014a). In the method using the five-minute fishing technique (catchment wide electro-fishing), a mean catch of 17.82 salmon fry/5min with a cumulative average from 2008 – 2014, consisting of 4 surveys, resulted in a value of 19.31 salmon fry/5min (IFI 2014a). This average salmon fry value is above the threshold of 17 salmon fry set by the Standing Scientific Committee on Salmon (SSCS) therefore indicative of good spawning grounds and hence the improved salmon numbers observed.

2017 records from the fish counter present 100m upstream of the estuary in the Blackwater River detected 95 spring salmon, 377 Grilse, 39 late summer salmon and 69 sea trout (IFI 2017a). In 2018, fish species detected showed 76 spring salmon, 285 grilse, 39 late summer salmon and 71 sea trout (IFI 2018).

Table 2.13: SACs designated for Annex II migratory fish species

SAC (Site code)	SAC shortest pathway by water (km)	Qualifying Feature (Qualifying Feature Code)			
		Twaite shad (*Alosa fallax fallax*) (1103)	River lamprey (*Lampetra fluviatilis*) (1099)	Sea lamprey (*Petromyzon marinus*) (1095)	Atlantic salmon (*Salmo salar*) (1106)
Blackwater River (Cork/Waterford) SAC (002170)	206.4	✓	✓	✓	✓
Blackwater River (Kerry) SAC (002173)	36.1				✓
Castlemaine Harbour SAC (000343)	65.4		✓	✓	✓
Cloghernagore Bog and Glenveagh National Park SAC (002047)	491.9				✓
Connemara Bog Complex SAC (002034)	194.1				✓
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627)	396.1		✓	✓	
Glenamoy Bog Complex SAC (000500)	315.1				✓
Killala Bay/Moy Estuary SAC (000458)	367.6			✓	
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)	10.8		✓	✓	✓
Leannan River SAC (002176)	528.3				✓

SAC (Site code)	SAC shortest pathway by water (km)	Qualifying Feature (Qualifying Feature Code)			
		Twaite shad (*Alosa fallax fallax*) (1103)	River lamprey (*Lampetra fluviatilis*) (1099)	Sea lamprey (*Petromyzon marinus*) (1095)	Atlantic salmon (*Salmo salar*) (1106)
Lough Corrib SAC (000297)	216.8			✓	✓
Lough Eske and Ardnamona Wood SAC (000163)	433.2				✓
Lough Gill SAC (001976)	404.5		✓	✓	✓
Lough Melvin SAC (000428)	413.7				✓
Lower River Shannon SAC (002165)	101.4		✓	✓	✓
Lower River Suir SAC (002137)	283.1	✓	✓	✓	✓
Maumturk Mountains SAC (002008)	245.8				✓
Mweelrea/Sheeffry/Erriff Complex SAC (001932)	237.5				✓
Newport River SAC (002144)	282.8				✓
Owenduff/Nephin Complex SAC (000534)	264.4				✓
River Barrow and River Nore SAC (002162)	273.5	✓	✓	✓	✓
Slaney River Valley SAC (000781)	335.6	✓	✓	✓	

2.2.9. Birds

The southwest coast of Ireland supports numerous SPAs designated for the protection of species listed under the Birds Directive. Given the wide ranging behaviour of birds there is potential that individuals from SPAs may occur in the project area and so be affected by operations. The Stage 1 Screening for AA and Stage 2 AA therefore considers SPAs designated for Qualifying Feature species with maximum foraging ranges overlapping the project area.

The Deenish site is located in the Deenish island and Scariff Island SPA (Site code: 004175). Other SPAs located close to the proposed site include the Beara Peninsula SPA (Site code: 004155), The Bull and the Cow Rocks SPA (Site code: 004066), Iveragh Peninsula (Site code: 004154), The Skelligs (Site code: 004007) and Puffin Island SPA (Site code: 004003); short description of these SPAs are provided below.

Deenish Island and *Scariff* Island SPA

The site incorporates the islands and surrounding waters of Deenish Island and Scariff Island situated between 5km and 7km west of Lamb's Head off the Co. Kerry coast. The islands are very exposed to the Atlantic Ocean. Scariff is the larger of the two and is surrounded on all sides by steep cliffs. Theisland vegetation is a mix of maritime grassland, areas dominated by bracken and heathy areas withLing Heather. Deenish is less rugged than Scariff and rises to 144 m in its southern half; the northernhalf is lower and flatter. The vegetation is mostly grassland, with some heath occurring on the higherground. The surrounding seas to a distance of 500 m around the islands are included within the site.
The site support important populations of breeding seabirds and is designated for the following species: Fulmar, Manx Shearwater, Storm Petrel, Lesser Black-backed Gull and Arctic Tern.

Iveragh *Peninsula* SPA

The SPA is a large site situated on the west coast of Co. Kerry. The site encompasses the high coast and sea cliff sections of the peninsula from just west of Rossbehy in the north, around to the end of the peninsula at Valencia Island and Bolus Head, and as far east as Lamb's Head in the south. The proposed Deenish site is located approximately 3.3km west of the boundary of the SPA near Lamb's Head. The site supports an important internationally population of breeding Chough. The site also holds nationally important populations of Guillemot and Fulmar. Other species recorded include Great Black-backed Gull and Black Guillemot, as well as smaller populations of other breeding seabirds: Razorbill, Herring Gull, Cormorant, and Shag. The SPA site is designated for Chough, Peregrine, Guillemot, Fulmar, and Kittiwake.

The Beara *Peninsula* SPA

The SPA is a coastal site situated on the west coast of Co. Cork. It encompasses the high coast and sea cliff sections of the western end of the peninsula from Reenmore Point/Cod's Head in the north, around to the end of Dursey Island in the west, and as far east as Bear Island in the south. The Deenish site is located approximately 10.6km northwest of Reenmore Point/Cod's Head. The site is designated for the following species: Chough and Fulmar. The site also holds a nationally important population of Fulmar. Other breeding seabirds presents include Shag, Herring Gull, Lesser Black- backed Gull, Razorbill and Black Guillemot – all seabird data from 2000. The site is also used by Peregrine.

The Cow and the Bull SPA

The site comprises two very small rocky islands, the Cow and the Bull, situated 2.5km and 4km respectively from Dursey Head off the coast of Co. Cork. The islands, which are composed of vertically stratified sandstone, rise to over 60 m and are generally precipitous. The surrounding water, between and to a distance of 500 m around each island, is included within the site for the benefit of the breeding seabirds. The site holds one of the most important seabird colonies in the country, with populations of Storm Petrel and Gannet of at least national importance. The Gannet colony on the Bull is long established and is the second largest colony in Ireland. The populations of Puffin and Great Black-backed Gull may be of national importance. Other species which breed are Cormorant, Guillemot, Fulmar, Herring Gull and Razorbill. Both islands are extremely inaccessible and difficult to land on and hence are seldom visited. site is designated for the following species: Storm Petrel, Gannet and Puffin. The Deenish site lies approximately 16.4km northeast of the SPA.

The Skelligs (Site code: 004007)

The site comprises Great Skelligs and Little Skellig Island. The island which are highly exposed and isolated islands are separated by a distance of 3 km, and are located 14 km and 11 km (respectively) off the County Kerry mainland. The Skelligs comprise one of the most important seabird colonies in the country for populations and species diversity. Great Skellig has an internationally important population of Storm Petrel, with birds nesting both in the stonework associated with the monastic settlement and in natural crevices amongst the scree and rock. Little Skellig is best known for its long established and internationally important Gannet colony. This is by far the largest colony in Ireland and one of the largest in the world. Great Skellig also has one of the largest Puffin colonies in the country, with 6,000 pairs estimated in 2002. Other seabird species which occur on the islands in nationally important numbers include: Fulmar and Guillemot. Razorbill occur but below the threshold of national importance. Great Skellig is a traditional site for Chough, though the relatively small size of the island supports limited nesting pairs. Owing to the high importance of the islands for birds, each has been

designated a Statutory Nature Reserve. This site is one of the top five seabird sites in the country and is of international importance on account of both the assemblage of over 10,000 pairs of breeding seabirds and the individual populations of Storm Petrel and Gannet. The Deenish site lies approximately 20.0km east of the SPA.

Puffin Island SPA

The site lies approximately 0.5 km off the northern side of St Finan's bay in south-west Co. Kerry. Puffin Island is one of the most important seabird sites in Ireland. It supported internationally important populations of Storm Petrel. The nationally important population of breeding Puffin was the largest recorded in Ireland. The island also supports nationally important populations of Fulmar, Razorbill and Lesser Black-backed Gull. Other seabirds recorded include Shag, Guillemot, and Great Black-backed Gull (72 pairs). Chough also breeds on Puffin Island. During winter the resident population may be joined by other birds that breed on the mainland. The Deenish site lies approximately 16.1km southeast of the SPA.

Further detail on the above SPAs is provided below.

2.2.10. Potential Impacts Mechanisms

The impact mechanisms that may interact with and result in potential significant direct and indirect effects to Qualifying Features of SACs and SPAs are presented in **Table 2.14**.

Section 2.3 below presents a screening assessment of the Qualifying Features that may be impacted directly and indirectly by these impact mechanisms.

For Qualifying Features for which potential direct and/ or indirect impacts could not be screened out, a detailed assessment of potential effects is presented in the Stage 2 AA (see **Section 3**).

Table 2.14 Impact Mechanisms

Impact Mechanism
Organic enrichment
Disturbance
Entanglement
Pest and disease risk
Genetic impacts
Introduction of therapeutants.

2.3. Identification of Relevant Natura 2000 sites

2.3.1. Screening Methodology

A key factor in the consideration as to whether or not a particular Qualifying Feature of a SAC or a SPA is likely to be affected by the proposed project is its physical distance from the proposed aquaculture site and the likely connectivity (or interaction/ or impact pathway) between Qualifying Features and the impact mechanisms associated with the project.

The assessment of connectivity and potential likely significant effects of the project on Qualifying Features considers proximity of the project to habitats and non-mobile species, species foraging distances and migration routes, the proximity of the project to foraging and breeding areas, and changes in species behaviour.

Specifically **Section 2.3.2** presents a screening assessment of interaction and potential impact to Qualifying Features of SACs and SPAs located within 15km of the project while **Section 2.3.3** considers interaction and potential impact to wide ranging Qualifying Features of SACs and SPAs located more that within 15km from the project that may be found in the vicinity of the project area.

Where it is evident that there is no potential connectivity between an impact mechanism and a Qualifying Feature, the Qualifying Feature is screened out of the AA process.

Where connectivity exists between the impact mechanism and a Qualifying Feature, the Qualifying Feature is brought forward in the assessment to identify the significance of the effects.

Where it is deemed that the impact mechanism will not result in likely significant effects to the Qualifying Feature, the Qualifying Feature can be screened out.

Where it is not possible to exclude likely significant effects on the basis of best scientific knowledge, a more detailed scientific Stage 2 AA is undertaken on the potential effect of the impact mechanism(s) on the Natura 2000 sites likely to be affected and the relevant Qualifying Feature in question. A Stage 2 AA of the current project is presented in **Section 3**.

2.3.2. Natura 2000 Sites within 15km of the project

2.3.2.1. Overview

Adopting a precautionary principle[13], the Natura 2000 sites within 15km radius of the proposed project (as measured using the shortest linear distance[14]) were considered in the screening for AA (see **Table 2.15, Figure 2-27**, **Figure 2-28**).

Table 2.15: SACs and SPAs within 15km of the project.

SACs
Kenmare River SAC (Site code: 002158)
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site code: 000365)
Ballinskelligs Bay and Inny Estuary SAC (Site code: 000353)
SPAs
Deenish Island and Scariff Island SPA (Site code: 004175)
Iveragh Peninsula SPA (Site code: 004154)
Beara Peninsula SPA (Site code: 004155)

Section 2.3.2.2 and **Section 2.3.2.3** respectively provide brief descriptions of the above SACs and SPAs within 15km of the project and presents a screening assessment of potential interactions. The Qualifying Features of the sites and the screening assessment conclusions are summarised in **Table 2.16** and **Table 2.17**.

2.3.2.2. Special Areas of Conservation

Kenmare River SAC (Site code: 002158)

Kenmare River SAC in Co. Kerry, is a long, narrow, south-west facing bay. It has a wide range of marine communities from exposed coast to ultra-sheltered areas (NPWS, 2013, 2016). The SAC is designated for a wide variety of Annex I coastal and terrestrial habitats (including sand dunes [Qualifying Feature codes: 1410,2120, 2130], grassland formations [6130], salt marsh [1330], heath and scrub [4030, 5130], rocky cliff [2130], stony bank [1220] and sea caves [8330]), Annex II terrestrial species are whorl snail [1014], lesser horseshoe bat [1303]. Given the distance of the proposed project from these

[13] A distance of 15 km is currently recommended in the case of plans, as a potential zone of influence, and this distance is derived from UK guidance (Scott Wilson et al., 2006).

[14] Distances are the shortest straight-line distance (i.e. as the 'crow flies').

Qualifying Features, no pathway for interaction with the proposed project exists; consequently, impacts are screened out.

The proposed project overlaps two Annex I Habitats for which the SAC is designated; these habitats are Large shallow inlets and bays [1160] and Reefs [1170]. Given the spatial overlap potential effects can not be excluded at the screening stage; habitats are brought forward to the Stage II AA NIS (see **Section 3**). Conservation Objectives for the Annex I Habitats for which potential effects could not be screened out are included in **Section 3** below.

The site is also designated for the Annex II marine mammal species Common (Harbour) Seal (*Phoca vitulina*) (1365) and the coastal aquatic mammal species Otter (*Lutra lutra*) (1355). There is potential that the species may occur in the vicinity of the proposed project and so may be affected by operations; consequently, the species is brought forward to the Stage II AA NIS (see **Section 3**). While otter is more an aquatic rather than a truly marine mammal, they are widely distributed in the SAC (Saunders, 2017) and so may occur within the proposed project area; consequently, potential effects to the otter cannot be excluded at the screening stage. Otter is brought forward to the Stage II AA NIS (see **Section 3**).

Respectively Conservation Objectives for Common Seal and Otter at Kenmare River SAC are included in **Appendix 6** and **Section 3** below.

Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (Site code: 000365)

This very large site encompasses the mountains, rivers and lakes of the Iveragh Peninsula, and the Paps Mountains which stretch eastward from Killarney towards Millstreet (NPWS, 2013, 2017). The majority of the site is in Co. Kerry, with a small portion in Co. Cork. The SAC is designated for a wide variety of Annex I terrestrial habitats (including lakes [3110, 3130], floating vegetation (3260), grassland formations and vegetation [6130, 6410, 7150], forest [91E0] and woodlands [91A0, 91J0]. Annex I species of fauna for which the site is designated include lamprey species (1095, 1096, and 1099), Killarney shad (5046) and lesser horseshoe bat [1303]. Annex II Qualifying Feature invertebrate species for which the site is designated include Kerry slug [1024], marsh fritillary [1065] while Annex II flora include Killarney fern [1421] and slender naiad [1833]. Given the non-marine terrestrial and/ or aquatic nature of these Qualifying Features, no pathway for interaction with the proposed project exists.

The site is also designated for the Annex II species *Salmo salar* (Salmon) (1106) and *Margaritifera margaritifera* (Freshwater pearl mussel). Given the nature of the proposed project there is potential that salmon cultivation activities may directly affect wild populations of the salmon with indirect knock-on effects to pearl mussel; consequently, the species are brought forward to the Stage II AA NIS

(see **Section 3**). Conservation Objectives for Salmon and Freshwater pearl mussel are included in **Section 3** below**.**

Ballinskelligs Bay and Inny Estuary SAC (Site code: 000353)

The site is located at the western end of the Iveragh Peninsula, Co. Kerry, close to the town of Waterville (NPWS, 2013, 2014). It comprises the marine waters of Ballinskelligs Bay, adjoining terrestrial areas and the River Inny upstream estuary. The site extends from Horse Island at the western end of the bay round to Rineen Point at its south-eastern side. Much of the site comprises shallow marine water, Ballinskelligs Bay, but it also supports a wide variety of other habitats, including intertidal mud/sand flats, sandy beaches, shingle, tidal river channels, sea cliffs, wet and dry grassland, freshwater marshes, swamps, cut-away bog, scrub, Bracken and saltmarsh. The site is designated for Annex I Atlantic salt meadows [1330] and Mediterranean salt meadow [1410] and the Annex II species petalwort *Petalophyllum ralfsii* [1395] (NPWS 2013).

Given the distance of the proposed project from these Qualifying Features, no pathway for interaction with the proposed project exists; consequently, impacts are screened out.

2.3.2.3. Special Protection Areas

Deenish Island and Scariff Island SPA (Site code: 004175)

Deenish Island and Scariff Island are small- to medium sized islands situated between 5km and 7km west of Lamb's Head off the Co. Kerry coast; they are thus very exposed to the force of the Atlantic Ocean (NPWS, 2015, 2018). Scariff is the larger of the two. It is steep-sided all the way around and rises to a peak of 252 m. The island vegetation is a mix of maritime grassland, areas dominated by bracken and heather. Deenish is less rugged than Scariff and rises to 144m in its southern half; the northern half is lower and flatter. The vegetation is mostly grassland, with some heath occurring on the higher ground. The site is a designated for the following species: Fulmar (*Fulmarus glacialis*) [A009], Manx Shearwater (*Puffinus puffinus*) [A013], Storm Petrel (*Hydrobates pelagicus*) [A014], Lesser Black-backed Gull (*Larus fuscus*) [A183] and Arctic Tern (*Sterna paradisaea*) [A194]. There is potential that these species may be present in the proposed project area during operations; consequently, impacts to the Qualifying Features cannot be excluded at the screening stage and the species are brought forward to the Stage II AA NIS (see **Section 3**). Conservation Objectives for the Qualifying Features of Deenish Island and Scariff SPA are included in **Appendix 6**.

Iveragh Peninsula SPA (Site code: 004154)

The Iveragh Peninsula SPA is a large site situated on the west coast of Co. Kerry. The site encompasses the high coast and sea cliff sections of the peninsula from just west of Rossbehy in the north, around to the end of the peninsula at Valencia Island and Bolus Head, and as far east as Lamb's Head in the south. The site includes the sea cliffs, the land adjacent to the cliff edge and also areas of sand dunes at Derrynane and Beginish. (NPWS, 2015, 2018). Vegetated sea cliffs dominate the site occurring along the length of the site. The cliff-tops support heath or coastal grassland. Apart from the sea cliffs themselves, the site includes areas of dry heath, wet heath, upland acid grassland, dense bracken semi-improved and improved pasture grassland, dune grassland, streams, bedrock shores and islets. The site is designated for fulmar (*Fulmarus glacialis*) [A009], Peregrine (*Falco peregrinus*) [A103], Kittiwake (*Rissa tridactyla*) [A188], Guillemot (*Uria aalge*) [A199] and Chough (*Pyrrhocorax pyrrhocorax*) [A346].

There is potential that the following Qualifying Features may be present in the proposed project area during operations; fulmar, kittiwake and guillemot. fulmar (*Fulmarus glacialis*) [A009], Kittiwake (*Rissa tridactyla*) [A188] and Guillemot (*Uria aalge*) [A199]; consequently impacts to the Qualifying Features cannot be excluded at the screening stage and the species are brought forward to the Stage II AA NIS (see **Section 3**). Conservation Objectives for Qualifying Features for which potential effects could not be screened out are included in **Appendix 6.**

In contrast, as chough and peregrine exhibit coastline or inland habitat preferences the species are unlikely to be present in the proposed project area during operations; consequently, impacts can be screened out.

Beara Peninsula SPA (Site code: 004155)

This SPA is located on the west coast of Co. Cork, south-west of the town of Kenmare. It encompasses the high coast and sea cliff sections of the western end of the peninsula from Reenmore Point/Cod's Head in the north, around to the end of Dursey Island in the west, and as far east as Bear Island in the south (NPWS, 2015, 2018). The site is a designated for the following species: Chough (*Pyrrhocorax pyrrhocorax*) [A346] and Fulmar (*Fulmarus glacialis*) [A009]. The site also holds nationally important population of Fulmar (575 pairs). The site synopsis report prepared for the SPA (NPWS 2015) also lists a number of notable seabird species including: Shag (12 pairs), Herring Gull (20 pairs), Lesser Blackbacked Gull (4 pairs), Razorbill (5 pairs) and Black Guillemot (87 individuals in 1999) – all seabird data from 2000. The site synopsis report also lists peregrine as a notable species.

Given the marine habitat preference and wide of ranging foraging behaviour of the Qualifying Feature Fulmar and the notable seabirds, there is potential that these species may be present in the proposed

project area during operations; consequently impacts cannot be excluded at the screening stage and the species are brought forward to the Stage II AA NIS (see **Section 3**). Conservation Objectives for Qualifying Features for which potential effects could not be screened out are included in **Appendix 6.**

In contrast, given the coastline or inland habitat preferences of chough and peregrine, impacts can be screened out.

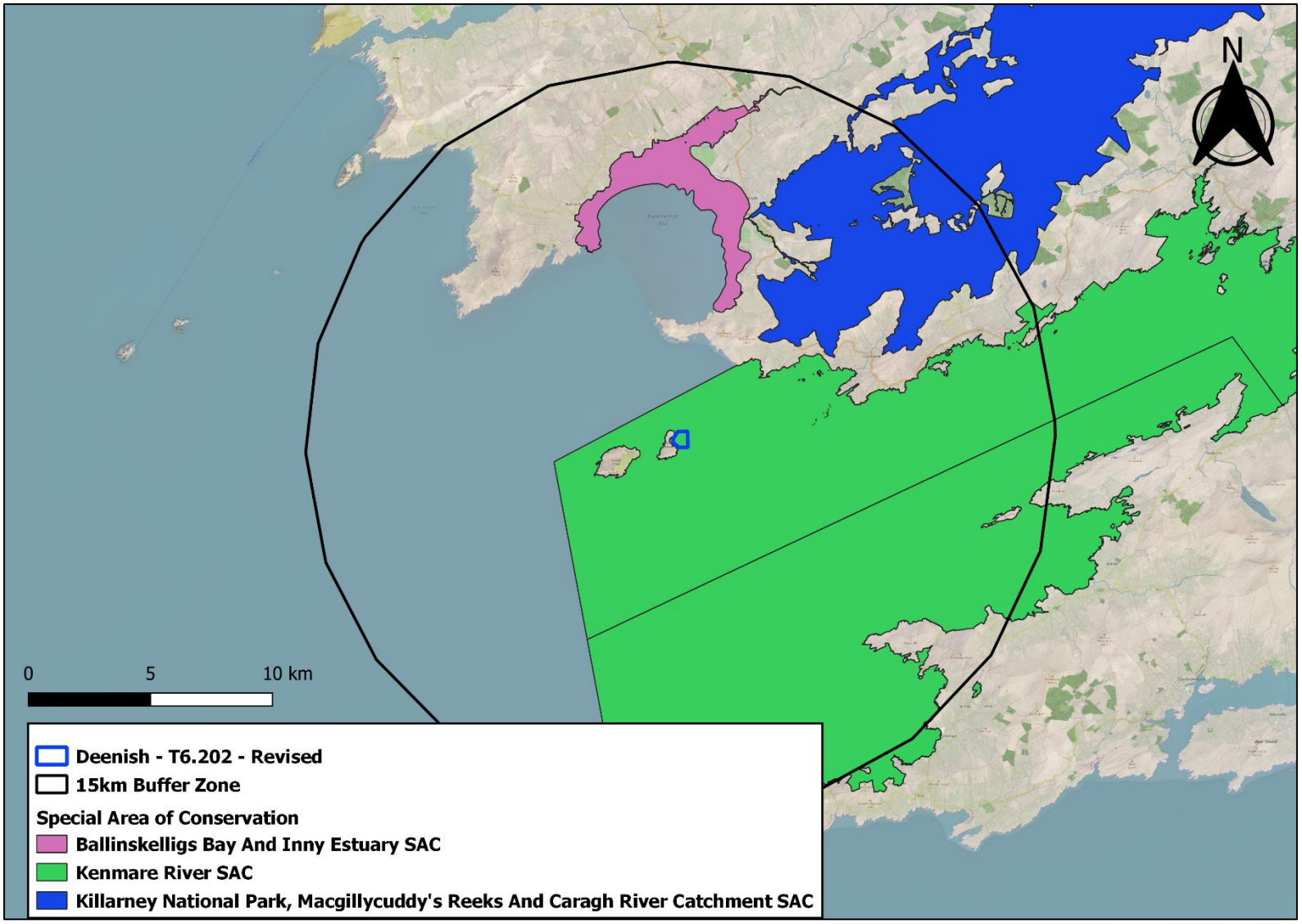


Figure 2-27: SACs within 15km of the Deenish site.

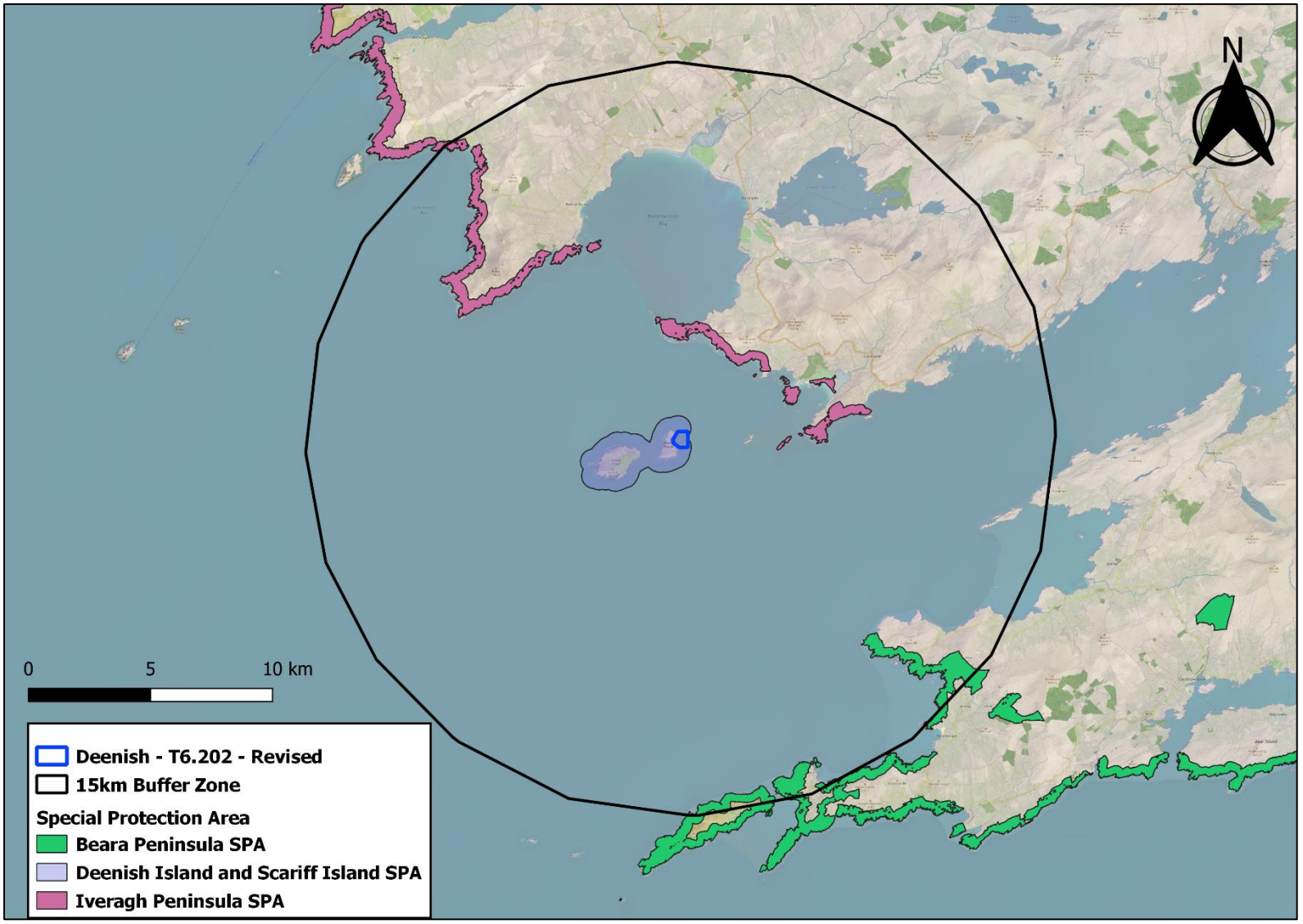


Figure 2-28: SPAs within 15km of the Deenish site.

Table 2.16: SACs within 15km of the project.

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
Kenmare River SAC (002158)	0 (project within SAC)	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No. No pathway for interaction due to non-marine or terrestrial nature of the Annex I Habitat.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]		
		Calaminarian grasslands of the Violetalia calaminariae [6130]		
		European dry heaths [4030]		
		Mediterranean salt meadows (Juncetalia maritimi) [1410]		
		Perennial vegetation of stony banks [1220] Reefs [1170]		
		Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]		
		Submerged or partially submerged sea caves [8330]		
		Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]		
		Narrow-mouthed Whorl Snail (Vertigo angustior) [1014]	No. No pathway for interaction due to non-marine terrestrial nature of the Annex II Species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		Lesser Horseshoe Bat (Rhinolophus hipposideros) [1303]		
		Reefs [1170]	**Yes – potential direct connectivity.** **Annex I Habitat is immediately adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage.** **Qualifying Feature brought forward to Stage 2 AA.**

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
		Large shallow inlets and bays [1160]	**Yes – potential direct connectivity. Annex I Habitat coincides with the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage. Qualifying Feature brought forward to Stage 2 AA.**
		Harbour seal (*Phoca vitulina*) [1365]	**Yes – potential direct connectivity. Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage. Qualifying Feature brought forward to Stage 2 AA.**
		Otter (*Lutra lutra*) [1355]	**Yes – potential direct connectivity. Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the screening stage. Qualifying Feature brought forward to Stage 2 AA.**
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (000365)	4.8	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae*, *Salicion albae*) [91E0]	No. No pathway for interaction due to non-marine or terrestrial nature of the Annex I Habitat.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		* *Taxus baccata* woods of the British Isles [91J0]		
		Alpine and Boreal heaths [4060]		
		Blanket bogs (* if active bog) [7130]		
		Calaminarian grasslands of the *Violetalia calaminariae* [6130]		
		Depressions on peat substrates of the *Rhynchosporion* [7150]		
		European dry heaths [4030]		
		Juniperus communis formations on heaths or calcareous grasslands [5130]		
		Molinia meadows on calcareous, peaty or clayey-siltladen soils (*Molinia caeruleae*) [6410]		
		Northern Atlantic wet heaths with *Erica tetralix* [4010]		

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
		Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]		
		Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea [3130]		
		Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation [3260]		
		Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110]		
		Kerry Slug (*Geomalacus maculosus*) [1024]	No. No pathway for interaction due to non-marine terrestrial nature of the Annex II Species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		Lesser Horseshoe Bat (*Rhinolophus hipposideros*) [1303]		
		Marsh Fritillary (*Euphydryas aurinia*) [1065]		
		Killarney fern (*Trichomanes speciosum*) [1421]		
		Slender Naiad (*Najas flexilis*) [1833]		
		Brook lamprey (*Lampetra planeri*) [1096]	No. No pathway for interaction due to non-migratory nature of the Annex II Species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		Killarney Shad (*Alosa fallax killarnensis*) [5046]		
		Atlantic salmon (*Salmo salar*) (only in fresh water) [1106]	**Yes – potential direct connectivity.** **Given the nature of the proposed project and the cultivation of salmon there is potential that wild populations of the salmon may be affected by the proposed project.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage.** **Qualifying Feature brought forward to Stage 2 AA.**
		Sea lamprey (*Petromyzon marinus*) [1095]	No. No pathway for interaction due to non-marine terrestrial nature of the Annex II Species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		River lamprey (*Lampetra fluviatilis*) [1099]		

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
		Otter (*Lutra lutra*) [1355]	**Yes – potential direct connectivity. Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage. Qualifying Feature brought forward to Stage 2 AA.**
		Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]	**Yes – potential indirect connectivity. Project may affect salmon, an obligate host of *Margaritifera margaritifera* larvae.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage. Qualifying Feature brought forward to Stage 2 AA.**
Ballinskelligs Bay and Inny Estuary SAC	5.0	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	No. No pathway for interaction due to non-marine or terrestrial nature of the Annex I Habitat.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
		Petalwort (*Petalophyllum ralfsi*i) [1395]	No. No pathway for interaction due to non-marine terrestrial nature of the Annex II Species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.

Table 2.17: SPAs within 15km of the project.

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Notable species[15]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
Deenish Island and Scariff Island SPA (004175)	0km (project within site)	Arctic Tern (*Sterna paradisaea*) [A194] Fulmar (*Fulmarus glacialis*) [A009] Lesser Black-backed Gull (*Larus fuscus*) [A183] Manx Shearwater (*Puffinus puffinus*) [A013] Storm Petrel (*Hydrobates pelagicus*) [A014]	Black Guillemot Great Black-backed Gull Herring Gull Shag	**Yes – potential direct connectivity.** **Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage.** **Qualifying Feature brought forward to Stage 2 AA.**
Iveragh Peninsula SPA (004154)	3.3km	Fulmar (*Fulmarus glacialis*) [A009] Guillemot (*Uria aalge*) [A199] Kittiwake (*Rissa tridactyla*) [A188]	No additional species listed in NPWS Site Synopsis report.	**Yes – potential direct connectivity.** **Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage.** **Qualifying Feature brought forward to Stage 2 AA.**
		Chough (*Pyrrhocorax pyrrhocorax*) [A346] Peregrine (*Falco peregrinus*) [A103]	-	No. No pathway for interaction due to coastline or inland habitat preference of the species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.
Beara Peninsula SPA (004155)	10.6	Fulmar (*Fulmarus glacialis*) [A009]	Black Guillemot Herring Gull Lesser Black-backed Gull Razorbill Shag	**Yes – potential direct connectivity.** **Species may occur within or adjacent to the project area.**	**No - likely significant effects cannot be excluded at the Stage 1 Screening for AA stage.** **Qualifying Feature brought forward to Stage 2 AA.**

[15] Species identified in the of the SPAs as listed in NPWS Site Synopsis reports.

SAC (Site code)	Shortest linear distance from project (km)	Qualifying Features [Feature code]	Notable species[15]	Potential Connectivity Exists	Is it possible to screen out likely significant effects?
		Chough (*Pyrrhocorax pyrrhocorax*) [A346]	Peregrine	No. No pathway for interaction due to coastline or inland habitat preference of the species.	Yes - likely significant effects can be excluded at the Stage 1 Screening for AA stage.

2.3.3. Qualifying Features of Natura 2000 Sites Located More Than 15km From the Project

2.3.3.1. Overview

There is potential that wide-ranging species that are Qualifying Features of SACs and SPAs greater than 15km from the project could be present in the vicinity of the Deenish site or within the project zone of potential disturbance and thereby be affected by the proposed operations. Significant effects to these Qualifying features cannot be screened out and are therefore brought forward to Stage 2 AA. Respectively the relevant Qualifying Features of SAC and SPA are outlined in **Section 2.3.3.2** and **Section 2.3.3.3** below.

2.3.3.2. Additional Qualifying Features of Special Areas of Conservation Brought Forward to Stage 2 Appropriate Assessment

As outlined below, mobile wide-ranging marine mammal Qualifying Features of SAC have the potential to occur within the project area and are considered in the Stage 2 AA:

Pinniped species:

- ***Phoca vitulina* (Harbour seal):** The furthest foraging trip for harbour seal reported by Sharples, et al. (2016) was 220km. A total of 4 SACs in Irish waters designated for harbour seal located within 220km of the project are brought forward to the Stage 2 AA.
- ***Halichoerus grypus* (Grey *seal*):** Cronin et al. (2011) investigated grey seal movement on Irelands' continental shelf. Of the total of 529 foraging trips recorded, the furthest foraging trip was 511km. Given this wide range all 10 SACs designated for the species in Irish waters are brought forward to the Stage 2 AA.

Cetacean species:

- ***Phocoena phocoena* (Harbour porpoise):** The 3 SACs in Irish waters designated for the wide ranging species are brought forward to the Stage 2 AA.
- ***Tursiops truncatus* (Common Bottlenose Dolphin):** The 2 SACs in Irish waters designated for the species are are brought forward to the Stage 2 AA.

The sites designated for the above pinniped and cetacean species are listed in **Section 2.2.5** above while Conservation Objectives for the Qualifying Features are included in **Appendix 6**.

2.3.3.3. Additional Qualifying Features of Special Protection Areas Brought Forward to Stage 2 Appropriate Assessment

The mobile wide ranging seabird species considered are those for which species specific foraging ranges are identified in Thaxter et al. (2012), Jovani et al (2015) and Wakefield et al. (2017). The species

considered are listed in **Table 2.18** below alongside maximum foraging ranges[16] identified for the species. In order to establish the sites that lay within the foraging ranges specified, measures of the shortest distance between the sites and the project were used[17]. SPAs designated for Qualifying Feature species with maximum foraging ranges overlapping the project are listed in **Table 2.19**.

Conservation Objectives for the relevant Qualifying Features of SPAs located over 15km from the project that are considered in the screening assessment are included in **Appendix 6**.

It should be noted, that given the nature of the proposed development it is considered that bird species that exhibit coastline or inland habitat and do not utilise the marine environment are unlikely to be present in the project area and so can be excluded from further consideration; impacts to the species are unlikely to occur and the species can be screened out. For instance, impact can be excluded to intertidal, coastal and inland species, such as oystercatcher, chough, swans etc.

[16] Mean foraging range (taken from Thaxter et al. 2012), maximum foraging range (from Jovani et al., 2015) or median foraging range (from Wakefield et al. 2017) was chosen according to the highest value.

[17] Distances are the shortest straight-line distance (i.e. as the 'crow flies').

Table 2.18: Seabird foraging ranges (summarised from Thaxter et al. 2012, Jovani et al., 2015 and Wakefield et al. 2017). Distances used in the current assessment are indicated in bold.

Species	Thaxter et al., 2012		Jovani et al., 2015	Wakefield et al, 2017	
	Maximum foraging range	Mean foraging range	Foraging range	Maximum foraging range	Mean foraging range
Arctic tern (*Sterna paradisaea*)	**30**	7.1			
Black-headed Gull (*Larus ridibundus*)	**40**	11.4			
Black Guillemot (*Cepphus grylle*)			**7**		
Common Gull (*Larus canus*)	**50**	25			
Common Tern (*Sterna hirundo*)	**30**	7.1			
Cormorant (*Phalacrocorax carbo*)	**35**	5.2			
Eider (*Somateria mollissima*)	**80**	2.4			
Fulmar (*Fulmarus glacialis*)	**580**	47.5			
Gannet (*Morus bassanus*)	590	92.5	**709**		
Great Black-backed Gull (*Larus marinus*)			**60**		
Guillemot (*Uria aalge*)	135	37.8		**340**	10.5
Herring Gull (*Larus argentatus*)	**92**	10.5			
Kittiwake (*Rissa tridactyla*)	120	24.8	231	**300**	11.9
Leach's Storm Petrel *(Oceanodroma leucorhoa*)	**120**				
Lesser Black-backed Gull (*Larus fuscus*)	**181**	71.9			
Little Tern (*Sterna albifrons*)	**11**	2.1			
Manx Shearwater (*Puffinus puffinus*)	**330**	2.3			
Mediterranean Gull (*Larus melanocephalus*)	**20**	11.5			

Species	Thaxter et al., 2012		Jovani et al., 2015	Wakefield et al, 2017	
	Maximum foraging range	Mean foraging range	Foraging range	Maximum foraging range	Mean foraging range
Puffin (*Fratercula arctica*)	**200**	4			
Razorbill (*Alca torda*)	95	23.7	312	**340**	10.5
Red-throated Diver (*Gavia stellata*)	**9**	4.5			
Roseate Tern (*Sterna dougallii*)	**30**	12.2			
Sandwich Tern (*Sterna sandvicensis*)	**54**	11.5			
Shag (*Phalacrocorax aristotelis*)	17	5.9		**35**	3.4
Storm-petrel (*Hydrobates pelagicus*)	**65**				

Table 2.19: Qualifying Features of SPAs with foraging ranges overlapping the project area. Maximum foraging ranges used.

Qualifying Feature with maximum foraging distance overlapping project area	Species Foraging Distance	SPA	Shortest linear distance from project (km)
Arctic tern (*Sterna paradisaea*) (A194)	**30**	Deenish Island and Scariff Island SPA (NPWS, 2015, 2018)	0km (project within site)
Common Tern (Sterna hirundo) (A193)	**30**	Castlemaine Harbour SPA (004029)* (NPWS, 2011, 2014)	34.7km
Fulmar (*Fulmarus glacialis*) [A009]	**580**	Beara Peninsula SPA (004155) (NPWS, 2015, 2018)	10.6km
		Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Clare Island SPA (004136) (NPWS, 2014, 2018)	227.7km
		Cliffs of Moher SPA (004005) (NPWS, 2015, 2018)	141.4km
		Deenish Island and Scariff Island SPA (004175) (NPWS, 2015, 2018)	0km (project within site)
		Dingle Peninsula SPA (004153) (NPWS, 2014, 2018)	40.7km
		Duvillaun Islands SPA (004111) (NPWS, 2014, 2018)	258.8km
		High Island, Inishshark and Davillaun SPA (004144) (NPWS, 2010, 2018)	200.0km
		Horn Head to Fanad Head SPA (004194) (NPWS, 2010, 2018)	424.5km
		Iveragh Peninsula SPA (004154) (NPWS, 2015, 2018)	3.3km
		Kerry Head SPA (004189) (NPWS, 2015, 2018)	75.5km
		Lambay Island SPA (004069) (NPWS, 2011, 2018)	343.0km
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Saltee Islands SPA (004002) (NPWS, 2011, 2012)	249.9km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
		Tory Island SPA (004073) (NPWS, 2015, 2018)	412.6km
		West Donegal Coast SPA (004150) (NPWS, 2015, 2018)	336.2km
Gannet (*Morus bassanus*) (A016)	**709**	Saltee Islands SPA (004002) (NPWS, 2011, 2012)	249.9km

Qualifying Feature with maximum foraging distance overlapping project area	Species Foraging Distance	SPA	Shortest linear distance from project (km)
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
		The Bull and the Cow Rocks SPA (004066) (NPWS, 2014, 2018)	16.4km
Guillemot (*Uria aalge*) (A199)	**340**	Clare Island SPA (004136) (NPWS, 2014, 2018)	227.7km
		Cliffs of Moher SPA (004005) (NPWS, 2015, 2018)	141.4km
		Horn Head to Fanad Head SPA (004194)	424.5km
		Inishmore SPA (004152) (NPWS, 2014, 2018)	154.1km
		Ireland's Eye SPA (004117) (NPWS, 2010, 2018)	335.9km
		Iveragh Peninsula SPA (004154) (NPWS, 2015, 2018)	3.3km
		Lambay Island SPA (004069) (NPWS, 2011, 2018)	343.0km
		Loop Head SPA (004119) (NPWS, 2009, 2018)	92.1km
		Mid-Waterford Coast SPA (004193) (NPWS, 2015, 2018)	191.1km
		Old Head of Kinsale (004021) (NPWS, 2014, 2018)	115.5km
		Saltee Islands SPA (004002) (NPWS, 2011, 2012)	249.9km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
Herring Gull (*Larus argentatus*) [A184]	**92**	Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
Kittiwake (*Rissa tridactyla*) [A188]	**300**	Aughris Head SPA (NPWS, 2012, 2018)	297.8km
		Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Clare Island SPA ((004136) (NPWS, 2014, 2018)	227.7km
		Cliffs of Moher SPA (004005) (NPWS, 2015, 2018)	141.4km
		Helvick Head to Ballyquin SPA (004192) (NPWS, 2015, 2018)	175.4km
		Inishmore SPA (004152) (NPWS, 2014, 2018)	154.1km

Qualifying Feature with maximum foraging distance overlapping project area	Species Foraging Distance	SPA	Shortest linear distance from project (km)
		Loop Head SPA (004119) (NPWS, 2009, 2018)	92.1km
		Old Head of Kinsale (004021) (NPWS, 2014, 2018)	115.5km
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Saltee Islands SPA (004002) (NPWS, 2011, 2012)	249.9km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
		Wicklow Head SPA (004127)* (NPWS, 2012, 2018)	316.5km
Lesser Black-backed Gull (*Larus fuscus*) [A183]	**181**	Ballycotton SPA (004022) (NPWS, 2014, 2015)	150.5km
		Ballymacoda (004023) (NPWS, 2014, 2018)	158.0km
		Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Cork Harbour SPA (004030) (NPWS, 2014, 2015)	123.2km
		Deenish Island and Scariff Island SPA (004175) (NPWS, 2015, 2018)	0km (project within site)
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
Manx Shearwater (*Puffinus puffinus*) [A013]	**330**	Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Cruagh Island SPA (004170) (NPWS, 2010, 2018)	197.5km
		Deenish Island and Scariff Island SPA (004175) (NPWS, 2015, 2018)	0km (project within site)
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
Puffin (*Fratercula arctica*) [A204]	**200**	Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Cliffs of Moher SPA (004005) (NPWS, 2015, 2018)	141.4km
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km

Qualifying Feature with maximum foraging distance overlapping project area	Species Foraging Distance	SPA	Shortest linear distance from project (km)
		The Bull and the Cow Rocks SPA (004066) (NPWS, 2014, 2018)	16.4km
Razorbill (*Alca torda*) [A200]	**340**	Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Clare Island SPA (004136) (NPWS, 2014, 2018)	227.7km
		Cliffs of Moher SPA (004005) (NPWS, 2015, 2018)	141.4km
		Ireland's Eye SPA (004117) (NPWS, 2010, 2018)	335.9km
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Saltee Islands SPA (004002) (NPWS, 2011, 2012)	249.9km
Storm Petrel (*Hydrobates pelagicus*) [A014]	**65**	Blasket Islands SPA (004008) (NPWS, 2011, 2015)	41.3km
		Deenish Island and Scariff Island SPA (004175) (NPWS, 2015, 2018)	0km (project within site)
		Magharee Islands SPA (004125) (NPWS, 2014, 2018)	64.2km
		Puffin Island SPA (004003) (NPWS, 2015, 2018)	16.1km
		Skelligs SPA (004007) (NPWS, 2015, 2018)	20.0km
		The Bull and the Cow Rocks SPA (004066) (NPWS, 2014, 2018)	16.4km
*	SPA boundary distance to project within 5 km of maximum foraging range of species		

2.4. Screening Summary and Concluding Statement

Potential significant effects to the following Qualifying Features (habitats and species) of SACs are excluded, as based on distance from the proposed project, no potential pathway for interaction exists between project impact mechanisms and the Qualifying Features (i.e. no connectivity exists):

- Habitats Directive Annex I terrestrial habitats – grassland formations, forests, heath and scrub, bogs, mires and fens, rivers, rocky habitats and caves;
- Habitats Directive Annex II terrestrial and aquatic species – molluscs, non-migratory freshwater fish species, insects, higher and lower species of plant and vertebrates (i.e. bats);
- Habitats Directive Annex I coastal and marine habitats – reefs (geogenic and biogenic), cliffs, caves, offshore islands, sand dunes, salt marsh, beaches and river estuaries

In contrast, potential connectivity exists between the project and the following Qualifying Features (habitats and species) of SACs.

- Habitats Directive Annex I habitats Qualifying Features: Large shallow inlets and bays, Reefs
- Habitats Directive Annex II marine mammal Qualifying Features: *Phocoena phocoena* (Harbour porpoise), *Halichoerus grypus* (Grey seal), *Phoca vitulina* (Harbour seal), *Tursiops truncatus* (Common Bottlenose Dolphin)
- Habitats Directive Annex II aquatic mammal Qualifying Features: *Lutra lutra* (Otter)
- Habitats Directive Annex II migratory fish species Qualifying Features: *Salmo salar* (Atlantic salmon)
- Habitats Directive Annex II aquatic mollusc species Qualifying Features: *Margaritifera margaritifera* (Freshwater Pearl Mussel)

Potential connectivity exists between the project and the following Qualifying Features and notable species of SPAs; consequently, effects could not be excluded.

Birds Directive – seabird Qualifying Features and notable species: Arctic tern (*Sterna paradisaea*), Black Guillemot (*Cepphus grylle*), Chough (*Pyrrhocorax pyrrhocorax*), Common Tern (*Sterna hirundo),* Fulmar (*Fulmarus glacialis*), Gannet (*Morus bassanus*), Great Black-backed Gull (*Larus marinus*), Guillemot (*Uria aalge*), Herring Gull (*Larus argentatus*), Kittiwake (*Rissa tridactyla*), Lesser Black-backed Gull (*Larus fuscus*), Manx Shearwater (*Puffinus puffinus*), Peregrine (*Falco peregrinus*), Puffin (*Fratercula arctica*), Razorbill (*Alca torda*), Shag (*Phalacrocorax aristotelis*), Storm Petrel (*Hydrobates pelagicus*)

Significant effects to the above habitats and species are uncertain and are brought forward to Stage II AA for assessment of significance of effects (Section 3).

3. Stage 2 – Appropriate Assessment – Natura Impact Statement

3.1. Overview

This section presents the NIS that has been prepared to provide the relevant scientific information to enable the competent authority to carry out its AA to determine whether or not the proposed project would adversely affect the integrity of a SAC or SPA.

The NIS examines the impacts that the project might have on its own or in combination with other plans and projects, on Qualifying Features of SAC, and on Qualifying Features and notable species of SPAs for which likely significant effects could not be excluded during the Screening for AA (see **Section 2.4** for summary).

For the current project, the potential impact mechanisms (sources of impact) include organic enrichment, disturbance, entanglement, pest and disease risk, genetic impacts and introduction of therapeutants.

The assessment of potential impacts associated with these sources considered physical impacts, and changes to and/ or interference with natural behaviour of Qualifying Features of SACs and SPAs.

DAHG - NPWS (2012) guidance on the preparation of marine NISs outlines that the NIS should include the following:

1. Annex I Habitats – Consideration of the degree to which particular marine habitats may be affected by aspects of the proposed project or plan both in isolation and in combination with other plan or projects. The assessment of effect must take into account the extent and quality of the marine habitat and the susceptibility of the habitat to be affected by the project or plan activity in question. The assessment should also consider the location of the habitat relative to the project activity and its zone of influence and the ability of the habitat to recover.
   Annex II Species – Assessment of the impact of survey activity, both in isolation and in combination with other plan or projects, designated species at the sites and their likely habitats. It is noted in DAHG – NPWS (2012) that the assessment of impact must consider all aspects of potential impacts as well as the ecological requirements of the species in an area. Aspects of likely impact to be considered should include the intensity and duration of the impact and its relative effect on the species. The assessment of impact can focus on the effects associated with the impact such as physical injury and disturbance.
   The assessment of significant effects does not take into consideration mitigation measures.

2. Mitigation Measures to be Undertaken – Identification of mitigation measures (if required) to minimise and/ or eliminate the likely effects on the Qualifying Features of relevant SACs and SPAs.
3. Monitoring and Reporting to be Undertaken – Outline monitoring and reporting for a proposed project to be undertaken.
4. Concluding Statement – Statement of the determination of the NIS outlining clearly whether the proposed operation/activity is likely to have a significant effect.

3.2. Special Areas of Conservation

3.3. Overview - Benthic Habitats including Habitats Directive Annex I Qualifying Features

Potential impacts

The potential source of impact to benthic habitats from operations at the Deenish site is predominately organic enrichment due to settleable solids discharged from the fish sites which comprised fish faeces and feed waste. Solid wastes arising from the culture of fish can impact the seabed and associated benthic communities.

Assessment Methodology

Section 3.3.1 considers the potential impact of operations at the proposed site on the Conservation Objectives of **Annex I Benthic Habitats** of Kenmare River SAC for which potential impacts could not be discounted at the Stage I Screening for AA stage. The assessment of likely impact follows NPWS guidance on interpretation of the Conservation Objectives of the SAC.

The assessment of potential impacts in **Section 3.3.1**, which is based on the spatial overlap of the new proposed site with community types identified in Annex I benthic habitats, is supported by a two other more applied assessments of potential impacts at the site that focus on changes in benthic communities and sediments. The assessments are presented in **Section 3.3.2** and **Section 3.3.3**.

Specifically, **Section 3.3.2** describes the findings of annual monitoring survey carried out at the site in recent years. **Appendix 6** contains the 2018[18] and 2019[19] audit reports while **Section 3.3.3** describes monitoring and assessment undertaken in 2018 to meet Aquaculture Stewardship Council Accreditation.

3.3.1. Annex I Benthic Habitats

Potential likely significant effects of the proposed project to the following marine Annex I benthic habitats of Kenmare River SAC could not be excluded at the Screening for AA stage (see **Section 2.4** for summary):

- Large shallow inlets and bays [1160]
- Reef [1170]

The Conservation Objectives, which are, in effect, management targets for habitats and species in the Kenmare River SAC were identified in NPWS 2013[20]. For Large shallow inlets and bays [1160] and Reefs [1170] the Conservation Objectives are to maintain the favourable conservation condition of the features. Specifically, the natural condition of the designated features should be preserved with respect to their area, distribution, extent and community distribution. Constituent community types (i.e. communities and community complexes) recorded within the above Qualifying Interest habitats are outlined in **Table 3.1** (NPWS 2013).

Table 3.1: Community types within Qualifying Interest 1160 and 1170 at Kenmare River SAC

Qualifying Feature		Community Type
Large shallow inlets and bays 1160	Reefs 1170	
✓		Zostera-dominated community
✓		Maërl-dominated community
✓		*Pachycerianthus multiplicatus* community
✓		Intertidal mobile sand community complex

[18] AQUAFACT 2018a. Environmental Survey Beneath Finfish pens at Deenish aquaculture site (T6/202), Kenmare Bay, Co. Kerry. Produced by AQUAFACT International Services Ltd.

[19] AQUAFACT 2019b. Environmental Survey Beneath Finfish pens at Deenish aquaculture site (T6/202), Kenmare Bay, Co. Kerry. Produced by AQUAFACT International Services Ltd.

[20] NPWS, 2013. Conservation Objective Series Kenmare River SAC (site code: 2158) https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002158.pdf

Qualifying Feature		Community Type
Large shallow inlets and bays 1160	Reefs 1170	
✓		Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex
✓		Fine to medium sand with crustaceans and polychaetes community complex
✓		Coarse sediment dominated by polychaetes community complex
✓		Shingle
✓	✓	Intertidal reef community complex
✓	✓	Laminaria-dominated community complex
✓	✓	Subtidal reef with echinoderms and faunal turf community complex

The attributes and targets of the Qualifying Interests Large shallow inlets and bays and Reefs and their constituent community types are outlined in **Table 3.2** below (NPWS 2013[21]). Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species and managing levels of negative species.

Table 3.2: Attributes and Targets for Qualifying Interest 1160 and 1170 in Kenmare River SAC

Qualifying Interest (Community Type)	Attribute (measure)	Target
Large shallow inlets and bays 1160	**Habitat area (ha)**	**The permanent habitat area is stable or increasing, subject to natural processes; 39,322ha.**
(Zostera-dominated community)	Community extent (ha)	Maintain the extent of community subject to natural processes; 20ha.
(Maërl-dominated community)	Community extent (ha)	Maintain the extent of community subject to natural processes; 47ha.
(*Pachycerianthus multiplicatus* community)	Community extent (ha)	Maintain the extent of community subject to natural processes; 6ha.

[21] NPWS, 2013. Kenmare River SAC (site code: 2158) Conservation objectives supporting document - Marine habitats and species Version 1 March 2013

https://www.npws.ie/sites/default/files/publications/pdf/002158_Kenmare%20River%20SAC%20Marine%20Supporting%20Doc_V1.pdf

Qualifying Interest (Community Type)	Attribute (measure)	Target
(Intertidal mobile sand community complex)	Community distribution (ha)	Conserve the community in a natural condition: 63ha.
(Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex)	Community distribution (ha)	Conserve the community in a natural condition: 20,150ha.
(Fine to medium sand with crustaceans and polychaetes community complex)	Community distribution (ha)	Conserve the community in a natural condition: 1,989ha.
(Coarse sediment dominated by polychaetes community complex)	Community distribution (ha)	Conserve the community in a natural condition: 8,314ha.
(Shingle)	Community distribution (ha)	Conserve the community in a natural condition: 1ha.
(Intertidal reef community complex)	Community distribution (ha)	Conserve the community in a natural condition: 526ha.
(Laminaria-dominated community complex)	Community distribution (ha)	Conserve the community in a natural condition: 3,359ha.
(Subtidal reef with echinoderms and faunal turf community complex)	Community distribution (ha)	Conserve the community in a natural condition: 4,808ha.
Reefs (1170)	**Distribution (occurrence)**	**The distribution of reefs remains stable, subject to natural processes**
	Habitat Area (ha)	**The permanent habitat area is stable or increasing, subject to natural processes**
(Intertidal reef community complex)	Community structure (Biological composition)	Conserve in a natural condition; 681ha.
(Laminaria-dominated community complex)	Community structure (Biological composition)	Conserve in a natural condition; 3,678ha.
(Subtidal reef with echinoderms and faunal turf community complex)	Community structure (Biological composition)	Conserve in a natural condition; 4,838ha.

3.3.1.1. Modelling Potential Impact

For the proposed salmon production operations at the Deenish site, three-dimensional hydrodynamic simulation modelling was undertaken to determine the transport and dispersion of settleable solids surrounding the site. Details of the model are presented in full in **Appendix 7**. In summary, solid discharges from the farm were calculated based on production and feeding levels proposed at the site (see **Section 2** above). The fate, dispersion and transport of these solids were modelled following discharge into the water column at mid-water depth at the fish pens (i.e. approximately 4m below surface). The settleable solids discharged from the fish sites comprised two sources of organic particulate matter: fish faeces and feed waste. Of the feed supplied to a fish farm an estimated 97% is consumed by the fish stock while the remaining 3% is uneaten and settles to the bottom. The simulations show localised deposition immediately beneath the farm cages and within the proposed licensed site area. The modelled footprint of maximum monthly settleable solids sedimentation rates at the farm and surrounds is shown in **Figure 3-1**. The predicted maximum deposition rate at the farm is 1.4mm per month of which 1.68kg per m^2 of organic material per month (or 54g per m^2 per day). While slight migration of settleable solids outside of the licenced production area to the south and east is predicted the predicted maximum deposition rate is low at less than 0.2mm per month.

The Conservation objectives supporting document for the Kenmare River SAC (2013) provides guidance on interpretation of the Conservation Objectives of the SAC. This guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by the proposed activities.

For the practical purpose of management of habitats, a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold, which was used by Marine Institute in the AA of aquaculture activity in Kenmare River SAC (Marine Institute, 2017, 2019) (see **Appendix 1**), disturbance is deemed to be non-significant. Disturbance is defined as that which leads to a change in the characterizing species of the habitat (which may also indicate change in structure and function). Such disturbance may be temporary or persistent in the sense that change in characterizing species may recover to pre-disturbed state or may persist and accumulate over time.

The spatial over lap of the proposed site and the modelled sedimentation footprint with community types identified in Qualifying Feature Large shallow inlets and bays and Reefs are shown in **Figure 3-2**.

Table 3.3 highlights the specific community types that the proposed site and the sediment footprint overlap; for community types that coincide with the proposed site and the sedimentation footprint, overlaps are expressed as areal extent (ha) and as percentages of the total community type area.

3.3.1.2. Assessment

Of the 11 constituent community types identified in the Qualifying Feature Large shallow inlets and bays the proposed licenced area and sedimentation footprint overlapped respectively 4 community types.

In the case the Qualifying Feature Reef the proposed licenced area and sedimentation footprint overlapped to varying extents each of the 3 community types.

In all cases the percentage of the community overlapped by the proposed licenced area and/ or the sedimentation footprint was below the 15% threshold for a disturbing activity identified in NPWS guidance (NPWS 2013).

3.3.1.3. Conclusions

It can be concluded that in light the Conservation Objectives defined for the Kenmare River SAC the **operations at the Deenish Island site will not significantly affect Annex I benthic habitats** for which the SAC is designated.

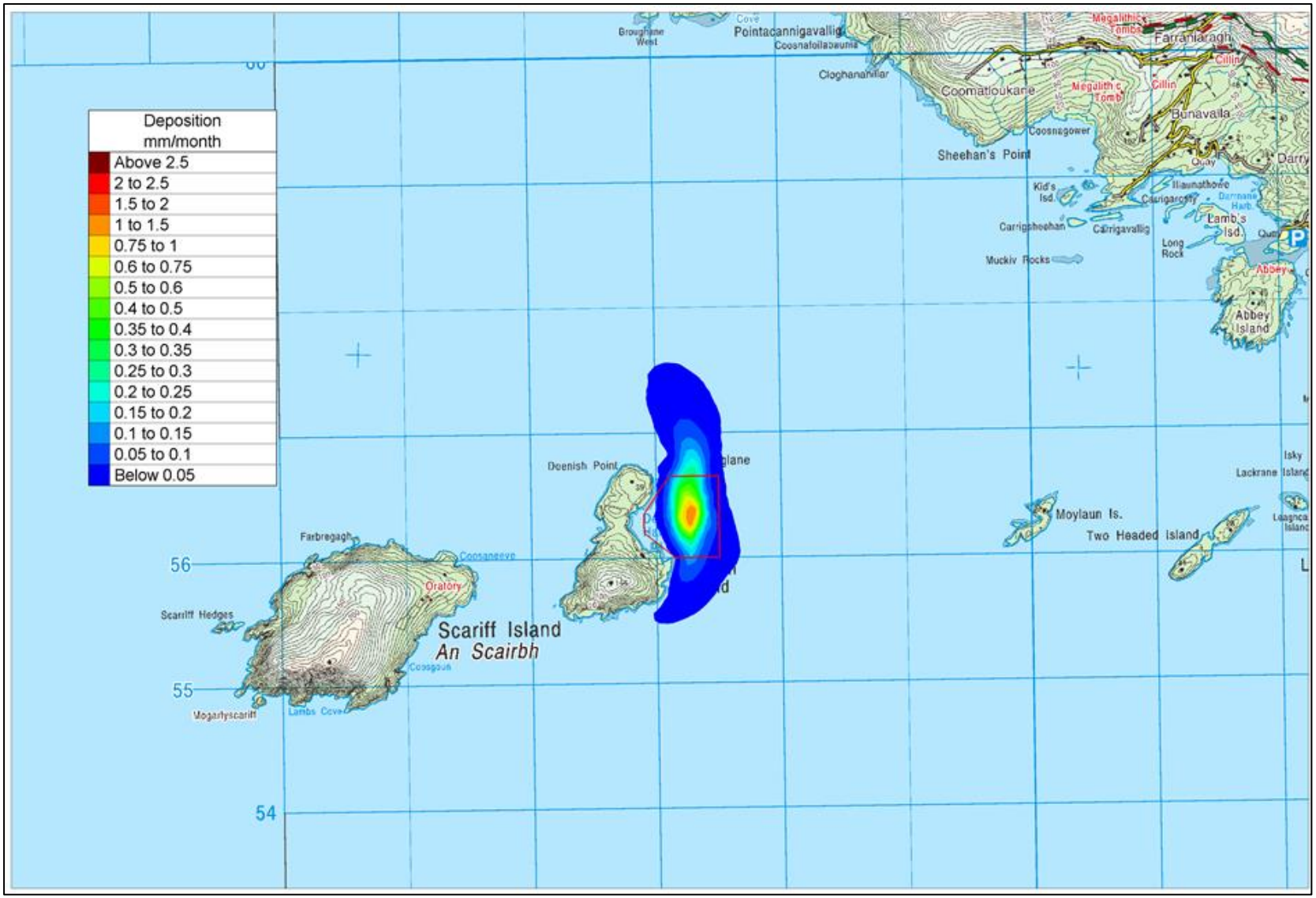


Figure 3-1: Predicted maximum monthly settleable solids sedimentation rates at the Deenish site.

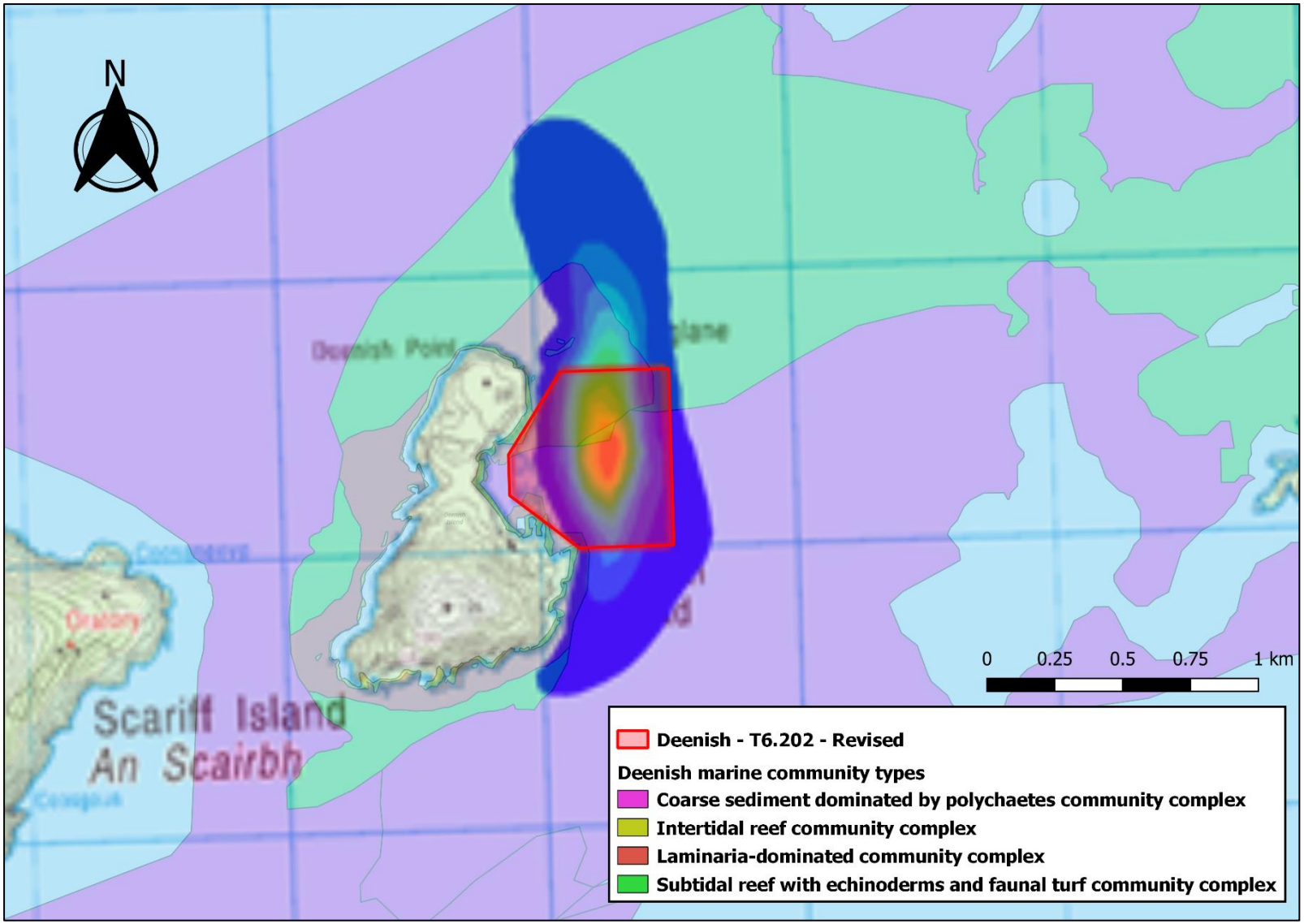


Figure 3-2: Predicted maximum monthly settleable solids sedimentation rates at the Deenish site.

Table 3.3: Overlap of proposed site and sedimentation footprint with community types

Qualifying Interest	Community Type (extent ha)	Proposed Site Footprint		Sedimentation Footprint	
		Overlap (ha)	Overlap %age of community type	Overlap (ha)	Overlap %age of community type
Large shallow inlets and bays 1160	Zostera-dominated community (20ha)	-	-	-	-
	Maërl-dominated community (47ha)	-	-	-	-
	Pachycerianthus multiplicatus community (6ha)	-	-	-	-
	Intertidal mobile sand community complex (63ha)	-	-	-	-
	Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex (20,150ha)	-	-	-	-
	Fine to medium sand with crustaceans and polychaetes community complex (1,989ha)	-	-	-	-
	Coarse sediment dominated by polychaetes community complex (8,314ha)	21.43ha	0.26%	42.29	0.51%
	Shingle (1ha)	-	-	-	-
	Intertidal reef community complex (526ha)	0.06ha	<0.01%	0.26	0.05%
	Laminaria-dominated community complex (3,359ha)	9.40ha	<0.01%	21.137	0.63%
	Subtidal reef with echinoderms and faunal turf community complex (4,808ha)	0.47ha	<0.01%	35.37	0.73%

Qualifying Interest	Community Type (extent ha)	Proposed Site Footprint		Sedimentation Footprint	
		Overlap (ha)	Overlap %age of community type	Overlap (ha)	Overlap %age of community type
Reefs (1170)	Intertidal reef community complex (681ha)	-	-	-	-
	Laminaria-dominated community complex (3,678ha)	9.40ha	<0.01%	21.137ha	0.57%
	Subtidal reef with echinoderms and faunal turf community complex (4,838ha)	0.47ha	<0.01%	35.37ha	0.73%

3.3.2. Annual Benthic Audits

3.3.2.1. Audit Design

Following Benthic Monitoring Guidelines laid down by the DAFM (December 2008) annual benthic audits are undertaken at the Deenish site to monitor the benthic environment. The annual audits involve direct observation, sampling and recording (photographic and written) of benthic conditions at sites along transects:

Transect 1 (T1) aligned with the prevalent water current

- directly under the pen (T1 Under)
- under the edge of the pen (T1 Edge)
- 10m from the edge of the pen (T1 10m)
- 20m from the edge of the pen (T1 20m)
- 50m from the edge of the pen (T1 50m)
- 100m from the edge of the pen (T1 100m)

Transect 2 (T2) aligned perpendicular to the prevalent water current

- directly under the pen (T2 Under)
- under the edge of the pen (T2 Edge)
- 10m from the edge of the pen (T2 10m)
- 20m from the edge of the pen (T2 20m)
- 50m from the edge of the pen (T2 50m)

Control/ reference station

3.3.2.2. Annual Audit Results and Assessment

Annual monitoring surveys have been carried out in recent years with the most recent audits carried out in May 2018[22] and September 2019[23]. **Appendix 8** contains the 2018 and 2019 audit reports.

In May 2018 at the time of the audit, 1,532.7 tonnes of fish were stocked on site with 44.6 tonnes having been input to the site in March 2017 following a 10 week week fallow period. This gave an onsite biomass production of approximately 1,488 tonnes prior to the survey. This level of biomass production

[22] AQUAFACT 2018a. Environmental Survey Beneath Finfish pens at Deenish aquaculture site (T6/202), KenmareBay, Co. Kerry. Produced by AQUAFACT International Services Ltd.

[23] AQUAFACT 2019b. Environmental Survey Beneath Finfish pens at Deenish aquaculture site (T6/202), Kenmare Bay, Co. Kerry. Produced by AQUAFACT International Services Ltd.

was significantly higher than the biomass production occurring at the site prior to the September 2019 audit. The stock biomass on-site in September 2019 survey was approximately 387.2 tonnes with 42.4 tonnes put to sea in February 2019 following an eight week fallow period, giving a production biomass at the site prior to survey of 344.8 tonnes.

The benthic audits undertaken in May 2018 and September 2019 (AQUAFACT, 2018a, 2019b) identifiedno major signs of impact detected beyond the edge 10m stations (i.e. TI 10m and T2 10m stations).
There were no observations of outgassing or bacterial mats in the area.

2018 Audit

In 2018 all the stations surveyed along Transect 2 (i.e. T2 under to T2 100m) were characterised as fine to medium grained sand (see **Figure 3-3**).

Stations located along Transect 1 under the fish pens and up to 20 m from the pens (i.e. T1 Under to T1 20) comprised fine to medium sand (see **Figure 3-4**) (and were similar to those identified at Transect 2). Sediments at the Transect 1 stations located underneath the pens and at the edge of the pens (i.e. T1 Under, T1 Edge) were formed into small hills and depressions by the bioturbating activity of opportunistic polychaeta including Capitella sp. complex and Malacoceros. *Arenicola marina* casts and uneaten feed pellets were also visible at the sites. Images of the seabed under the fish pens (i.e. T1 Under) and at the edge of the pens (i.e. T1 Edge) are shown in **Figure 3-5**.

Transect 1 stations located 50m and 100m from the pens (i.e. T1 50 and T1 100) were characterised as coarse sands with relatively high proportions of shell gravel material (see **Figure 3-4**). At these sites drift algae and phyodetrital material were present along with burrowing anemone *Cerianthus lloydi Asterias rubens* (see **Figure 3-6**).

2019 Audit

Surveys undertaken along Transect 1 and Transect 2 in September 2019 showed that the condition of the seafloor habitats did not change significantly since May 2018. Fine to medium grained sediments were observed at all Transect 2 stations (i.e. T2 Under to T2 50) (see **Figure 3-7**) and at the T1 Under and T1 10 (see **Figure 3-8**). These sites showed evidence of bioturbation activity of *Capitella* sp. complex and *Malacoceros* sp. *Arenicola marina* casts and uneaten feed pellets were also visible at the sites. Relatively more coarse stations were identified further from the pens. Fauna at these sites included the anemone *Cerianthus lloydi*, brittlestar, and the starfish *Asterias rubens.*

Impact Assessment

Capitella and *Malacoceros* sp. are first order deposit feeding opportunists that proliferate in reduced sediments to such a degree that there is a pronounced unbalance in the faunal assemblages. Once populations of these deposit-feeding species are established they play a major role in assimilating excess organic material at the bottom. These can also increase the apparent redox potential discontinuity (aRPD) depth through bioturbation of benthic sediments. This in turn increases oxygen levels and depths mitigating anoxia in surface sediments. This is evidenced by the SPI images of well oxygenated sediments at the site in 2018 where the bioturbation activity of the opportunistic polychaete community acted to remove excess organic material and reduce impacts.

Over time the assimilation of organic material by the opportunistic polychaete assemblage and the bioturbation of sediment will act to reduce impacts at the site and increase the depth of oxygen penetration into the sediments. The sediments at the sites will in time revert to a pre-disturbed state. In general, the seabed at the stations located at the edge of the pens and beyond appear to be in good condition and showed no signs of impact from the adjacent finfish activities.

3.3.2.3. Conclusions

The audits undertaken in 2018 and 2019 show that the benthic community in the vicinity of the site can tolerate the tonnages produced in those years.

It can be **concluded that the operations at the proposed site, together with the mitigation measures proposed (i.e. implementation of a fallow period), will not significantly affect benthic ecology**. Any disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activity.

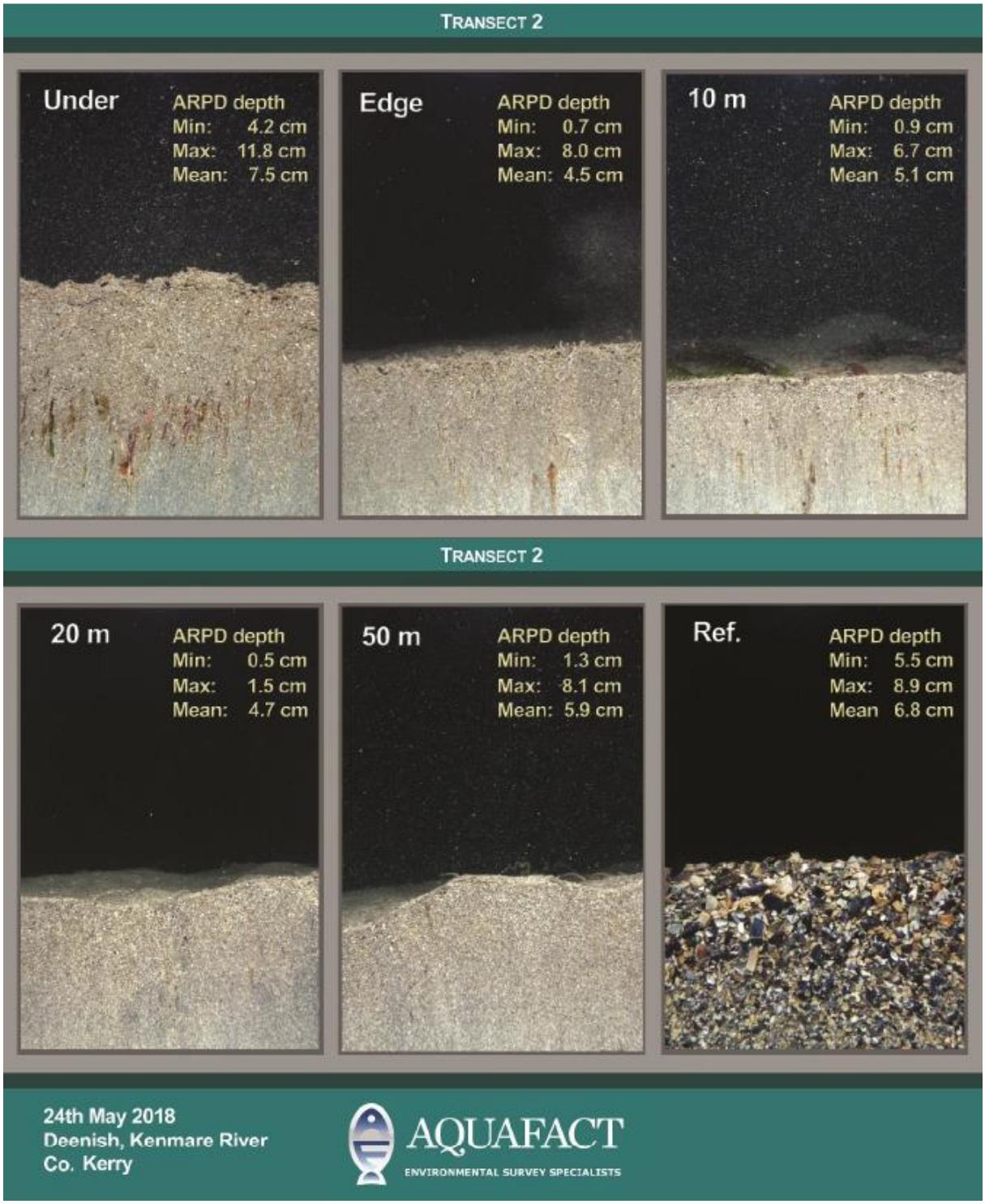


Figure 3-3: 2018 Audit: Representative photographs of the seafloor taken along Transect 2 by Sediment Profile Imagery (SPI) (May 2018)

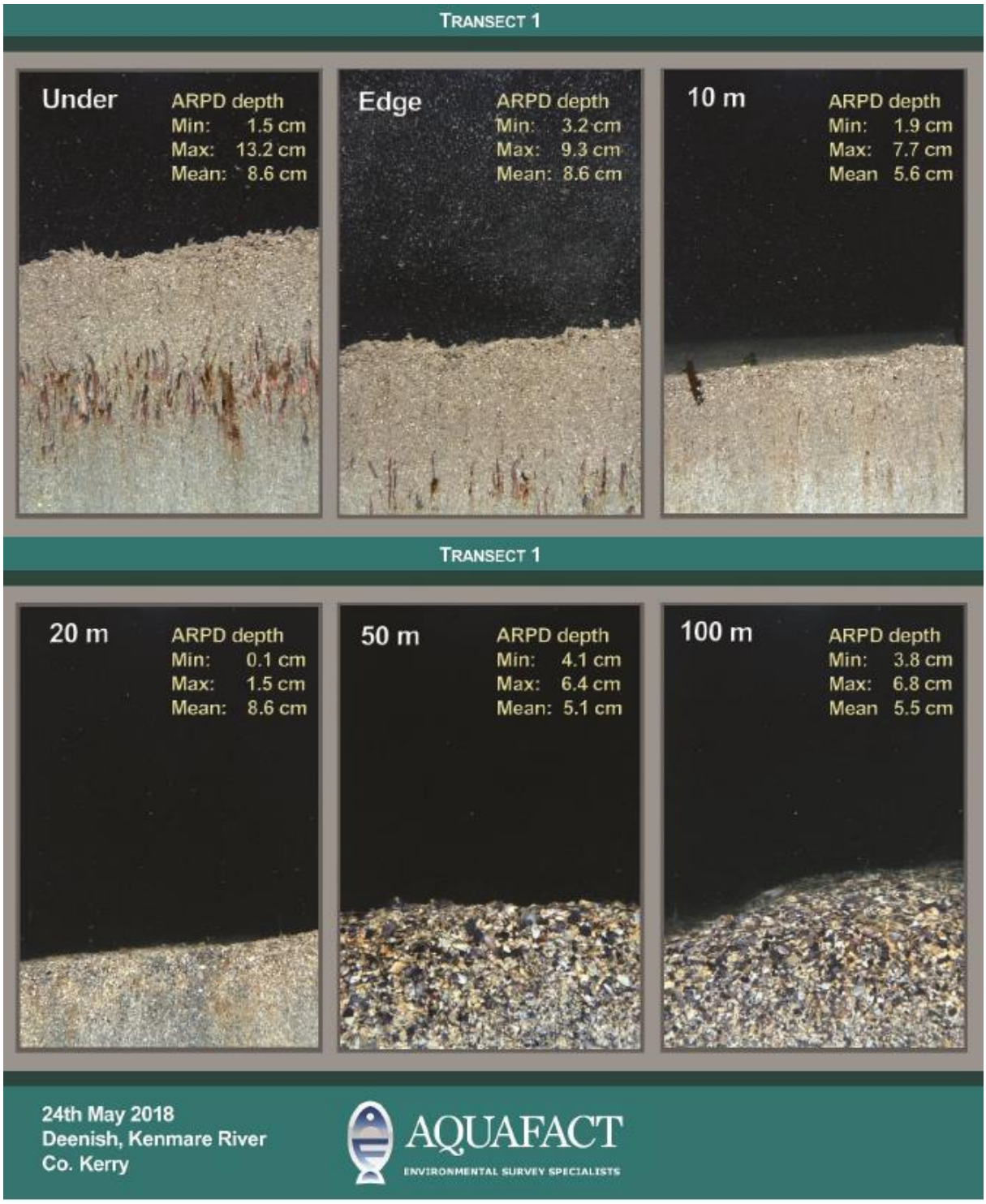


Figure 3-4: 2018 Audit: Representative photographs of the seafloor taken along Transect 1 by Sediment Profile Imagery (SPI) (May 2018)



Figure 3-5: 2018 Audit: Representative photographs of the seafloor taken along Transect 1 (May 2018)

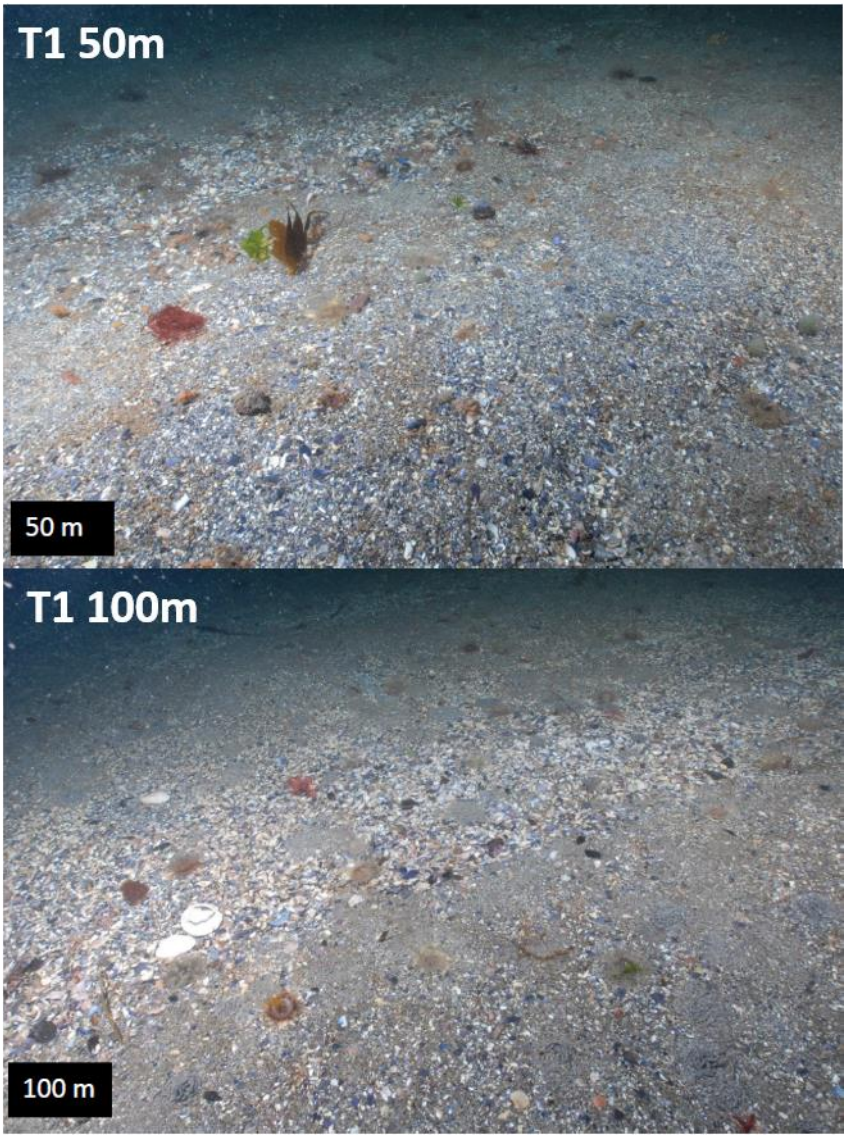


Figure 3-6: 2018 Audit: Representative photographs of the seafloor taken along Transect 1 (May 2018)

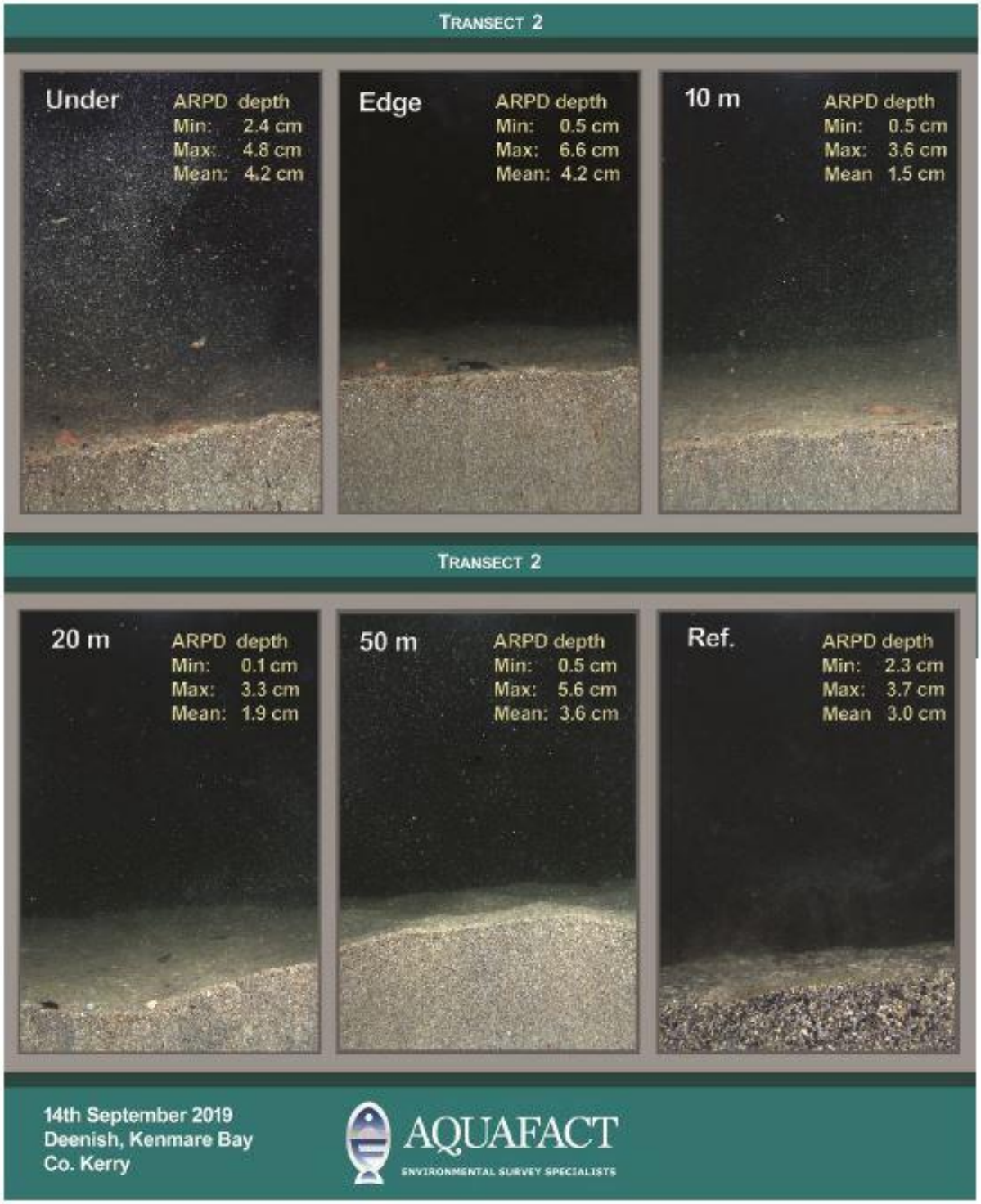


Figure 3-7 2019 Audit: Representative photographs of the seafloor taken along Transect 2 by Sediment Profile Imagery (SPI) (September 2019)

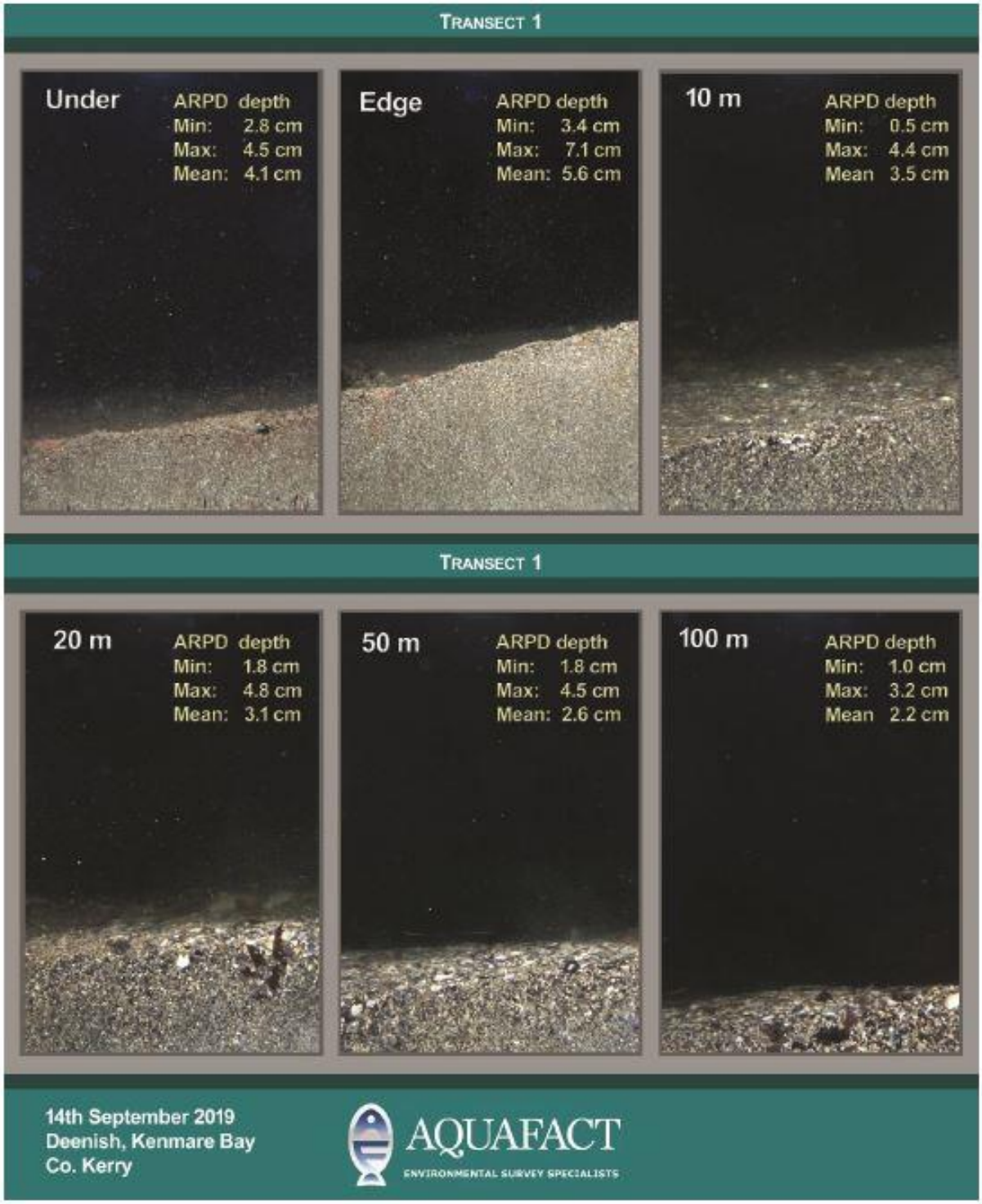


Figure 3-8: 2019 Audit: Representative photographs of the seafloor taken along Transect 1 by Sediment Profile Imagery (SPI) (September 2019)

3.3.3. Aquaculture Stewardship Council Accreditation

3.3.3.1. Background

Aquaculture Stewardship Council (ASC) Accreditation is a certification and labelling scheme that guarantees consumers that the seafood they are purchasing is sustainable for the environment. To attain accreditation the producer must demonstrate that the production of seafood in question does result in unsustainable impacts to the environment.

3.3.3.2. Allowable Zone of Effect

For aquaculture developments impacts should be confined the Allowable Zone of Effect (AZE) which is the area of sea-bed or volume of the receiving water body in the immediate vicinity of the farm within in which some deviation from national and international environmental quality standards is expected but is not beyond a point (threshold) where critical goods and services provided by the marine ecosystem are irreversibly compromised. Typically, the AZE is defined as a 30m buffer area around the edge of the pens. However, a site specific AZE (SSAZE) was determined for Deenish based on the site configuration and local hydrodynamic characteristics, which resulted in a 30m equivalent ellipse axis of approximately 64m from the edge of the surveyed pen along the long axis and 10m outside the edge on the narrow axis.

3.3.3.3. Assessment Methodology

Impacts are assessed using the AZTI (Ciencia y tecnología marina y alimentaria Derio) marine Benthic Index (AMBI). AMBI is a tool for measuring organic enrichment disturbance based on the proportions of sensitive and stress tolerant benthic invertebrate species present. Specifically, species are allocated to one of five ecological sensitivity groups depending on their sensitivity to an increasing stress gradient (i.e. organic matter enrichment). The ecological sensitivity groups are described in **Table 3.4**.

Based on the weighted average of the sensitivity scores of individuals across the five ecological sensitivity groups AMBI scores (or biotic index) are calculated. The scores range from 0 to 7. The AMBI score scale is sub-divided into five pollution disturbance classes by assigning a numerical value to each of the class boundaries. There are five disturbance classes and corresponding AMBI score range are shown in **Table 3.5**. It should be noted that AMBI was originally developed for European coastal waters. The tool can be used as a guideline for establishing the ecological quality in Irish waters.

Table 3.4 AMBI Groups

Group	Description
Group I	Species very sensitive to organic enrichment (present under unpolluted conditions)
Group II	Species indifferent to enrichment (always present in low densities)
Group III	Species tolerant to excess organic matter enrichment (indicative of slight unbalance situations)
Group IV	Second-order opportunistic species (indicative slight to pronounced unbalanced situations)
Group V	First-order opportunistic species (indicative pronounced unbalanced situations)

Table 3.5 AMBI score range and disturbance classes

Pollution disturbance class	Biotic Index Range	Dominating ecological sensitivity group
Unpolluted	0 – 1	I
Slightly Polluted	2 – 3	II – III
Moderately Polluted	3 – 5	IV – V
Heavily Polluted	5 – 6	V
Extremely polluted	6 - 7	Azoic

3.3.3.4. Survey Design

A total of 7 monitoring stations (including 1 reference station) were sampled at the site in 2018 (survey design and location of stations shown in **Appendix 8**). The reference stations are to determine natural baseline organic enrichment level at the site.

3.3.3.5. AMBI Results and Assessment

AMBI scores were calculated for the monitoring stations at Deenish in 2018 (see **Table 3.6)**. The majority of sites were classified as 'Moderately Disturbed' (4 of 7). Of the 7 monitoring stations sampled 1 was classified as 'Slightly Disturbed' and 1 classified as 'Undisturbed'. The reference station was classified as 'Stations classified as 'Slightly Disturbed'.

'Slightly Disturbed' were characterised by high abundances of Nematoda. Stations classified as 'Moderately Disturbed' were characterised by Group V species which are pollution tolerant including *Capitella* sp. complex, *Malacoceros vulgaris* and *Tubificoides benedii*.

The AMBI scores at stations at the site indicate aquaculture activity can lead to local increased organic enrichment, with scores of 'Moderately disturbed' driven by the high relative abundance of *Capitella* sp. and *Malacoceros vulgaris*.

As shown in **Section 3.3.2**, pioneering deposit-feeding polychaetes *Capitella* sp. complex and *Malacoceros vulgaris* will act to assimilate excess organic material, increase sediment oxygen levels

through bioturbation action thereby mitigating anoxia in sediments and allowing the sediments to recover to an unimpacted state.

Table 3.6 AMBI Score and equivalent disturbance classification obtained from reference stations sampled in the vicinity of the Deenish site, Kenmare Bay in 2018.

Station	AMBI Score	AMBI Classification
9	1.311	Slightly disturbed

Table 3.7 AMBI Scores and equivalent disturbance classification obtained from six stations sampled in the vicinity of the Deenish site, Kenmare Bay in 2018.

Station	AMBI Score	AMBI Classification
1	3.999	Moderately disturbed
2	3.380	Moderately disturbed
3	3.487	Moderately disturbed
4	4.344	Moderately disturbed
5	3.138	Slightly disturbed
6	1.135	Undisturbed

3.3.3.6. Conclusions

It can be **concluded that the operations at the proposed site, together with the mitigation measures proposed (i.e. implementation of a fallow period), will not significantly affect the benthic ecology**. Any disturbance experienced will be temporary with the species characterising the community types recovering to pre-disturbed state following cessation of activity

3.3.4. Mitigation Measures

Organic enrichment due to settleable solids discharged from the fish site is the main source of potential impact to marine benthic habitats. Potential effects of settleable solids will be mitigated through the implementation of fallow periods between production cycles at the site. Following each production cycle, the proposed Deenish site will lie fallow for 3 months. This fallow period will occur over the winter months when the site is at its most hydro-active thereby allowing dispersal of solids that may have accumulated under the pens during the production cycle. The fallow period also allows sufficient time for the seabed sediments and associated faunal community to recover to pre-production (pre-disturbed) state. Detail of the recovery of sediment and faunal communities following cessation of activities is documented in **Section 3.3.2** and **Section 3.3.3** above.

3.3.5. Overall Conclusions

Operations at the proposed site, together with the mitigation measures proposed, will **not significantly affect** benthic ecology or Annex I benthic habitats of the Kenmare SAC in light the Conservation Objectives.

3.4. Overview – Habitats Directive Annex II Qualifying Features Marine and Aquatic Mammals

Potential likely significant effects of the proposed project to the following marine Annex II marine and aquatic mammal species could not be screened out at the Stage 1 Screening for AA stage (see **Section 2.4** for summary):

- *Halichoerus grypus* (Grey *seal*)
- *Phoca vitulina (Harbour seal)*
- *Phocoena phocoena* (Harbour *porpoise*)
- *Tursiops truncatus* (*Common* Bottlenose Dolphin)
- *Lutra lutra* (Otter)

Brief descriptions of the SACs designated for the above species relevant to this Stage 2 AA are provided in **Section 3.4.1** to **Section 3.4.3** below. Assessment of potential impact to the species are presented in **Section 3.4.4** below.

3.4.1. Pinnipeds

3.4.1.1. Harbour seal (Phoca vitulina)

The Deenish site is located in Kenmare River SAC which is designated for Annex II species Common seal. Common Seal have been reported to take foraging trips of up 220km (Sharples et al., 2016). Given the wide ranging behaviour in the species there is potential that individuals from other SACs may occur in the project area. Of the SACs designated in Irish waters for the harbour seal in Ireland, 4 SACs (including Kenmare River SAC) are located within the potential foraging range of the species; these SACs are listed in **Table 3.8**. Conservation Objectives for the harbour seal at the sites listed in **Table 3.8** are included in **Appendix 6**.

Table 3.8: SACs designated for Harbour seal (*Phoca vitulina*) considered in the Stage 2 AA

SAC (Site code)	Shortest pathway by water to the site (km)
Kenmare River SAC (002158)	0 (project within SAC)
Glengarriff Harbour and Woodland SAC (000090)	66.9
Kilkieran Bay and Islands SAC (002111)	184.1
Galway Bay Complex SAC (000268)	204.0

Kenmare River SAC (002158)

The Deenish site is located within the Kenmare River SAC which is designated for the Annex II marine mammal species Common (Harbour) Seal. Common seal has been found to frequent rocky islets near Sneem, Templenoe and Castle Cove, as well as Brennel Island, Illaunsillagh, Kilmackilloge Harbour and Ballycrovane Harbour.

Glengarriff Harbour and Woodland SAC (000090)

Located to the south and north-west of Glengarriff Village in west Cork, this site consists of a glacial valley opening out into a sheltered bay with rocky islets (NPWS 2013). The rocky islets in the harbour support the largest colony of Common Seals in the south-west of Ireland (maximum count of 151 in the all-Ireland survey of 2003).

Kilkieran Bay and Islands SAC (002111)

Kilkieran Bay and Islands SAC is located just north of Galway Bay and extends from Keeraun Point, south of Carraroe, westwards to Mace Head, west of Carna, all in Co. Galway (NPWS 2015). The site contains a large area of open marine water, many islands and rocky islets, and the coastline is much indented with a series of bays (notably the interconnected Kilkieran Bay and Greatman's Bay), channels and inlets. Common Seal (maximum count of 116 in the all-Ireland survey of 2003).

Galway Bay Complex SAC (000268)

Situated on the west coast of Ireland, this site comprises the inner, shallow part of a large bay which is partially sheltered by the Aran Islands (NPWS 2015). Inner Galway Bay provides extensive good quality habitat for Common Seal (maximum count of 317 in the all-Ireland survey of 2003). The seals use a range of haul-out sites distributed through the bay - these include inner Oranmore Bay, Rabbit Island, St. Brendan's Island, Tawin Island, Kinvarra Bay, Aughinish Bay and Ballyvaughan.

3.4.1.2. Grey seal (Halichoerus grypus)

Halichoerus grypus (Grey *seal*) is a widespread species around the Irish coast, with greatest concentrations on the south-western, western and northern coasts where they prefer remote haul-out sites on rocky shores, uninhabited islands, isolated mainland beaches and in sea-caves. The greatest foraging range reported by Cronin et al. (2011) is 511km. Given this wide ranging behaviour and the potential that individuals may occur in the project area this assessment considered all Irish SACs designated for the species (see **Table 3.9**); Conservation Objectives for the grey seal at the sites are included in **Appendix 6**.

Table 3.9: SACs designated for *Halichoerus grypus* (Grey *seal*) considered in the Stage 2 AA

SAC (Site code)	Shortest pathway by water to the site (km)
Blasket Islands SAC (002172)	39.9
Roaringwater Bay and Island SAC (000101)	61.1
Slyne Head Islands SAC (000328)	195.9
Inishbofin and Inishshark SAC (000278)	217.8
Duvillaun Islands SAC (000495)	270.9
Inishkea Islands SAC (000507)	273.2
Saltee Island SAC (000707)	282.4
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190)	393.7
Horn Head and Rinclevan SAC (000147)	470.3
Lambay Island SAC (000204)	453.2

The Blasket Islands SAC (00172)

The Blasket Islands SAC is situated at the end of the Dingle peninsula in Co. Kerry (NPWS 2013). This SAC includes all of the islands in the group as well as a substantial area of the surrounding seas. This SAC has a large grey seal population (648-833 breeding in 2005; one-off moult count of 989 seals in2007). This is one of the largest populations in the country and represents about one-third of the Irishpopulation. The seals breed on boulder beaches and caves on several of the islands.

Roaringwater Bay and Island SAC (000268)

Roaringwater Bay, Co. Cork, is a wide, shallow bay located on the south-west coast of Ireland. The SAC includes the immediate coastline on the mainland from Long Island to Baltimore, together with the whole bay and most of the islands (NPWS 2014). Some of the larger islands included are Sherkin Island, Cape Clear Island, Heir Island, Horse Island, Castle Island and Long Island. Grey Seal is present at the site throughout the year during all aspects of its annual life cycle which includes breeding, moulting,

non-breeding, foraging and resting phases. A minimum population for all ages was estimated at 116-149 in 2005.

Slyne Head Islands SAC (000328)

This SAC comprises a long archipelago of islands, islets, rocks and reefs located off the western shoresand south-western tip of the Slyne Head Peninsula in Co. Galway (NPWS 2014). This SAC contains animportant breeding colony of Grey Seal. The breeding population is estimated at 238-306 individuals(in 2005). A one-off moult count in 2007 gave a figure of 162 seals

Inishbofin and Inishshark SAC (000278)

This SAC is situated off the Co. Galway coast, about 5.5 km from the mainland. It comprises two mainislands, Inishbofin and Inishshark, with several islets and stacks (NPWS 2013). Part of the surroundingmarine waters are also included. This SAC supports a breeding colony of Grey Seal. The breeding population is estimated at 749-963 individuals (in 2005). A one-off moult count in 2007 gave a figure of 270 seals.

Duvillaun Islands SAC (000495)

The Duvillaun Islands comprise a group of marine islands, rocks and reefs 3 km off the southern tip of the Mullet Peninsula, Co. Mayo. The main islands included are Duvillaun More, Duvillaun Beg, Turduvillaun, Gaghta Island, Keely Island and Leamareha Island (NPWS 2014). The Duvillaun Islands form part of a larger group of islands, together with the Inishkeas, Inishkeeragh and Inishglora, which hold an important breeding population of Grey Seal. The breeding population is estimated at 648-833 individuals (in 2005).

Inishkea Islands SAC (000507)

This SAC comprises a series of islands, rock and reef off the west coast of the Mullet Peninsula in north-west Co. Mayo. The Inishkea Islands are the two largest islands. The Inishkeas, together with a groupof neighbouring islands, including Inishglora, Inishkeeragh and the Duvillauns, are an importantbreeding site for Grey Seal. The breeding population is estimated at 665-855 individuals (in 2005). Aone-off moult count in 2007 gave a figure of 1,742 seals

Saltee Island SAC (000707)

This SAC comprises the Saltees Islands and a large area of the surrounding seas. There are two islands ,Great Saltee and Little Saltee, and a constellation of islets and rocks. The islands are situated between4 and 5 km off the south Wexford coast. Great Saltee has a breeding population of Grey Seal, one of

the very few in eastern Ireland. The breeding population was estimated at 571-744 individuals in 2005. A one-off moult count in 2007 gave a figure of 246 individuals

Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190)

This large and scenic site covers the northern half of the Slieve League peninsula in Co. Donegal, stretching from Ardara in the east towards Glencolmbkille and Glen Bay in the west. Grey Seal breed in sea caves in this SAC. The breeding population is estimated at 868-1116 individuals (in 2005). A one-off moult count in 2007 gave a figure of 92 seals.

Horn Head and Rinclevan SAC (000147)

Horn Head extends northwards into the Atlantic Ocean from Dunfanaghy, Co. Donegal. This SAC also extends westwards, reaching just beyond Dooros Point. A small population of Grey Seal occurs at Horn Head. The breeding population was estimated at four or five individuals in 2005.

Lambay Island SAC (000204)

Lambay Island is a large (250 ha) inhabited island lying 4 km off Portrane on the north Co. Dublin coast (NPWS 2014). Lambay supports the principal breeding colony of Grey Seal on the east coast of Ireland, numbering 196-252 seals, across all ages.

3.4.2. Cetaceans

The SACs designated in Ireland for the odontocetes species bottle-nosed dolphin (*Tursiops truncatus*) and common porpoise (*Phocoena phocoena*) are considered in the NIS (see **Table 3.10** and **Table 3.11** respectively).

Conservation Objectives for bottle-nosed dolphin and common porpoise at the sites listed in **Table 3.10** and **Table 3.11** are included in **Appendix 6**.

Table 3.10: SACs designated for *Tursiops truncatus* (Common Bottlenose Dolphin) considered in the Stage 2 AA

SAC (Site code)	Shortest pathway by water to Deenish site (km)
Lower River Shannon SAC (002165)	123.6
West Connacht Coast SAC (002998)	216.2

Table 3.11: SACs designated for *Phocoena phocoena* (Harbour porpoise) considered in the Stage 2 AA

SAC (Site code)	Shortest pathway by water to Deenish site (km)
Blasket Islands SAC (002172)	57.1
Roaringwater Bay and Island SAC (000101)	77.3
Rockabilll to Dalkey Island SAC (Site code:003000)	441.2

Lower River Shannon SAC (002165)

This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head, a distance of some 120 km (NPWS 2013). The site thus encompasses the Shannon, Feale, Mulkear and Fergus estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary which is the only known resident population of the species in Ireland. The population is estimated (in 2006) to be 140 ± 12 individuals.

West Connacht Coast SAC (002998)

This site consists of a substantial area of marine waters lying off the coasts of Counties Mayo and Galway in the west of Ireland (NPWS 2014). Comprising two parts, in its northern component the site extends from the coastal waters off Erris Head westwards beyond Eagle Island and the Mullet Peninsula in Co. Mayo. Bottle-nosed Dolphin occurs within the site in all seasons and the area comprises a key habitat for the species both regionally and within Irish waters. Local population estimates off south-west Co. Mayo and Connemara, Co. Galway describe a minimum of 123 dolphins, with possibly up to 150-200 individuals or more, occurring within the site as a whole.

Blasket Islands SAC (002172)

A brief description of the SAC is provided in **Section 3.4.1** above. The site is of importance for Harbour Porpoise, a species which has a regular presence in Blasket Sound (NPWS 2013). A population estimate in 2008 gave a figure of 267-477 individuals.

Roaringwater Bay and Islands SAC (000101)

A brief description of the SAC is provided in **Section 3.4.1** above. Roaringwater Bay may be one of the most important sites in Ireland for Harbour Porpoise (NPWS 2014). Harbour Porpoise in Irish waters are largely resident and observations have shown that they are regular in the waters of Roaringwater

Bay. Most observations are in the autumn, when more than 100 individuals have been recorded in a day. The population has been estimated (in 2008) to be 117-201 individuals.

3.4.3. Aquatic Mammal

3.4.3.1. Otter

The Deenish site is located within the Kenmare River SAC which is designated for otter. The Conservation Objective for the species is to restore the favourable conservation condition. The conservation attributes and targets of the Qualifying Interest Otter (*Lutra lutra*) in Kenmare River SAC are outlined in **Table 3.12** below (NPWS 2017).

Table 3.12: Attributes and Targets for Qualifying Interest Otter (*Lutra lutra*) in Kenmare River SAC

Attribute (measure)	Target
Distribution (percentage of positive survey sites)	No significant decline
Extent of terrestrial habitat (ha)	No significant decline. Area mapped and calculated as 268ha above high water mark (HWM); 40ha along river banks/ around ponds
Extent of marine habitat (ha)	No significant decline. Area mapped and calculated as 2,748ha
Extent of freshwater (river) habitat (km)	No significant decline. Length mapped and calculated as 18.9km
Extent of freshwater (lake/lagoon) habitat (ha)	No significant decline. Area mapped and calculated as 25.1ha
Couching sites and holts (number)	No significant decline
Fish biomass available (kg)	No significant decline
Barriers to connectivity (number)	No significant increase.

3.4.4. Assessment and Conclusion on Potential Impacts on Marine and Aquatic Mammals

The proposed project may interact with marine and aquatic mammals and result in the following effects and impacts:

- Disturbance
- Entanglement

3.4.4.1. Pinniped Species

To date little research has been undertaken to assess the impacts of aquaculture operations on seal species (National Research Council, 2009; Marine Institute, 2019), however, a considerable body of research has focussed on short-term responses of seal to recreational boaters (Johnson & Acevedo-Gutierrez, 2007; Lelli & Harris, 2001; Lewis & Mathews, 2000) and commercial shipping (Jansen et al., 2006). This research has focussed on seals at haul-out locations. Seal responses to disturbance can vary widely depending on the location and nature of the disturbance from increased alertness to movement towards the water and entering the water (Marine Institute, 2019). Disturbance by small boats and people have been reported to result in flushing responses in seals at distances of between 80m and 1km. The closest seal haul-out sites to the Deenish site are located approximately 12km to the northeast at Cove Harbour on the north shoreline of outer Kenmare Bay. Given this distance, it is unlikely that operations at the site will result in disturbance effects at seal haul-out sites and the likelihood of an impact occurring is remote; it is concluded that there will **no significant effects**.

As there is potential that harbour seals and grey seal may forage in the vicinity of the site in Kenmare Bay, effects from underwater noise and vibrations generated by the service vessels, well boat and feed barges must be considered. As is standard practice in marine vessel construction the engines will be on flexible sound dampening mounts. This effectively reduces the vibrations and the transfer of noise into the aquatic environment. Farmed salmon stock generally show no negative response or stress to the low level noise generated during normal farm activities (BIM, 2012). It should be noted that the underwater noise generated by the farm vessels will not be any more significant than normal fishing / recreational activities. Small fish are known to shoal around the pens of salmon farms as structures themselves can act as artificial reefs, an act that is unlikely to occur if there were any serious noise issues associated with the farm. Consequently, it is unlikely that operations at the site will result in disturbance effects and the likelihood of an impact occurring is remote; it is concluded that there will be **no likely significant effects**.

As both greys and harbour seals have the potential to occur in the vicinity of the site, it may be necessary to use anti-predator nets and/ or Acoustic Deterrent Devices (ADDs) to protect the stock from seal depredation. As ADDs have never been required at the licenced site, it is extremely unlikely that they will be required if the licence is renewed. Therefore, there will be no impacts due to these devices; it is concluded that there will be **no likely significant effects**.

The fish pens and associated infrastructure (nets, ropes, anchor lines etc.) pose an entanglement risk to pinniped species foraging in the site area. However, in contrast to fishing gear, there are far fewer documented entanglement cases in salmon aquaculture gear. Although entanglement incident would

most likely result in the fatality of the individual marine mammal, it is unlikely to be more than an isolated incident and the impact on the population would be similar in magnitude to natural variation. Consequently, it is concluded that there will be **no likely significant effects**.

3.4.4.2. Cetacean Species

The National Biodiversity Centre (NBC) online database includes 75 and 36 records of Harbour porpoise (*Phocoena phocoena*) and Bottle-nosed Dolphin (*Tursiops truncatus*) respectively in the coastal waters of Ballinskelligs Bay, Deenish Island and Kenmare Bay Kenmare Bay. Harbour porpoise were sighted in Baliinskellgs Bay in 2009 and 2015 while a pod of 6 was recorded in the outer bay in 2010. There have been approximately 10 strandings recorded in the Bay between the years 1995 and 2015. During ObSERVE Aerial Surveys the species was recorded near Deenish Island in both 2010 and 2012. Indiviudals and small pods of bottle-nose dolphin were recorded west and north of Deenish Island in 2013 and 2016. Within Ballinskelligs Bay individuals were recorded in 2014 and on two occasions in 2012, while pods of 4, 5 and 19 animals were recorded in 2013, 2010 and 2012. There are also two stranding records for the species (2009 and 2012). Given that Harbour porpoise and the Bottle-nosed dolphin have been reported in the area there is potential that the species may occur near Deenish site during operations. However, cetaceans rarely interact with marine farm sites and so disturbance and entanglement impact can be discounted. In addition, for the reasons outlined above for pinnipeds, the impact of noise and vibrations on cetaceans will be insignificant. As a result, no impact on cetacean species is expected. The likelihood of impacts occurring is remote; it is concluded that there will be **no likely significant effects** to cetacean species.

3.4.4.3. Otter

The Deenish site is present within the Kenmare River SAC which is designated for otter *Lutra lutra*. Otters forage and feed within 80m to 100m of the coastline (Kruuk & Moorhouse, 1991; De Jongh & O'Neill, 2010) and can travel distances up to 500m across estuaries or between islands (De Jongh & O'Neill, 2010). The diving depth of otters typically ranges from 10-12m with the majority of dives being <3m (Kruuk *et al.,* 1985) and lasting <20 seconds. Kruuk & Moorhouse (1991) reported that small benthic fish, eels and crustaceans are common prey items for otters, and they appear to have a strong preference for hunting in areas with dense seaweed cover in shallow, rocky environments. Although the proposed aquaculture renewal site is located within the Kenmare River SAC, the distance from the coastline of Deenish Island where otters can forage, is too significant for them to be found at the site. Furthermore, the water depths at the farm site are in excess of the diving range of otters and the habitat type at the farm sites is not conducive to foraging and therefore it is extremely unlikely that otters will come into contact with the aquaculture pens or be impacted by the aquaculture activity.

Saunders (2017) reports that otters are less vulnerable to disturbance than previously thought, with observational studies showing that otters are tolerant of human activity (Chanin, 2003a, b; Kruuk, 1995; McCafferty, 2005). With this in mind, as well as the distance of the site to the coastline, the impact of noise and vibrations on otters will be insignificant.

With regards to any knock-on effect that a theoretical decline in wild salmon populations would have on otter populations, Saunders (2017) in a report specifically focused on this concern concluded that as otters are omnivorous generalists with an ability to utilise a wide variety of species as food, adapting to whatever is available (which tends to vary seasonally), it would be logical to expect that during a theoretical scenario in which there is a fish farm-linked decline in wild salmonids, otters, either in freshwater or marine locations, would be unlikely to be significantly affected. In addition, Sanders (2017) notes that throughout the period when wild salmonid populations were declining, survey data for Irish otter populations indicated either a stable or increasing trend, resulting in the currently "Favourable" status under the Habitats Directive. Reid et *al.* (2013) in their evaluation of pressures on Irish otter populations conclude:

"None of the factors that significantly influenced otter occurrence (river size, substrate *type, bank elevation and slope or salmonid biomass) are likely to be limiting or impacted detrimentally by human activities"*

In addition, the AA of aquaculture activity in Kenmare River SAC undertaken by the Marine Institute concluded that aquaculture activities in the bay proposed do not pose a threat to the Otter ((Marine Institute 2017).

The likelihood of an impact occurring on otters is remote, the consequence of an impact if realised is negligible; it is concluded that there will be **no likely significant effects** to otter.

3.5. Overview – Habitats Directive Annex II Species – Migratory Fish Species and Aquatic Mollusc

Potential likely significant effects of the proposed project to the following marine Annex II species could not be screened out at the Stag2 1 Screening for AA stage (see **Section 2.4** for summary):

- Freshwater pearl mussel (*Margaritifera margaritifera*)
- Atlantic salmon (*Salmo salar*).

The Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC is located within 15km of the project and is designated for freshwater pearl mussel and Atlantic salmon.

Of the potential impact mechanisms identified (see **Section 2.2.10**), pest and disease risk is identified as a main source of potential direct impacts to the diadromous salmon and potential indirect impacts to freshwater pearl mussel.

3.5.1. Salmon and Pearl Mussel

Table 3.13 presents the Conservation Objectives for the Qualifying Interests freshwater pearl mussel (*Margaritifera margaritifera*) and Atlantic salmon (*Salmo salar*) of Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (NPWS 2017). The conservation attributes and targets for the species are outlined in **Table 3.14** below. The targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species and managing levels of negative species.

Table 3.13: Conservation Objectives for Qualifying Interest 1106 and 1029 in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]

Site	Qualifying Interest	Conservation Objective
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]	Salmon (Salmo salar) (1106)	To maintain the favourable conservation condition
	Freshwater Pearl Mussel (*Margaritifera margaritifera*) (1029)	To restore the favourable conservation condition

Table 3.14: Attributes and Targets for Qualifying Interest 1106 and 1029 in Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]

Qualifying Interest	Attribute (measure)	Target
Salmon (*Salmo salar*) 1106	Distribution: extent of anadromy (Percentage of river accessible)	100% of river channels down to second order accessible from estuary
	Adult spawning fish (number)	Conservation limit (CL) for each system consistently exceeded
	Salmon fry abundance (Number of fry/5 minutes electrofishing)	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling
	Out-migrating smolt abundance (number)	No significant decline
	Number and distribution of redds (Number and occurrence)	No decline in number and distribution of spawning redds due to anthropogenic cause
	Water quality (EPA Q value)	At least Q4 at all sites sampled by EPA
Freshwater Pearl Mussel (*Margaritifera margaritifera*) 1029	Distribution (km)	See targets below. Note that the distribution target lengths include the perimeters of lakes in each catchment
	Distribution: Caragh (km)	Maintain Caragh distribution at 35.06km
	Distribution: Currane (km)	Maintain Currane distribution at 14.90km
	Distribution: Gearhameen (km)	Maintain Gearhameen distribution at 4.45km
	Population size (Number of adult mussels)	Restore populations to at least: 2.8 million adult mussels in the Caragh, 100,000 in the Currane and 100,000 in the Gearhameen
	Population structure: recruitment (Percentage per size class)	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length
	Population structure: adult mortality (Percentage)	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution

Qualifying Interest	Attribute (measure)	Target
	Suitable habitat: extent (km)	See targets below and map 8. Note that the suitable habitat target lengths include the perimeters of lakes in each catchment
	Suitable habitat: extent – Caragh (km)	Restore suitable habitat in more than 33.18km in the Caragh and any additional stretches necessary for salmonid spawning
	Suitable habitat: extent – Currane (km)	Restore suitable habitat in more than 6.86km in the Currane and any additional stretches necessary for salmonid spawning
	Suitable habitat: extent – Gearhameen (km)	Restore suitable habitat in more than 4.45km in the Gearhameen and any additional stretches necessary for salmonid spawning
	Water quality: macroinvertebrate and phytobenthos (diatoms) (Ecological quality ratio [EQR])	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93
	Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants) (Percentage)	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)
	Substratum quality: sediment (Occurrence)	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment
	Substratum quality: oxygen availability (Redox potential)	Restore to no more than 20% decline from water column to 5cm depth in substrate
	Hydrological regime: flow variability (Metres per second)	Restore appropriate hydrological regime
	Host fish (Number)	Maintain sufficient juvenile salmonids to host glochidial larvae
	Fringing habitat: area and condition (ha)	Maintain the area and condition of fringing habitats necessary to support the population

3.5.2. Assessment and Conclusion on Potential Impacts on Marine and Aquatic Mammals

A comparison of trout versus salmon dominated rivers of Ireland shows that all identified pearl mussel rivers are associated with salmon and sea trout. Salmon and freshwater pearl mussel have been cited as symbiotic in their relationship, with both species providing a beneficial role for the other (Ziuganov & Nezlin 1988, Ziuganov et al. 1994) with salmon gills hosting mussels during their glochidial stage and pearl mussels preventing early senility in salmon (Ziuganov 2005).

Given the nature of salmon farming there is potential that operations may directly impact wild salmon populations:

- increasing lice infection rate in wild salmon;
- disease spread;
- the introduction of therapeutants; and
- genetic interaction between farmed and wild Atlantic salmon.

Potential loss of host fish has been cited as a potential reason for pearl mussel decline (Araujo & Ramos 2001, Anon 2005, Geist et al. 2005); consequently, there is potential that the proposed project may affect wild salmon, an obligate host for pearl mussel larvae.

3.5.3. Sea Lice

3.5.3.1. Background

Sea lice are natural parasites of both wild and farmed fish. There are two main species found in Ireland; *L. salmonis* which infests only salmonids and while *Caligus elongatus* which is known to parasitise over 80 different species of marine fish (O'Donohoe *et al.,* 2017). *L. salmonis* is the larger of the two species and is regarded as the more damaging parasite. It is endemic at a high prevalence (>90%) within wild populations (Jackson *et al.,* 2013), and occurring frequently on farmed salmonids (Jackson & Minchin, 1992; Jackson *et al.,* 2005).

L. salmonis is an obligate parasite with a direct lifecycle with 8 stages (comprising of nauplius 1, nauplius 2, copepodid, chalimus 1, chalimus 2, pre-adult 1, pre-adult 2 and the adult stages (O'Donohoe *et al.,* 2017). The life cycle is shown in **Figure 3-9**. The nauplius 1 stage hatches from paired egg-strings and is dispersed in the plankton. It moults to nauplius 2, also planktonic, which is followed by a copepodid, the infective stage where attachment to the host takes place. The copepodid then moults through the attached chalimus stages before becoming a mobile pre-adult. There are two pre-adult stages before maturing to the adult phase. The adult female can produce a number of batches of paired egg-strings, which in turn hatch into the water column to give rise to the next generation (Hamre, 2013;

Kabata, 1979; Schram, 1993). Hatch rate is variable according to season, host and other factors but peaks at about 400 Nauplii per clutch. The copepodid attaches to its target host through the development of a frontal filament.

Copepodids have limited strategies to assist in seeking out hosts. They can dart by up to 10cm on sensing a passing host fish. They may also be able to adjust their position in the water column, sinking towards the seabed in response to the ebbing tide (geotaxis), to assist in maintaining their position and population density, close to estuaries and inshore margins, through which their target hosts migrate. Once attached, to the host, the louse feeds on blood and tissue. It develops through four chalimus larval stages and two pre-adult stages before maturing. The time taken between metamorphoses for this cycle to complete, and the next generation of eggs to be produced, is temperature-dependant.

Lice fecundity peaks in spring, when infective copepodid stages appear to congregate near the river mouths, from which smolts emerge. The precise mechanism behind this phenomenon is not clear but it is likely that ovigerous female lice are carried into the inshore margins near estuaries on wild adult salmon, returning to their native rivers to spawn. By this means, a critical mass of descending smolts are met by a critical mass of waiting copepodids, such that a successful infestation ensues.

L. salmonis evolved this strategy of infesting salmonid smolt during their migration, countless millennia ago, long before the advent of salmon farming. In fact, *L. salmonis* must be very successful at host targeting because the clutch size of lice juveniles is quite small for a parasite that releases its young into open waters to complete its life cycle rather than directly onto a host species.

Copepodids cannot feed and only survive as long as their internal yolk supplies last. Any that fail to find wild hosts drift seawards and die, within ten days or so, dependant on temperature, as their yolk supplies run out. Inadvertently, salmon farms offer a new, alternative host source since they are situated at fixed locations downstream of river mouths and their relatively high stocking density mirrors the natural shoaling of their wild cousins, prior to their migration dispersal.

However, whilst wild fish disperse seawards from their native estuaries, effectively ending their exposure to the parasite, farmed salmon remain at high densities, within the confines of their pens. This makes it easy for chance encounters with small numbers of drifting wild copepodids to result in widespread infestation of farm stocks within one or two lice generations if the infestation is not treated. This is the primary means of lice infestation of well-managed salmon farms, their secondary route being infestation by copepodid drift from one farm site to others, downstream of it.

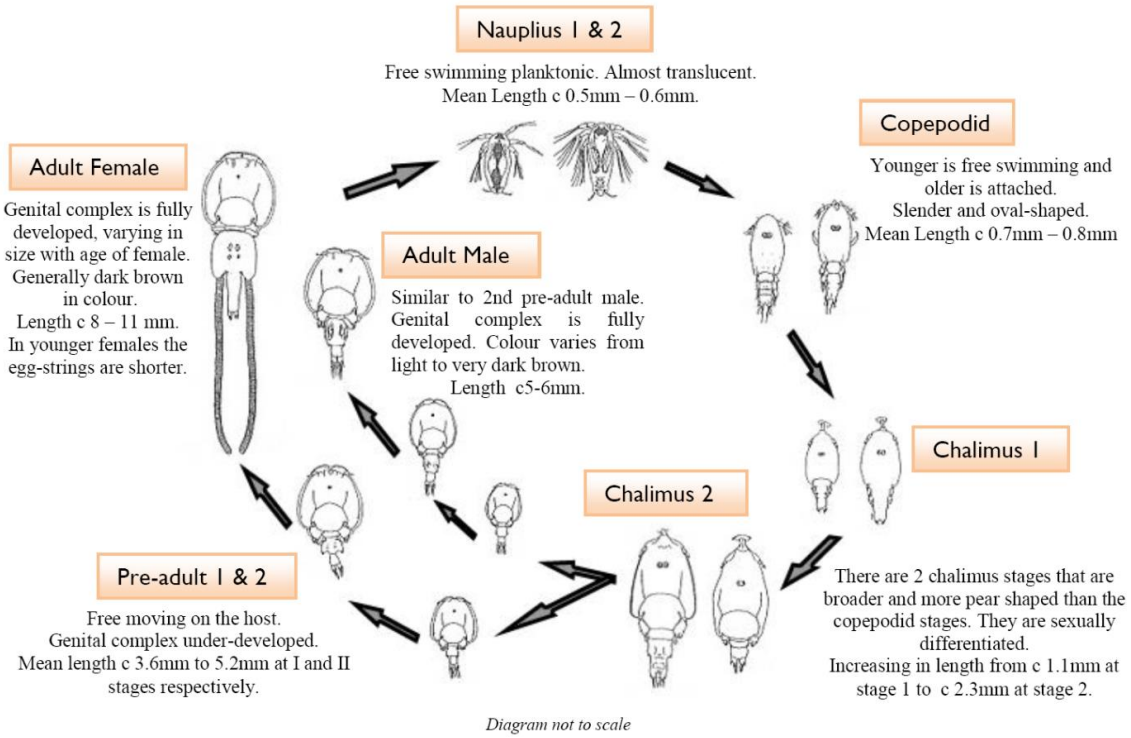


Figure 3-9 Life cycle of *Lepeophtheirus salmonis* (O'Donohoe et al., 2017 after Schram, 1993 & Hamre, 2013).

3.5.3.2. Modelling Potential Impact

For the proposed salmon production operations at the Deenish site, three-dimensional hydrodynamic simulation modelling was undertaken to determine the transport and dispersion of sea lice (*L. salmonis*) larvae from the farm (see **Appendix 7** for full modelling report). For the purposes of modelling larval lice dispersal from the salmon farm sites it was assumed that the average number of adult female Lice per fish is 1 and that each adult female louse releases on average 250 viable nauplius I larvae into the water column per hatch. The nauplius I will metamorphose into nauplius II larvae which then metamorphose into the infective copepodid larvae stage. These three larval stages are free living in the water column and can be treated as passive particles being advected and dispersed by the ambient currents. The infective copepodid larvae stage occurs within approximately 4 days post hatch and generally has a maximum longevity of approximately 10 days at typical spring time temperatures. Water temperature affects the die-off rates of the copepodid larvae. The ability of the copepodids to latch onto a host is thought to diminish with age. An exponential decay is used to model the longevity of the larvae with a decay coefficient of 0.241 day^{-1} (Amundrud and Murray 2009). Other sea lice larvae dispersion modelling studies (Cawley, 1998) used a higher decay rate of 0.364 day^{-1} based on

Johnson & Altibright's (1991) laboratory research into survival rates for temperatures of 12°C degrees and salinity of 30 to 35 psu.

DAFM set trigger level for lice treatment during the susceptible spring period (when wild salmon migrate) is 0.5 ovigerous female lice per fish (at bi-weekly monitoring). Therefore, the assumption of 1 ovigerous female lice per fish for baseline simulations of the dispersal of larvae from the salmon farm within Kenmare Bay and the potential to infect wild salmon is considered to be reasonably conservative.

March Year 2 production and harvesting fish numbers were used as the maximum total of adult fish numbers at the Deenish site (561,041) (see modelling report in **Appendix 7**). The modelling used 1 louse per adult fish producing 250 eggs per louse gives the following average input rate of 52.4 larvae released per second.

The sea lice larvae simulations were performed over a 35 day period which included a 6 day warm period followed by a 29 day lunar cycle lunar period using a time step of 15 seconds and outputting predicted plume results at 15minute interval over that period. The hydrodynamics simulated were representative of a complete spring-neap-spring lunar cycle.

The simulation output is presented both as the predicted tidal maximum and tidal average (mean) Nauplius I larvae plume concentration envelope (see **Figure 3-10** and **Figure 3-11** respectively). The maximum plume concentration envelope plot represents the instantaneous maximum concentration both in the water column and over time with the maximum concentration outputted spatially over the model domain. It should be noted that such maximum concentrations spatially do not occur simultaneously in time and that the frequency and duration of occurrence is relatively low.

The average larvae plume concentration (nauplius and copepodid stages) envelope represents the average concentration plume in the water column and over time and is reasonably similar in magnitude (generally higher) to the statistical median (50-percentile) concentration, particularly over a 29 day simulation period. A total of 10 reference sites were selected in the vicinity of the site (see **Figure 3-12**). Plume median, average, 95-percentile, 99-percentile and maximum concentrations at these stations are presented in **Table 3.15**.

3.5.3.3. Assessment

Modelling shows that lice larval numbers reduce dramatically in concentration with increasing distance from the site with tidal average concentrations less than 0.1 larvae per m^3 and generally not discernible from background concentrations remote from the licensed farm site. The instantaneous maximum

concentrations just outside of the licensed Farm site is typically at 0.9 to 1.9 No /m^3 and rapidly reduces to trace numbers. The predicted maximum larvae concentrations at the site is 5.3 No./m^3.

Infestation routes and treatment strategies for *Lepeophtheirus* are illustrated by the empirical data given in **Section 2.1.13**. This indicates that ovigerous female lice on the site did not breach trigger levels throughout the entire production cycle for the 2015 S1/2 and Atlantic salmon 2017 origin fish.

Several laboratory studies have investigated the effect of lice on the physiology of Atlantic salmon, sea trout, and Arctic charr smolts (reviewed in Finstad & Bjørn, 2011; Thorstad *et al*., 2015). Major primary (nervous, hormonal), secondary (blood parameters), and tertiary (whole body response) physiological effects (e.g. high levels of plasma cortisol and glucose, reduced osmoregulatory ability, and reduced non-specific immunity) occur when the lice develop from the sessile chalimus second stage to the mobile first pre-adult stage. Reduced growth, reproduction, swimming performance, and impaired immune defence have also been reported (Finstad & Bjørn, 2011). The susceptibility and response to louse infection varies among individuals, populations, and species of salmonid. Laboratory studies show that 0.04–0.15 lice per gram fish weight can increase stress levels and that infections of 0.75 lice per gram fish weight can kill hatchery-reared smolts if all the lice develop into pre-adult and adult stages. This is the equivalent of 11 lice per smolt. This is also supported by field studies (ICES, 2016).

Evidence suggests that sea lice induced mortality has an impact on Atlantic salmon returns, which may impact the achievement of conservation limits in salmon rivers. This research in recent years has tended to be based on a variety of statistical analyses of large quantities of data gathered from releases of tagged salmon smolts, a proportion of which have been treated with Slice®, to protect from lice infestation, and recaptures of the resultant returning salmon (Jackson *et al.,* 2011a, b; Gargan *et al.,* 2012; Jackson *et al.,* 2013; Krkošek *et al.,* 2013; Skilbrei *et al.,* 2013; Jackson *et al.,* 2014; Krkošek *et al.,* 2014; Vollset *et al.,* 2014; Vollset *et al.,* 2016). These studies assumed that the louse treatments were efficacious and that released smolts were exposed to lice during the period of the outmigration in which the treatment was effective.

Furthermore, the studies were not designed to discriminate between lice from farm and non-farm sources. In addition, the baseline marine survival from untreated groups, which is used as a comparator for treated groups, is itself likely to be affected by louse abundance, introducing an element of circularity that leaves the interactive effects between lice and other factors on salmon survival poorly characterized (ICES, 2016).

ICES (2016) advice on the impacts of salmon aquaculture and sea lice on wild salmon outlines the differing perspectives on the mortality attributable to lice (Jackson *et al.,* 2013; Krkošek *et al.,* 2013) as follows:

"*In one view (Jackson et al., 2013), the emphasis is placed on the absolute difference in marine mortality between fish treated with parasiticides and those that are not. In this instance, viewed against marine mortality rates at or above 95% for fish in the wild, the mortality attributable to lice has been estimated at around 1% (i.e. mortality in treated groups is 95% compared to 96% in untreated groups). This "additional" mortality between groups is interpreted as a small number compared to the 95% mortality from the treatment groups.*

The other perspective of this same example is in terms of the percent loss of recruitment, or abundance of returning adult salmon, due to exposure to sea lice. In this perspective, the same example corresponds to a 20% loss in adult salmon abundance due to sea lice; for every five fish that return as adults in the treated groups (95% mortality), four fish return as adults in the untreated group (96% mortality). In other words, one in five fish is lost to sea lice effects. These perspectives are solely differences in interpretation of the same data. Where impacts of lice have been estimated as losses of returns to rivers, these indicate marked variability, ranging from 0.6% to 39% (Gargan et al., 2012; Krkošek et al., 2013; Skilbrei et al., 2013). These results suggest that a small incremental increase in marine mortality due to lice (or any other factor) can result in losses of Atlantic salmon that are relevant for fisheries and conservation management and which may influence the achievement of conservation requirements for affected stocks (Gargan et al., 2012). Vollset et al. (2016) (sic) *concluded that much of the heterogeneity among trials could be explained by the release location, time period, and baseline (i.e., marine) survival. Total marine survival was reported to be the most important predictor variable. When marine survival was low (few recaptures from the control group), the effect of treatment was relatively high (odds ratio of 1.7:1).*

However, when marine survival was high, the effect of treatment was undetectable (odds ratio of ~1:1). One explanation for this finding is that the detrimental effect of lice is exacerbated when the fish are subject to other stressors, and the findings of other studies support this hypothesis (Finstad et al., 2007; Connors et al., 2012; Jackson et al., 2013; Godwin et al., 2015). Potential interactive effects of multiple factors are likely to be important for explaining the result from meta-analysis where the effect of sea lice on salmon survival depends on the baseline survival of untreated fish (Vollset et al., 2016 (sic)).

In conclusion the authors cautioned that though their study supported the hypothesis that lice contribute to the mortality of salmon, the effect was not consistently present and strongly modulated

by other risk factors, suggesting that population-level effects of lice on wild salmon stocks cannot be estimated independently of the other factors that affect marine survival."

3.5.3.4. Conclusions

The control and reduction of sea lice within farmed salmon pens in Kenmare Bay is important to the welfare of wild salmon as well as to the farmed salmon. Additionally, as sea trout tend to remain in coastal areas for longer than salmon they may be exposed to lice for longer than migrating salmon post-smolts. The continuous weekly monitoring as well as coordinated treatment of all licenced sites within the bay through the Single Bay Management (see **Section 2.1.16** for further details) plan once trigger levels have been breached is imperative to minimise any potential risk on wild salmonids. Consequently it can be concluded that the proposed operations at the site are unlikely to result in significant impact in sea lice infestations in wild salmon populations; consequently there will be **no likely significant direct effects to the Qualifying Feature salmon and no likely significant indirect effects to the Qualifying Feature freshwater pearl mussel.**

Table 3.15: Modelled Larvae concentrations at reference stations

Reference Sites	Modelled No./m^3				
	Average	Median	95-percentile	99-percentile	Maximum
1	1.458	1.112	3.771	5.001	6.175
2	0.228	0.105	0.793	1.452	1.94
3	0.095	0.041	0.384	0.601	0.8
4	0.208	0.084	0.749	1.14	1.547
5	0.086	0.03	0.371	0.604	1.032
6	0.067	0.041	0.226	0.319	0.443
7	0.009	0.003	0.045	0.097	0.121
8	0.014	0.007	0.048	0.071	0.092
9	0.019	0.017	0.043	0.065	0.099
10	0.025	0.017	0.069	0.095	0.114

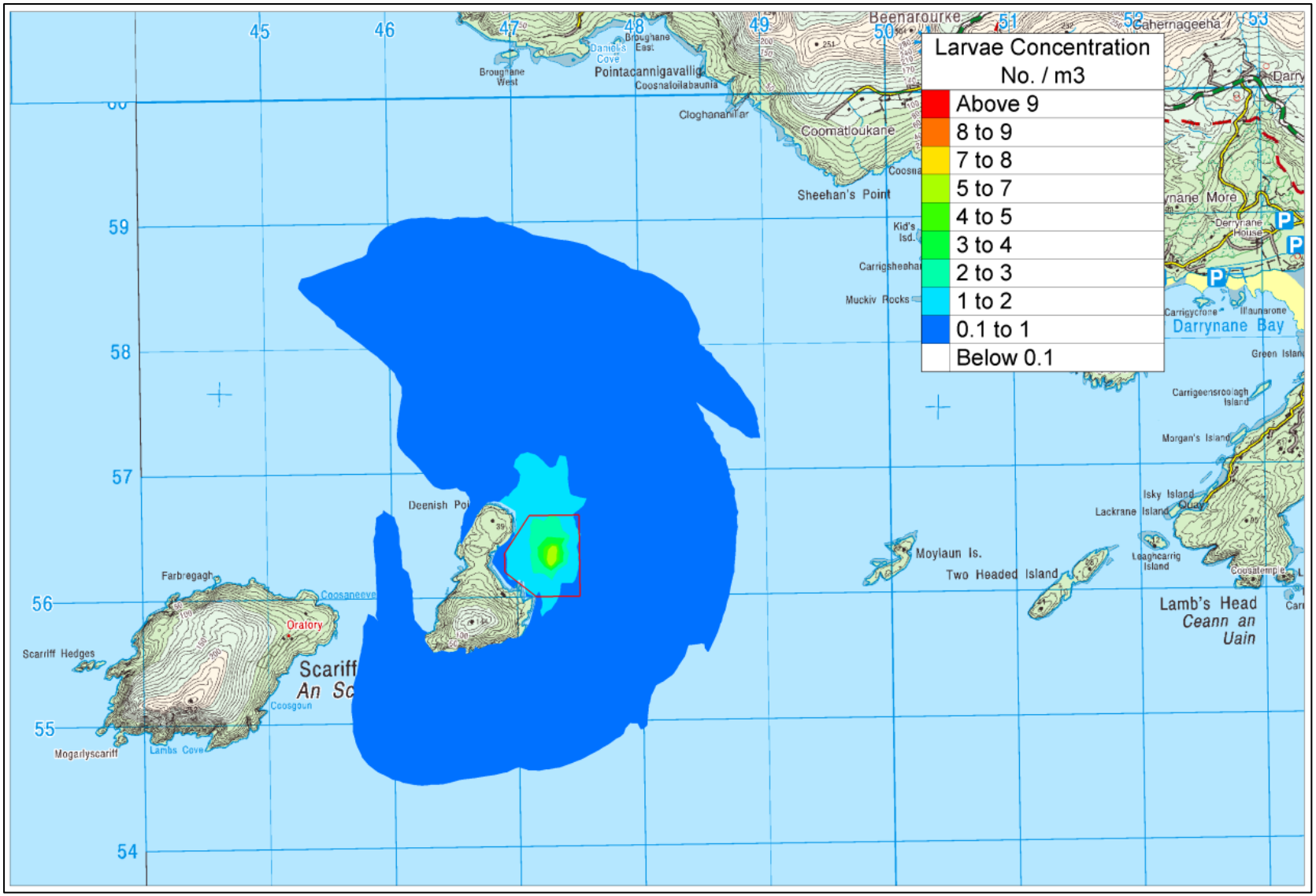


Figure 3-10: Predicted tidal maximum nauplius I larvae numbers (No./m3) from operations proposed at the Deenish site.

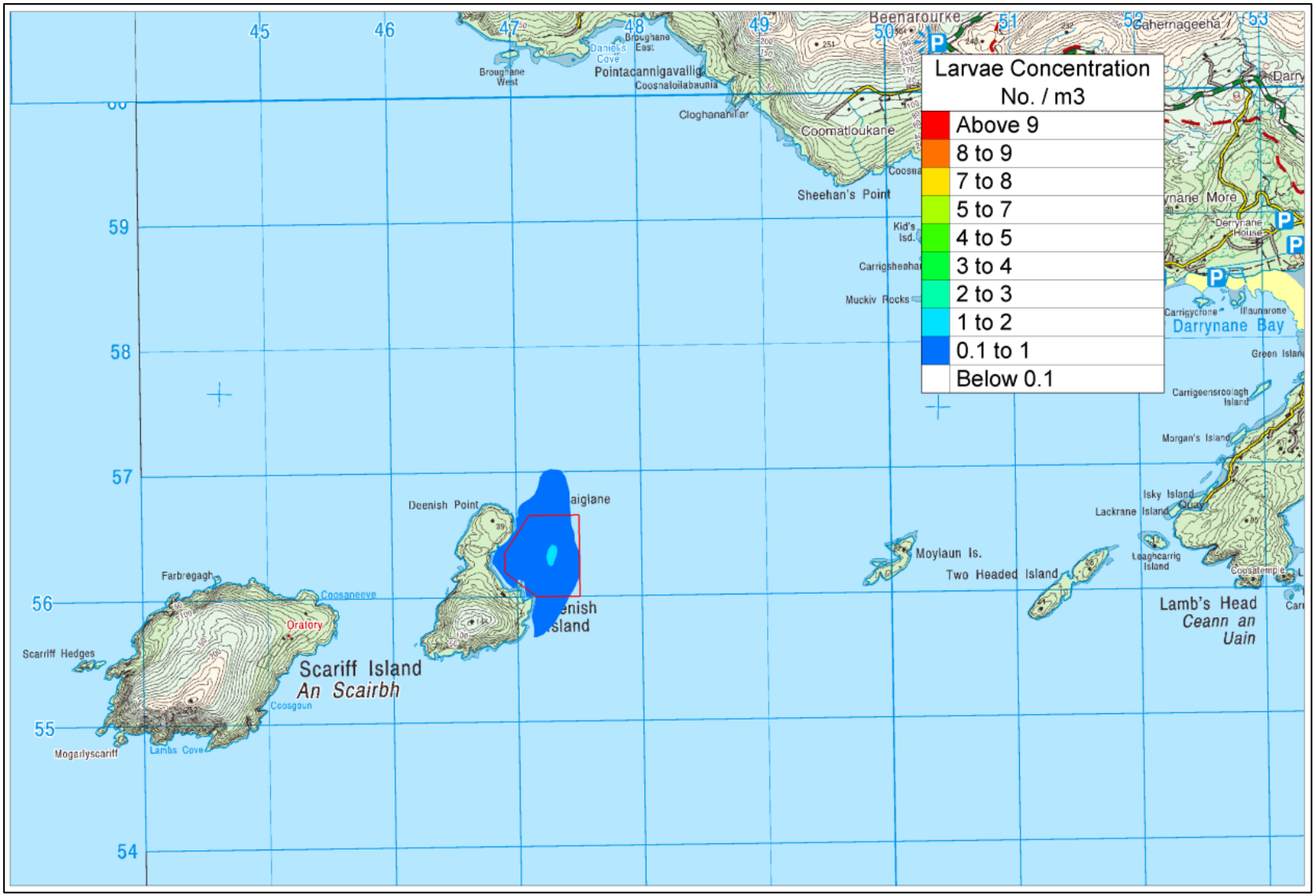


Figure 3-11: Predicted tidal mean Nauplius I larvae numbers (No./m3) from the Deenish site.

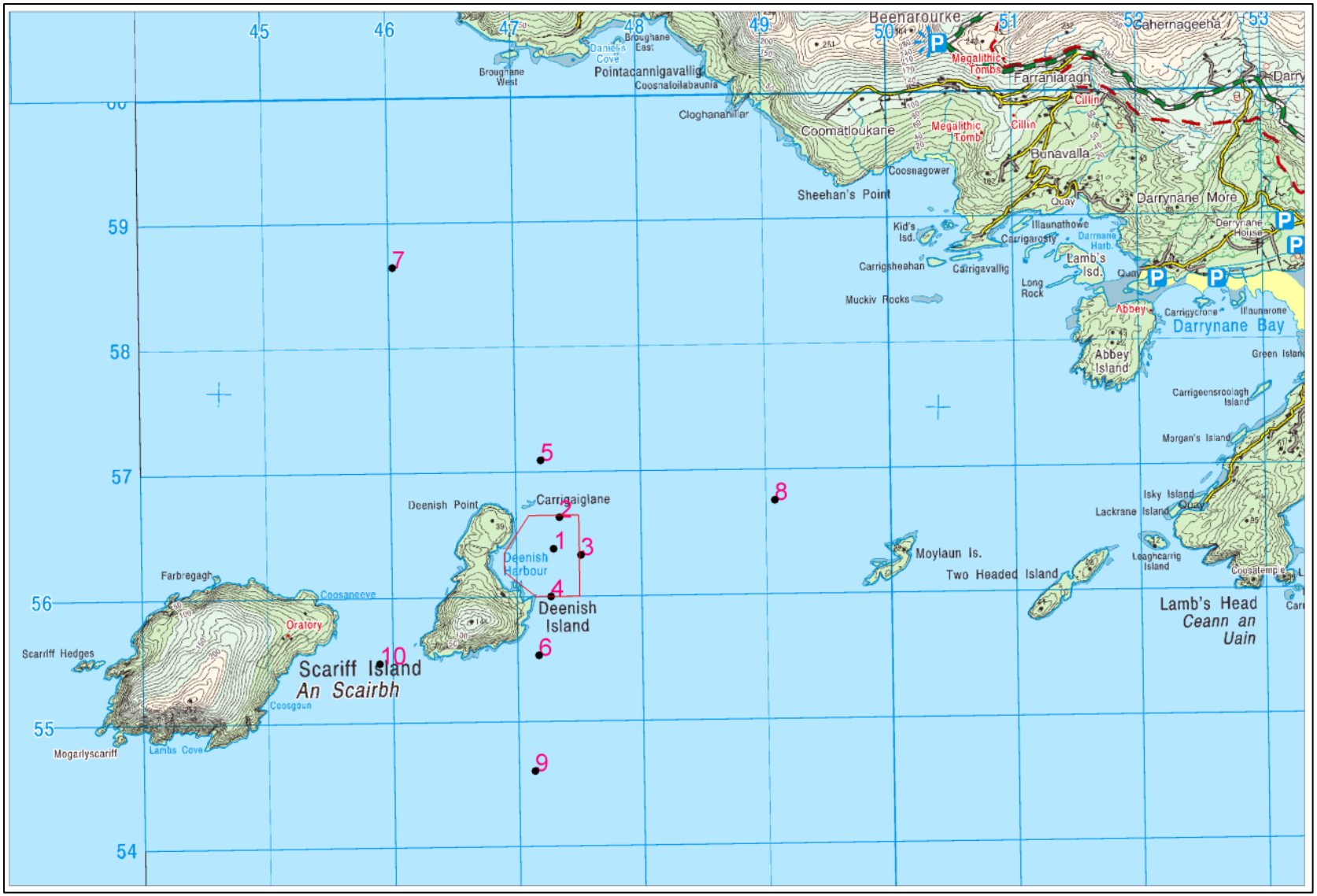


Figure 3-12: References station at Predicted tidal mean Nauplius I larvae numbers (No./m3) from the Deenish site.

3.5.4. Disease spread

3.5.4.1. Background

Disease occurrence in organic farming in covered in **Section 2.1.13**. Diseases contracted by farmed salmon mainly arise in the first instance from local wild stocks. Regulation of farmed stock movements is such that the introduction of diseased farmed fish from other regions is unlikely.

3.5.4.2. Assessment and Conclusions

The use of vaccines and effective veterinary supervision have brought the eradication and control of diseases on salmon farms to a level that surpasses accepted levels for other livestock. In MOWI's view any lower level of vigilance defeats the objectives of their business model. Given the control of diseases on the farm, it is highly unlikely that the farm act as a significant source of disease; consequently, it is concluded that there will be **no likely significant direct effects to the Qualifying Feature salmon and no likely significant indirect effect to the Qualifying Feature freshwater pearl mussel**.

3.5.5. Therapeutants

3.5.5.1. Background

The use of chemicals, including antibiotics, has been reduced with the introduction of vaccines and the application of organic standards. In-feed antibiotic treatments are never used prophylactically for farmed salmon.

3.5.5.2. Assessment and Conclusions

Modern treatments, in particular for lice, break down and disperse rapidly post-treatment, with no prospect of deleterious impact on wild salmonid stocks. For example, Slice® a licenced in–feed treatment for sea lice which, where hydrographic conditions suit its application, is commonly chosen in preference to bath treatments as it is considered more effective, in that it kills all lice stages and is more environmentally benign. Slice® is a proprietary pre-mix containing 0.2% Emamectin Benzoate (EmBZ), for surface coating onto salmon feed, at a rate of 5kg Slice® / tonne of feed (that is 10g EmBZ / tonne of feed). It is manufactured by Merck Animal Health Inc. The treatment is applied, on veterinary prescription, as a surface dressing to salmon feed, prior to use. The course of treatment lasts 7 days. SEPA (2015) has determined that 10% of the EmBZ dose ingested is excreted during this treatment period. Of the remaining 90% of the chemical, approximately 99% is excreted over the subsequent 216 days. This excretion has an exponential decay profile such that 50% of the chemical remaining in the fish is released, on average, over each ensuing 36 – 37 day period. It has also been determined that EmBZ breaks down into “non-toxic” sub-compounds with a half-life period of 250 days. Given the

limited potential for the introduction and persistence of therapeutants in the environment its can be concluded that there will be **no likely significant direct effects to the Qualifying Feature salmon and no likely significant indirect effect to the Qualifying Feature freshwater pearl mussel**.

3.5.6. Escapees

3.5.6.1. Background

Glover *et al.* (2017) reviewed the current status of knowledge on half a century of genetic interaction between farmed and wild Atlantic salmon. Impact risk depends on the maturity of the escapees and farmed fish are harvested before they fully mature. By and large, escapees are more likely to die or be preyed upon at sea than to enter a river system, in particular if they are immature, which is the most likely prospect (Hansen, 2006; Skilbrei, 2010; Whoriskey *et al.*, 2006). Fish will only enter a river system if they escape close to maturation and survive to mature. Further, overrunning of redds or interbreeding with wild fish also only becomes a risk if escapees are mature. Overrunning and displacement of wild salmon eggs is an impact risk because farmed fish tend to mature later than wild stock. However, later maturation would limit interbreeding risks. While the evidence indicates that survival to sexual maturity of escapees is very low, and only a small proportion manages to survive and enter rivers, the number is often numerically high due simply to the high numbers involved in escape events (Glover *et al.*, 2017). The actual numbers, however, can be expected to be dependent on both the stage of the life cycle and the time of the year at which they escape (Skilbrei *et al.*, 2015).

Fears of interactions between farmed and wild salmon stocks were expressed by McGinnity *et al.* (2003). However, the scenario that the authors depict could only result from significant, persistent or annual escapes surviving to enter single rivers. Nevertheless, farmed escapees have been documented in rivers in most regions where there is commercial aquaculture. In addition, escapees have been reported in oceanic feeding areas as well as in rivers far away from major farming regions (Glover *et. al.*, 2017). While escapees display considerable potential for long-distance dispersal/migration the incidence of farmed escaped salmon in rivers is correlated with the volume of farming within that region (Fiske *et al.,* 2006; Green *et al.,* 2012; Youngson *et al.,* 1997; Clifford *et al.,* 1998).

Experiments have shown that adult escapees have reduced spawning success compared to wild salmon that depends on the life stage at which they escape into the wild, mature and attempt to spawn with wild fish, and the level of competition with wild fish in the spawning grounds. Farmed females display a greater relative spawning success than farmed males which will increase the relative frequency of hybrid as opposed to pure farmed offspring. Wild populations that are already experiencing natural declines in adult abundance will be more vulnerable to introgression of farmed salmon due to the

reduced level of competition faced by escapees once on the spawning grounds. The offspring of farmed and hybrid salmon will also compete with wild salmon for both territory and resources. (Glover *et al.* 2017). There is unequivocal evidence of the introgression of farmed salmon into ca. 150 native Norwegian populations (ranging from 0% to 47%) (Glover *et al.,* 2013; Karlsson *et al.,* 2016). Reduced genetic variability will affect a species' ability to cope with a changing environment. One-way gene flow, as occurs through successful spawning of farmed escapees, potentially represents a powerful evolutionary force. It erodes genetic variation among wild populations (Glover *et al.*, 2012). Many wild salmon populations are already under evolutionary strain from a wide variety of anthropogenic challenges (Lenders *et al.,* 2016; Parrish *et al.,* 1998) and such populations are more likely to be vulnerable to the potential negative effects of introgression. The long-term consequences of introgression on native populations can be expected to lead to changes in life-history traits, reduced population productivity and decreased resilience to future impacts such as climate change. Only a substantial or complete reduction in the number or escapees in rivers, and/or creating a reproductive barrier through sterilization of farmed salmon can eliminate these impacts (Glover *et al.* 2017).

Preventing the escape of fish is a priority for MOWI Ireland. MOWI has an improved standardised pen, net and mooring design adopted on all farms. They have classified their sites in Kenmare Bay as having a High Risk for susceptibility to storm damaged based on the wave climate and hydrographic regime in the locality. Pen, mooring and anchor design within Kenmare Bay reflects this and strongly mitigates against storm damage thus reducing the risk of an escape event.

3.5.6.2. Assessment and Conclusions

In the event of an escape incident occurring the magnitude of impact depends on the number of escapees, their level of maturity and the time of year of the event. Large escapes (tens of thousands of individuals) of mature fish in the spawning season have a greater potential for impact significance than small escapes of smolts. Large escape events have the potential to have a significant effect on wild salmon populations in the area especially considering the low returns within many salmon rivers. However, the likelihood of an escape event occurring is remote and MOWI have adopted a range of measures to prevent such an occurrence; **consequently, significant direct effects to the Qualifying Feature salmon and indirect effect to the Qualifying Feature freshwater pearl mussel can be excluded**.

3.6. Special Protection Areas

3.7. Overview – Special Protection Areas and Bird Species

Due to the mobile nature of birds, Qualifying Features and notable species of SPA sites within within the foraging ranges of the Deenish site are considered.

Based on the species specific foraging ranges, potential likely significant effects of the proposed project could not be screened out at the Stage 1 Screening for AA stage for the Qualifying Features of SPAs listed in **Table 3.16** (see **Section 2.4** for summary). **Table 3.16** also presents the conservation status of species as determined with reference to Colhoun and Cummins (2013[25]). Short descriptions of the SPAs listed in **Table 3.16** are presented below while Conservation Objectives for the relevant Qualifying Features of the above SPAs are included in **Appendix 6**.

Table 3.16: Qualifying Features of SPAs with foraging ranges overlapping the project area. Maximum foraging ranges used.

Qualifying Feature (Species Foraging Distance km)	**BoCCI[26]**	**SPA** (Shortest linear distance[6] from project km)
Arctic tern (*Sterna paradisaea*) (30km)	**Amber**	**Deenish Island and Scariff Island SPA** (0km - project within site)
Common Tern (*Sterna hirundo*) (30 km)	**Amber**	**Castlemaine Harbour SPA (004029)** (34.7km)
Fulmar (*Fulmarus glacialis*) (580km)	**Green**	**Beara Peninsula SPA (004155)** (10.6km)
		Blasket Islands SPA (004008) (41.3km)
		Clare Island SPA (004136) (227.7km)
		Cliffs of Moher SPA (004005) (141.4km)
		Deenish Island and Scariff Island SPA (004175) (0km -project within site)
		Dingle Peninsula SPA (004153) (40.7km)
		Duvillaun Islands SPA (004111) (258.8km)
		High Island, Inishshark and Davillaun SPA (004144) (200.0km)
		Horn Head to Fanad Head SPA (004194) (424.5km)
		Iveragh Peninsula SPA (004154) (3.3km)

[25] Colhoun K. and Cummins, S. 2013 Birds of Conservation Concern in Ireland 2014-19. Irish Birds 9:523-544 d

[26] BoCCI - Birds of Conservation Concern in Ireland

Qualifying Feature (Species Foraging Distance km)	**BoCCI**[26]	**SPA** (Shortest linear distance[6] from project km)
		Kerry Head SPA (004189) (75.5km)
		Lambay Island SPA (004069) (343.0km)
		Puffin Island SPA (004003) (16.1km)
		Saltee Islands SPA (004002) (249.9km)
		Skelligs SPA (004007) (20.0km)
		Tory Island SPA (004073) (412.6km)
		West Donegal Coast SPA (004150) (336.2km)
Gannet (*Morus bassanus*) (709km)	**Amber**	**Saltee Islands SPA (004002)** (249.9km)
		Skelligs SPA (004007) (20.0km)
		The Bull and the Cow Rocks SPA (004066) (16.4km)
Guillemot (*Uria aalge*) (340km)	**Amber**	**Clare Island SPA (004136)** (227.7km)
		Cliffs of Moher SPA (004005) (141.4km)
		Horn Head to Fanad Head SPA (004194) (424.5km)
		Inishmore SPA (004152) (154.1km)
		Ireland's Eye SPA (004117) (335.9km)
		Iveragh Peninsula SPA (004154) (3.3kmkm)
		Lambay Island SPA (004069) (343.0km)
		Loop Head SPA (004119) (92.1km)
		Mid-Waterford Coast SPA (004193) (191.1km)
		Old Head of Kinsale (004021) (115.5km)
		Saltee Islands SPA (004002) (249.9km)
		Skelligs SPA (004007) (20.0km)
Herring Gull (*Larus argentatus*) (92km)	**Red**	**Blasket Islands SPA (004008)** (41.3km)
Kittiwake (*Rissa tridactyla*) (300km)	**Amber**	**Aughris Head SPA** (297.8km)
		Blasket Islands SPA (004008) (41.3km)
		Clare Island SPA ((004136) (227.7km)
		Cliffs of Moher SPA (004005) (141.4km)
		Helvick Head to Ballyquin SPA (004192) (175.4km)
		Inishmore SPA (004152) (154.1km)
		Loop Head SPA (004119) (92.1km)
		Old Head of Kinsale (004021) (115.5km)
		Puffin Island SPA (004003) (16.1km)

Qualifying Feature (Species Foraging Distance km)	**BoCCI**[26]	**SPA** (Shortest linear distance[6] from project km)
		Saltee Islands SPA (004002) (249.9km)
		Skelligs SPA (004007) (20.0km)
		Wicklow Head SPA (004127) (316.5km)
Lesser Black-backed Gull (*Larus fuscus*) (181km)	**Amber**	**Ballycotton Bay SPA (004022)** (150.5km)
		Ballymacoda (004023) (1158.0km)
		Blasket Islands SPA (004008) (43.3km)
		Cork Harbour SPA (004030) (123.2km)
		Deenish Island and Scariff Island SPA (004175) (0km -project within site)
		Puffin Island SPA (004003) (16.1km)
Manx Shearwater (*Puffinus puffinus*) (330km)	**Amber**	**Blasket Islands SPA (004008)** (41.3km)
		Cruagh Island SPA (004170) (197.5km)
		Deenish Island and Scariff Island SPA (004175) (0km -project within site)
		Puffin Island SPA (004003) (16.1km)
		Skelligs SPA (004007) (20.0km)
Puffin (*Fratercula arctica*) (200km)	**Amber**	**Blasket Islands SPA (004008)** (41.3km)
		Cliffs of Moher SPA (004005) (141.4km)
		Puffin Island SPA (004003) (16.1km)
		Skelligs SPA (004007) (20.0km)
		The Bull and the Cow Rocks SPA (004066) (16.4km)
Razorbill (*Alca torda*) (340km)	**Amber**	**Blasket Islands SPA (004008)** (41.3km)
		Clare Island SPA (004136) (227.7km)
		Cliffs of Moher SPA (004005) (141.4km)
		Ireland's Eye SPA (004117) (335.9km)
		Puffin Island SPA (004003) (16.1km)
		Saltee Islands SPA (004002) (249.9km)
Storm Petrel (*Hydrobates pelagicus*) (65km)	**Amber**	**Blasket Islands SPA (004008)** (41.3km)
		Deenish Island and Scariff Island SPA (004175) (0km -project within site)
		Magharee Islands SPA (004125) (64.2km)
		Puffin Island SPA (004003) (16.1km)
		Skelligs SPA (004007) (20.0km)
		The Bull and the Cow Rocks SPA (004066) (16.4km)

Aughris Head SPA

Aughris Head is a rocky headland on the north-facing Co. Sligo coastline, located some 20 km west of Sligo Town (NPWS 2015). Its near-vertical cliffs reach a maximum height of 30 m above sea level (NPWS 2012). The marine area to a distance of 500 m from the base of the cliffs is included in the site. The site was designated for Kittiwake (742 breeding pairs). Other breeding seabirds including Guillemot (811 pairs), Razorbill (58 pairs) and Fulmar (94 pairs).

Ballycotton Bay SPA (004022)

Situated on the south coast of Co. Cork, Ballycotton Bay is an east-facing coastal complex, which stretches northwards from Ballycotton to Ballynamona, a distance of c. 2 km. The site comprises two sheltered inlets which receive the flows of several small rivers. The site is designated for important populations of waterbirds including Teal (903), Ringed Plover (167), Golden Plover (2,383), Grey Plover (124), Lapwing (2,782), Black-tailed Godwit (136), Bar-tailed Godwit (175), Curlew (853), Turnstone (179), Common Gull (584) and Lesser Black-backed Gull (1,293) - all figures are five year mean peaks for the period 1995/96 to 1999/2000. Other notable species at the site include Shelduck (99), Wigeon (522), Mallard (232), Oystercatcher (255), Dunlin (575), Sanderling (56), Redshank (117), Greenshank (12) and Great Black-backed Gull (324). The site is also designated for Wetland & Waterbirds.

Ballymacoda Bay SPA (004023)

This coastal site stretches north-east from Ballymacoda to within several kilometres of Youghal, Co. Cork (NPWS 2014). It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment. Part of the tidal section of the river is included in the site and on the seaward side the boundary extends to, and includes, Bog Rock, Barrel Rocks and Black Rock. The inner part of the estuary is well sheltered by the Ring peninsula, a stabilised sand spit with sand dunes at its northern end and salt marshes on the landward side. Ballymacoda Bay is of high ornithological importance and is designated for Wigeon (907), Teal (887), Ringed Plover (153), Grey Plover (535), Lapwing (4,063), Sanderling (98), Dunlin (3,192), Bar-tailed Godwit (581), Curlew (1,145), Redshank (357) and Turnstone (137), Black-headed Gull (1,560), Common Gull (1,120) and Lesser Black-backed Gull (5,051).

Beara Peninsula SPA (004155)

Beara Peninsula SPA (004155) consists of high coast and sea cliff sections which supports heath and coastal grassland, as well as sites further inland (NPWS 2015). The SPA is of importance due to the presence of nationally important Fulmar and Chough. The Chough species are primarily found along

the coast from Bear Island to Reenmore Point, including Dursey Island with the characterised marginal agricultural land with semi-natural vegetation in proximity to the cliffs making this a favourable location for the species. Other species within the SPA include Shag (*Phalacrocorax aristotelis*), Herring Gull (*Larus argentatus*), Lesser Black-backed Gull (*Larus fuscus),* Razorbill (*Alca torda*) and Black Guillemot (*Cepphus grylle*) as well as Peregrine (*Falco peregrinus*).

Blasket Islands SPA (004008)

The Blasket Islands are situated at the end of the Dingle peninsula in Co. Kerry (NPWS 2015). The site comprises all of the main islands in the group, as well as the various islets and rocks, and also the seas which surround the islands to a distance of 500 m. There are six main islands, plus some smaller islands, islets and sea stacks. The largest island, Great Blasket, is separated from the mainland by the Blasket Sound, a distance of some 2 km. The smallest island, Beginish, lies close to Great Blasket, while the other islands (Inishtooskert, Inishnabro, Inishvickillane, Tearaght Island) are between about 7 km and 12 km from the mainland. The Blasket Islands SPA is one of the most important seabird colonies and is designated for breeding population of Storm Petrel and Manx Shearwater (c. 52,141 and 19,534 pairs respectively; 2000/2001 survey). The site is also designated for nationally important populations: Fulmar (2,179 pairs), Lesser Black-backed Gull (at least 333 pairs), Herring Gull (131 pairs), Kittiwake (773 pairs) and Puffin (4,924 pairs) (1988 survey). An incomplete survey in 1999/2000 recorded a nationally important population of Shag (60 pairs). The site is also designated for Arctic Tern (at least 200 pairs in 1988 and 102 pairs in 2001). Other notable species include Guillemot, Oystercatcher, Peregrine, Raven, Rock Dove, Twite and Wheatear.

Castlemaine Harbour SPA (004029)

Castlemaine Harbour SPA is a large coastal site occupying the innermost part of Dingle Bay. It extends from the lower tidal reaches of the River Maine and River Laune to west of the Inch and Rosbehy peninsulas (c. 16 km from east to west) (NPWS 2014). The average width of the estuary is 4-5 km though it is c. 11 km wide at the outer limit. The site comprises the estuaries of the River Maine and the River Laune, both substantial rivers, and has extensive areas of intertidal sand and mud flats. The site is designated for important populations of waterbirds including; Red-throated Diver (56), Cormorant (136), Wigeon (6,819), Mallard (487), Pintail (145), Scaup (74), Common Scoter (3,637), Oystercatcher (1,035), Ringed Plover (206), Sanderling (335), Bar-tailed Godwit (397), Redshank (341), Greenshank (46) and Turnstone (144). The site support nationally important numbers of Chough and is designated for the species. The site is also designated for Wetland & Waterbirds.

Clare Island SPA (004136)

Clare Island lies at the entrance to Clew Bay, in Co. Mayo, and some 5 km from the mainland (NPWS 2014). The site comprises all of the cliffs on the island, a length of approximately 10 km, as well as the land adjacent to the cliff edge (inland for 300 m) and the adjacent marine waters (to distances of 200 m or 500 m, depending on auk distribution).The site is designated for important populations of waterbirds including the largest population in the country of Fulmar (4,029 pairs), and nationally important populations of Shag (89 pairs), Common Gull (39 pairs), Kittiwake (1,785 pairs), Guillemot (1,528 pairs), Razorbill (354 pairs) and Black Guillemot (62 individuals). The site is also designated for Chough (16 pairs) Other notable species at the site include Cormorant, Gannet, Great Black-backed Gull, Herring Gull, Lesser Black-backed Gull, Peregrine and Puffin.

Cliffs of Moher SPA (004005)

This site extends a distance of some 9.5 km along the north Clare coast from Faunmore in the north to just south of Cancregga Point in the south (NPWS 2015). The cliffs, which rise to 203 m in height. The site includes the cliffs, the land adjacent to the cliff edge (inland for 300 m) as well as the adjacent sea area to a distance of up to 500 m from the cliff base. The site is designated for important populations of including Chough (12 pairs 2002/ 2003), Fulmar (3,566 pairs), Kittiwake (7,698 pairs), Guillemot (13,375 pairs) and Puffin (1,365 pairs) and Razorbill (Alca torda) (5,159) (1998/1999 survey). Other notable species at the site include Black Guillemot, Great Black-backed Gull, Herring Gull, and Shag.

Cork Harbour SPA (004030)

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra (NPWS 2015). The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay, Ringabella Creek and the Rostellan and Poulnabibe inlets. The site is designated for important populations of waterbirds including Black-tailed Godwit (1,896) and Redshank (2,149) (all figures given are five year mean peaks for the period 1995/96 to 1999/2000) and nationally important populations of the following 19 species occur: Little Grebe (57), Great Crested Grebe (253), Cormorant (521), Grey Heron (80), Shelduck (2,009), Wigeon (1,791), Teal (1,065), Mallard (513), Pintail (57), Shoveler (103), Red-breasted Merganser (121), Oystercatcher (1,809), Golden Plover (3,342), Grey Plover (95), Lapwing (7,569), Dunlin (9,621), Bartailed Godwit (233), Curlew (2,237) and Greenshank (46). Other species for which the site is designated include Mute Swan (38), Whooper Swan (5), Pochard (72), Gadwall (6), Tufted Duck (64), Goldeneye (21), Coot (53), Ringed Plover (73), Knot (26) and Turnstone (113), Black-headed Gull (3,640), Common Gull (1,562) and Lesser Black-backed Gull (783). Notable

species at the site include Little Egret and Mediterranean Gull, two species which have recently colonised Ireland. Other notable species at the site include Coot, Gadwall, Goldeneye, Greenshank, Knot, Mallard, Mute Swan, Pochard, Ringed Plover, Tufted Duck, Turnstone and Whooper Swan. The site is also designated for Wetland & Waterbirds.

Cruagh Island SPA (004170)

Cruagh Island is located approximately 2 km west of Omey Island, off the Connemara coast in Co. Galway (NPWs 2010). It is a small- to medium sized, low-lying island (maximum height 62 m) and is uninhabited. The island is dominated by a maritime grassy sward with some exposed rock. The sea area to a distance of 500 m is included in the site to accommodate 'rafting' shearwaters. The site is designated for important populations of Manx Shearwater (3,286 pairs), Great Black-backed Gull (30 pairs) and Barnacle Goose. The site is regular feeding site for Barnacle Goose during the winter.

Deenish Island and Scariff Island SPA (004175)

Deenish Island and Scariff Island are small- to medium-sized islands situated between 5 and 7 km west of Lamb's Head off the Co. Kerry coast; they are thus very exposed to the force of the Atlantic Ocean. Scariff is the larger of the two (NPWS 2014). It is steep-sided all the way around and rises to a peak of 252 m. The highest cliffs are on the south side. The island vegetation is a mix of maritime grassland, areas dominated by Bracken (*Pteridium aquilinum*) and heathy areas with Ling Heather (*Calluna vulgar*is). The site is designated for important populations of waterbirds including Arctic Tern (54 pairs in 1995) Fulmar (385 pairs in 2000), Lesser Black-backed Gull (97 pairs in 2000), Manx Shearwater (2,311 pairs) and Storm Petrel (estimated 6,200 pairs). Other notable species at the site include Black Guillemot, Great Black-backed Gull, Herring Gull and Shag.

Inishmore SPA (004152)

Situated approximately 8 km off the south coast of County Galway, Inishmore (Árainn) is the largest of the three Aran Islands. The site comprises all of the cliffs and rocky shore along the entire southern side of the island, part of the low cliffs/rocky shore at the west end, and the low cliffs/rocky shore at the east end - a distance of over 17 km of coastline. Also included are the two islands west of Inishmore (Brannock Island and Rock Island), Straw Island at the east end of Inishmore, the dune system at Barr na Coise, and the adjacent seas out to 500 m from the shoreline. The cliffs vary in height, being often less than 20 m but rising to over 80 m near Dún Aonghasa where they are notably sheer. The site is designated for important populations of birds including Arctic Tern (338 in 1995), Guillemot (2,312 pairs in 1999), Kittiwake (587 pairs in 1999), Little Tern (3 pairs in 1995, 13 pairs in 1999). Other notable

species at the site include Black Guillemot, Chough, Fulmar, Great Black-backed Gull, Herring Gull, Peregrine, Razorbill and Shag.

Ireland's Eye SPA (004117)

Ireland's Eye is an uninhabited island located about 1.5 km north of Howth in Co. Dublin (NPWS 2011). The site encompasses Ireland's Eye, Rowan Rocks, Thulla, Thulla Rocks, Carrageen Bay and a seaward extension of 200m in the west and 500m to the north and east. The island has an area of c. 24 ha above the high tide mark. The site is designated for important populations of waterbirds including Cormorant (306 pairs in 1999), Guillemot (1,468 pairs in 1999), Herring Gull (246 pairs in 1999), Kittiwake (941 pairs in 1999), Razorbill (460 pairs in 1999). Other notable species at the site include Fulmar, Gannet, Great black-backed Gull, Greylag Goose, Lesser Black-backed Gull, Light-bellied Brent Goose, Oystercatcher, Peregrine, Puffin, Ringed Plover, Shag and Shelduck.

Iveragh Peninsula SPA (004154)

The Iveragh Peninsula SPA is a large site situated on the west coast of Co. Kerry (NPWS 2015). The site encompasses the high coast and sea cliff sections of the peninsula from just west of Rossbehy in the north, around to the end of the peninsula at Valencia Island and Bolus Head, and as far east as Lamb's Head in the south. The site includes the sea cliffs, the land adjacent to the cliff edge and also areas of sand dunes at Derrynane and Beginish. The site is designated for an important breeding population of Chough (106 breeding pairs in 1992, 88 in 2002/2003). The site is also designated for Fulmar (766 pairs in 1999-2000), Guillemot (2,860 pairs in 1999-2000), Kittiwake (1,150 pairs in 2000), Peregrine (5 pairs in 1999-2002).

Kerry Head SPA (004189)

Kerry Head SPA is situated on the south side of the mouth of the River Shannon in north Co. Kerry (NPWS 2015). It encompasses the sea cliffs from just west of Ballyheigue, around the end of Kerry Head to the west and north-eastwards as far as Kilmore. The site includes the sea cliffs and land adjacent to the cliff edge. The site is designated for an internationally important population of breeding Chough (32 breeding pairs in the 1992, 30 in the 2002/03 survey). The site is also designated for a nationally important population of Fulmar (421 pairs). Other notable species include Shag (8 pairs in 2000) and Peregrine (2 pairs in 2002).

Lambay Island SPA (004069)

Lambay Island lies approximately 4 km off the north Co. Dublin coastline and is separated from it by a channel of 10-13 m in depth (NPWS 2011). East of Lambay Island the water deepens rapidly into the Irish Sea basin. The island, which rises to 127 m, has an area of 250 ha above high tide mark. The site

is designated for important breeding populations of Fulmar (585 pairs in 1999), Lesser Black-backed Gull (309 pairs in 1999), Kittiwake (4,091 pairs in 1999), Herring Gull (1,806 pairs in 1999), Puffin (265 pairs in 1999) and Razorbill (2,906 pairs in 1999). The site is also designated for internationally important populations of Cormorant (675 pairs), Shag (1,122 pairs) and Guillemot (40,705 pairs). Other designated species include Barnacle Goose, Black Guillemot, Common Gull, Curlew, Gannet, Great Black-backed Gull. Notable species at the site include Light-bellied Brent Goose, Manx Shearwater, Oystercatcher, Purple Sandpiper and Turnstone.

Loop Head SPA (004119)

Loop Head is situated at the most westerly point in Co. Clare, approximately 20 km south-west of Kilkee (NPWS 2009). The site includes the cliffs, shoreline and the adjacent marine area to a distance of 500 m from the shore. The vertical cliffs are impressive, rising to 60 m and extending for 5 km along the coast. The site is designated for breeding important populations Guillemot (2,687 pairs in 1987) and Kittiwake (690 pairs in 1987). Notatble species at the site include; Chough, Fulmar, Peregrine and Razorbill.

Magharee Islands SPA (004125)

The Magharee Islands lie about 2 km north of the Maghárees Peninsula on the north side of the Dingle Peninsula, Co. Kerry (NPWS 2014). The site includes the main Magharee Islands ("Seven Hogs"), the islands of Mucklaghmore and Illaunnabarnagh to the east, Illaunnanoon and Doonagaun Island to the south and several smaller rocky islets. Illaunimmill and Illauntannig are the largest of the islands included in the site. The site is designated for Barnacle Goose which frequent the site in winter months (85 – four survey mean between 1993 and 2003. Other species for which the site is designated include breeding tern species including Arctic Tern (232 pairs in 1995), Common Tern (58 pairs in 1995) and Little Tern (36 pairs in 1995). The site is also designated for nationally important populations of Shag (61 pairs in 2001), Storm Petrel (1272 in 2007), Common Gull (43 pairs in 2001). Other notable species at the site include Chough, Cormorant, Fulmar, Great Black-backed Gull, Herring Gull, Lesser Black-backed Gull and Roseate Tern.

Mid-Waterford Coast SPA (004193)

The Mid-Waterford Coast SPA encompasses the areas of high coast and sea cliffs in Co. Waterford between Newtown Cove to the east and Ballyvoyle to the west (NPWS 2015). The site includes the sea cliffs and the land adjacent to the cliff edge. Sea cliffs are the predominant habitat of the site; these occur along its length and are generally well-vegetated by a suite of typical sea cliff species. Above the cliffs areas of heath, improved grassland, unimproved wet and dry grassland, and woodland occur. The

site is designated for an internationally important population of breeding Chough (24 breeding pairs in the 1992, 20 pairs in the 2002/03). The site is also designated for a nationally important population of Peregrine (10 pairs in 2002), Cormorant (79 pairs in 1999-2000) and Herring Gull (147 pairs in 1999-2000). Other notable species at the site include Black Guillemot, Fulmar, Razorbill and Shag.

Old Head of Kinsale (004021)

The Old Head lies approximately 10 km south of the town of Kinsale in Co. Cork, and is a 5 km long headland formed of steeply inclined beds of rock (NPWS 2014). The site comprises a section of the cliffs on the western side of the narrow isthmus leading to the Head and a 500 m seaward extension. These are vertical rock cliffs providing optimum habitat for ledge nesting seabirds. The site is designated for important populations of Guillemot (2,303 pairs in 2000) and Kittiwake (951 pairs in 2001). Other notable species at the site include Chough, Fulmar, Herring Gull, Peregrine, Razorbill and Shag.

Puffin Island SPA (004003)

Puffin Island lies approximately 0.5 km off the northern side of St Finan's bay in south-west Co. Kerry (NPWS 2015). It is a long, narrow island of Old Red Sandstone. The island is almost divided into two halves – the southern half is a long narrow, rocky ridge, rising to 130 m, while the northern half broadens into a grassy plateau though has a high point of 159 m. The island is surrounded by mostly steep cliffs and slopes. It is designated for internationally important populations of Storm Petrel (5,177 pairs in 2000) and Manx Shearwater (6,329 pairs in 2000) and nationally important populations of breeding Puffin (5,125 pairs in 2000), Fulmar (447 pairs in 2000), Razorbill (402 pairs in 1985 - incomplete survey in 2000) and Lesser Black-backed Gull (139 pairs in 2000) and Kittiwake (25 pairs in 2000). Other notable species at the site include Great Black-backed Gull, Guillemot and Shag.

Saltee Islands SPA (004002)

The Saltee Islands SPA is situated some 4-5 km off the coast of south Co. Wexford and comprises the two islands, Great Saltee and Little Saltee, and the surrounding seas both between them and to a distance of 500 m from them (NPWS 2012). The bedrock of the islands is of Precambrian gneiss and granite. Both islands have exposed rocky cliffs on their south and east – those on Great Saltee being mostly c. 30 m high, those on Little Saltee about half this height. The northern and western sides of both islands are fringed with shingle and boulder shores, backed by boulder clay cliffs, as well as small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee. The Saltee Islands sites is designated for nationally important Gannet colony (2,446 pairs in 2004), Fulmar (520 pairs in 1998-2000), Cormorant (273 pairs in 1998-2000), Shag (268 pairs in 1998-2000), Lesser Black-backed

Gull (164 pairs) in 1998-2000, Herring Gull (73 pairs in 1998-2000), Kittiwake (2,125 pairs in 1998-2000), Guillemot (14,362 pairs in 1998-2000), Razorbill (2,505 pairs in 1998-2000) and Puffin (1,822 pairs in 1998-2000). Other notable species recorded at the site include Chough, Hen Harrier and Peregrine.

Skelligs SPA (004007)

The site comprises Great Skellig and Little Skellig islands (NPWS 2015). These highly exposed and isolated islands, which are separated by a distance of 3 km, are located in the Atlantic some 14 km and 11 km (respectively) off the County Kerry mainland. Both islands are precipitous rocky sea stacks, Great Skellig rising to 218 m and Little Skellig to 134 m. The Skelligs comprise one of the most important seabird colonies in the country for populations and species diversity. The sites is designated for Fulmar (830 pairs in 2002), Gannet (29,683 pairs in 2004), Guillemot (1,652 pairs in 2002), Kittiwake (1,035 in 2002), Puffin (6,000 pairs estimated in 2002), Storm Petrel (9,994 pairs in 2002). Other notable species at the site include Razorbill and Chough

The Bull and the Cow Rocks SPA (004066)

This site consists of two very small rock islands, the Cow and the Bull. The site is designated for Storm Petrel, Gannet and Puffin (NPWS 2014). The site hosts one of the most important Storm Petrel colonies in Ireland (3,500 pairs in 2000), as well as the nationally important gannet species possessing its second largest colony in Ireland on Bull Island (3,694 in 2004). Additional bird species include, Great Black-backed Gull, Cormorant, Kittiwake, Guillemot, Fulmar, Herring Gull and Razorbill.

Tory Island SPA (004073)

Tory Island is a remote, rocky island lying some 11 km to the north of Bloody Foreland in County Donegal (NPWS 2015). The island is around 4 km long by 1 km wide. The eastern section comprises high (up to 83 m), dramatic coastal cliffs which continue along much of the north coastline. The southern shoreline is low-lying, consisting of bedrock shore and boulder beach. A marine area, extending 500 m from the base of the cliffs along the eastern and north-east side of the island, is included within the site. The site is designated for: Fulmar, Corncrake, Razorbill and Puffin. Tory Island SPA supports a breeding population of Corncrake (25 pairs - five year mean between 2003 and 2007, based on records of calling males). Tory Island SPA also supports nationally important breeding populations of Fulmar (641 pairs), Razorbill (671 pairs) and Puffin (1,402 pairs) - all figures from 1999. Other species that occur include Black Guillemot, Black-headed Gull, Chough, Great Black-backed Gull, Guillemot, Herring Gull, Kittiwake, Lapwing, Oystercatcher, Peregrine, Redshank, Ringed Plover, Shag, Snipe, Tree Sparrow, Little Tern and Storm Petrel.

West Donegal Coast SPA (004150)

The West Donegal Coast SPA comprises separate sections of the Co. Donegal coastline and extends from Muckros Head in the south, northwards to Slieve League, Malin Beg, Rocky Point, Glen Head, Slieve Tooey, Maghera, Loughros Point, Dunmore Head, Aran Island, Magheradrumman, Carrickfin, Carnboy, Bunbeg, Magheragallan, Lunniagh, as far as Carrick, to the south of Bloody Foreland. The site includes the high coast areas and sea cliffs of the mainland and Aran Island, the land adjacent to the cliff, areas of sand dunes/machair at Maghera, Mullaghderg, Braade/Carrickfin/Carnboy, Magheragallan and Lunniagh/Carrick, and also several areas further inland of the coast at Croaghmuckros and Slieve League, north of Glencolumbkille and south of Dunmore Head. A low-lying area of land on the coast at Bunbeg used by roosting Chough is also included. The site is designated for Chough, Peregrine, Fulmar, Cormorant, Shag, Herring Gull, Kittiwake and Razorbill. Other species noted at the sites include Barnacle Goose, Black Guillemot, Great Black-backed Gull, Lesser Black-backed Gull, Ring Ouzel, Twite and Puffin.

Wicklow Head SPA (004127)

Wicklow Head is a rocky headland site situated approximately 3 kilometres south of Wicklow town (NPWS 2012). The cliffs at the sites rise to about 60 m and it is here that most of the seabirds breed. The site comprises the cliffs and cliff-top vegetation, as well as some heath vegetation. The marine area to a distance of 500 m from the base of the cliffs is included in the site. The site was designated for a nationally important population of Kittiwake (956 pairs in 2002). Oher notable species at the site includes Fulmar, Shag, Herring Gull, Guillemot and Razorbill, Black Guillemot, Peregrine, Ravens, Stonechat, Whitethroat and Linnet.

3.7.1. Potential Impacts

3.7.1.1. Disturbance Risk

Potential disturbance effect to bird species could arise in two ways:

- from avoidance of the farm structures; and
- from avoidance of activity associated with the salmon farm.

In general, birds seem to use artificial structures as roosting sites when they prove suitable. Birds will avoid artificial structures when they interfere with specific habitat requirements such as flight paths or maintaining open views to detect predators. Considering the scale of the pens in the proposed renewal sites, this is unlikely to be an issue.

There will be daily human activity at the licence renewal site while the site is stocked with fish. This activity will include work boat transport to and from the site as well as daily activity relating to feeding,

health and quality checks, sampling and removal of mortalities. These activities would be low level with a limited number of people on site. Larger scale activities will include net pen maintenance, including in situ net cleaning, stock grading, stock treatment and harvesting. These activities will require a larger human presence and the use of more equipment on site including a well boat. Following the harvest period potentially large maintenance activities will also take place.

3.7.1.2. Entanglement/ Mortality Risk

There is potential that bird species may predate on farmed fish and thereby become entangle in farm pens and nets. However, if reasonable mitigation measures are taken against predation, such as the correct installation and fixing of bird nets, most species will do nothing more than perch until disturbed. The measures that will be employed include correct installation and fixing of bird nets. Entanglement of birds in nets is also less likely when nets are correctly installed and kept taut. Gulls are also habitual followers of fish farm vessels as they are with fishery vessels. Cormorants are the most persistent avian predators of farmed fish. They are capable of breaching the pen nets underwater and on occasions can also breach bird nets, to predate on the salmon stock. However, mitigating measures can deter such activities. Experience at MOWI suggests that cormorants should not prove problematic at this site as long as the stock is adequately protected. No direct predator control will be employed at the licence renewal site.

3.7.1.3. Impacts on Foraging and Licenced Area Habitat Suitability

If the licenced area coincides with suitable foraging areas, the farming operation may directly and indirectly effect bird foraging success. For instance, the farm structures may act as a fish aggregation device or artificial reef thereby increasing bird prey availability. Bird foraging success may also be positively affected through the provision of resting/ roosting locations and/ or the creation of sheltered waters in the lee of structures.

As shown in **Section 3.3** the proposed development effects the benthic habitats and communities in the vicinity of the farm through organic enrichment. There is potential that organic enrichment may indirectly affect the foraging behaviour of bird species by effecting benthic and demersal prey.

There is also potential that bird species may supplement natural foraging and diet by directly predating on farmed salmon.

3.7.2. Impact Assessment Methodology

3.7.2.1. Criteria Overview

A risk assessment[27] to examine the potential impacts on birds listed in **Table 3.16** has been carried using criteria for the following:

- species risk of disturbance (as detailed in **Table 3.17**);
- species population sensitivity (**Table 3.18**);
- licenced area habitat suitability (**Table 3.19**); and
- species habitat flexibility (**Table 3.20**).
- The significance of risk is presented in **Table 3.22**.

3.7.2.2. Disturbance Risk

The greatest potential impact from human activity will be associated with boat movements around the site. The sensitivity of various high conservation value species to such impacts will vary. Species that regularly follow fishing trawlers and larger boats (*i.e.* the gulls and Fulmars) are unlikely to be significantly displaced by boat movements. A disturbance scale developed by Garthe & Hüppop (2004) and Furness *et al.* (2012, 2013) rated the potential vulnerability of seabirds to disturbance on a scale of 1–5, with 1 representing hardly any escape/avoidance behaviour and/or non/very low fleeing distance and 5 representing strong escape/ avoidance behaviour and/or large fleeing distance. Using the disturbance scale, relevant Qualifying Features (presented in **Table 3.16**) are assigned to disturbance categories in **Table 3.17**.

Table 3.17: Disturbance risk categories of Qualifying Features of SPAs.

Qualifying Feature	Disturbance Category
Fulmar (*Fulmarus glacialis*)	1
Manx Shearwater (*Puffinus puffinus*)*	1
Storm Petrel (*Hydrobates pelagicus*)*	1
Arctic tern (*Sterna paradisaea*)	2
Common Tern (*Sterna hirundo*)	2
Gannet (*Morus bassanus*)	2

[27] The methods of impact assessment have been adapted from Atkins (2012)

Qualifying Feature	Disturbance Category
Herring Gull (*Larus argentatus*)	2
Kittiwake (*Rissa tridactyla*)	2
Lesser Black-backed Gull (*Larus fuscus*)	2
Puffin (*Fratercula arctica*)	2
Guillemot (*Uria aalge*)	3
Razorbill (*Alca torda*)	3

3.7.2.3. Species Population Sensitivity

The determination of the sensitivity of species population takes into account the following

- Tolerance to change: the species' ability to accommodate temporary and permanent change
- Recoverability: the ability of the receptor to return to its natural state following cessation of an effect.
- Adaptability: the ability of a receptor to avoid or adapt to an effect
- Value: a measure of the receptor's importance, rarity and worth.

In general, populations with very poor conservation status including species on the BoCCI red list have little capacity to tolerate change and recover following an impact. In contrast, populations that are not of conservation concern typically exhibit capacity to absorb impacts.

Table 3.18: Sensitivity criteria

Sensitivity	Definition
Very High	Receptor population has no tolerance of effect. e.g. no capacity to absorb change, a population level effect very likely to occur Likely to be limited to populations with very poor conservation status - BoCCI Red List
High	Receptor population has a very limited tolerance of effect. e.g. likely to have no capacity to absorb change, so a population level effect likely. Likely to be limited to populations with poor existing conservation status - BoCCI Amber List
Medium	Receptor population has limited tolerance of effect. e.g. very minor capacity to absorb change, so a population effect possible. Likely to include but not be limited to populations with poor existing conservation status - BoCCI Green List
Low	Receptor population has some tolerance of effect. e.g. likely to have minor capacity to absorb additional mortality or reduction in productivity or habitat loss, so a population level effect unlikely.

Sensitivity	Definition
Negligible	Receptor population generally tolerant of effect. e.g. likely to have moderate capacity to absorb additional mortality or reduction in productivity or habitat loss, so a population effect very unlikely.

3.7.2.4. Licenced Area Habitat Suitability

The habitat suitability of the licence renewal site is coded as follows:

1. habitat conditions include specific features (substrate type, upwellings, etc.) identified as being important for the species;
2. habitat conditions generally suitable (e.g. within depth range) but lack specific features identified as being important for the species;
3. habitat conditions include some features identified as unsuitable in some studies;
4. habitat conditions generally unsuitable.

Habitat preference follows that identified for the species in Furness *et al.* (2012, 2013).

Table 3.19: Habitat Suitability

Qualifying Feature	Species Habitat Preference	Suitability Score
Arctic tern (*Sterna paradisaea*)	Coastal marine	2
Common Tern (*Sterna hirundo*)	Estuaries, sea lochs sheltered coast, few inland on river and lochs	2
Herring Gull (*Larus argentatus*)	Forages around ship in inshore areas, on shoaling fish, in the intertidal, in agricultural areas, on refuse and in streets.	2
Kittiwake (*Rissa tridactyla*)	Birds forage over continental shelf with the 200m contour.	2
Lesser Black-backed Gull (*Larus fuscus*)	Feed in a range of habitats in coastal areas, and in agricultural areas, and extensive use is made of refuse tips and other sources of human waste.	2
Razorbill (*Alca torda*)	Found in a range of marine habitats but generally in shallow sea	2

Qualifying Feature	Species Habitat Preference	Suitability Score
Guillemot (*Uria aalge*)	Typically feeds offshore with inshore and pelagic feeding less common.	3
Fulmar (*Fulmarus glacialis*)	Oceanic and shelf break although large number can occur near trawler on continental shelf	4
Gannet (*Morus bassanus*)	Oceanic, pelagic but mainly offshore over continental shelf	4
Manx Shearwater (*Puffinus puffinus*)	Pelagic although mainly over continental shelf	4
Puffin (*Fratercula arctica*)	Feed far from the coast and is pelagic in winter.	4
Storm Petrel (*Hydrobates pelagicus*)	Pelagic, generally found over continental shelf.	4

3.7.2.5. Species Habitat Flexibility

The habitat use flexibility scores are based on Garthe & Hüppop (2004) and Furness *et al.* (2012, 2013). The score value ranges from 1 to 5 with 1 indicating species is very flexible in habitat use and to 5 indicating the species is reliant on specific habitat characteristics. Species that are coded low occupy large sea areas with no specific habitat preferences while species that are coded high rely on specific habitat features.

Table 3.20: Habitat Flexibility Scores.

Qualifying Feature	Flexibility Scores
Fulmar (*Fulmarus glacialis*)	1
Herring Gull (*Larus argentatus*)	1
Manx Shearwater (*Puffinus puffinus*)	1
Storm Petrel (*Hydrobates pelagicus*)	1
Common Tern (*Sterna hirundo*)	2
Gannet (*Morus bassanus*)	2
Kittiwake (*Rissa tridactyla*)	2
Lesser Black-backed Gull (*Larus fuscus*)	2
Arctic tern (*Sterna paradisaea*)	3
Guillemot (*Uria aalge*)	3

Qualifying Feature	Flexibility Scores
Puffin (*Fratercula arctica*)	3
Razorbill (*Alca torda*)	3

3.7.3. Assessment of Impact Significance

The level of impact is determined by combining assessments of 1) Disturbance, 2) Population Sensitivity, 3) Licenced Area Habitat Suitability and 4) Habitat Flexibility Scores. The level of impact are described in **Table 3.21**, based on the sensitivity/value of the receptor, the magnitude of effects and the likelihood of occurrence, determines the significance of the impact.

The level of potential impact and significance to species are detailed in **Table 3.22**

Table 3.21: Level of Impact

Level of Impact	Impact Significance	Definition
Negligible	No change (**NOT SIGNIFICANT**)	No discernible change in the ecology of the affected feature
Negligible	Imperceptible Impact (**NOT SIGNIFICANT**)	An impact capable of measurement but without noticeable consequences
Minor	Slight Impact (**NOT SIGNIFICANT**)	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	Moderate Impact (**SIGNIFICANT**)	An impact that alters the character of the environment that is consistent with existing and emerging trends
Major	Significant Impact (**SIGNIFICANT**)	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Severe	Profound Impact (**SIGNIFICANT**)	An impact which obliterates sensitive characters.

3.7.4. Conclusions

The likelihood of impacts occurring is remote; it is concluded that there will **be no likely significant effects**.

Table 3.22: Potential impacts on bird populations.

Qualifying Feature	Disturbance	Population Sensitivity BoCCI[28]	Licenced Area Habitat Suitability	Habitat Flexibility Scores	Overall Level of Impact	Impact Significance
Herring Gull (*Larus argentatus*)	2	Very High BoCCI Red List	2	1	Minor	Potential Slight Impact (NOT SIGNIICANT)
Arctic tern (*Sterna paradisaea*)	2	High – BoCCI Amber List	2	3	Negligible	Potential Imperceptible Impact (NOT SIGNIICANT)
Common Tern (*Sterna hirundo*)	2	High – BoCCI Amber List	2	2	Negligible	Potential Imperceptible Impact
Gannet (*Morus bassanus*)	2	High – BoCCI Amber List	4	2	Negligible	(NOT SIGNIICANT)
Guillemot (*Uria aalge*)	3	High – BoCCI Amber List	3	3	Negligible	Potential Imperceptible Impact
Kittiwake (*Rissa tridactyla*)	2	High – BoCCI Amber List	2	2	Negligible	(NOT SIGNIICANT)
Lesser Black-backed Gull (*Larus fuscus*)	2	High – BoCCI Amber List	2	2	Negligible	Potential Imperceptible Impact
Manx Shearwater (*Puffinus puffinus*)	1	High – BoCCI Amber List	4	1	Negligible	(NOT SIGNIICANT)

[28] BoCCI - Birds of Conservation Concern in Ireland

Qualifying Feature	Disturbance	Population Sensitivity BoCCI[28]	Licenced Area Habitat Suitability	Habitat Flexibility Scores	Overall Level of Impact	Impact Significance
Puffin (*Fratercula arctica*)	2	High – BoCCI Amber List	4	3	Negligible	Potential Imperceptible Impact
Razorbill (*Alca torda*)	3	High – BoCCI Amber List	2	3	Negligible	(NOT SIGNIICANT)
Storm Petrel (*Hydrobates pelagicus*)	1	High – BoCCI Amber List	4	1	Negligible	Potential Imperceptible Impact
Fulmar (*Fulmarus glacialis*)	1	Medium - BoCCI Green List	4	1	Negligible	No change NOT SIGNIICANT

3.8. Mitigation

Organic enrichment due to settleable solids discharged from the fish site is the main source of potential impact to Habitats Directive Annex I Habitats. Potential effects of settleable solids on Habitats Directive Annex I Habitats will be mitigated through the implementation of fallow periods between production cycles at the site. Following each production cycle, the proposed Deenish site will lie fallow for a minimum of one month. This fallow period allows will occur over the winter months when the site is at its most hydro-active thereby allowing dispersal of solids that may have accumulated under the pens during the production cycle. The fallow period also allows sufficient time for the seabed sediments and associated faunal community to recover to pre-production (pre-disturbed) state. Detail of the recovery of sediment and faunal communities following cessation of activities is documented in **Section 3.3.2** and **Section 3.3.3** above.

Habitats Directive Annex II Species salmon maybe affected by the proposed farm through lice infestation, disease spread and the introduction of therapeutants. Details of the farm management schemes (i.e. Single Bay Management, CLAMS) designed to co-ordinate husbandry practices are detailed in **Section 2.1.16**. These schemes ensure the breaking of disease and parasite life cycles with the effect of enhancing the efficacy of lice control and reducing the overall incidence of disease in the stocks and the use of therapeutants, thereby reducing risks to wild population of salmon. Wilds populations of salmon are also at risk from genetic interaction with escapees from fish farms. **Section 2.1.15.6** details measures in place to reduce the risk of escapees occurring.

Potential effect to Birds Directive species will be mitigated by the uses of top (bird) nets on the pens to prevent entanglement of birds with farm pens. Specifications for the bird nets are outlined in **Appendix 3.4**.

3.9. Monitoring

Benthic monitoring is detailed in **Section 3.3.2** and **Section 3.3.3** above while parasite monitoring in place at the farm is described in **Section 2.1.13.2.2**.

3.10. In-combination Effects

The in-combination impact of the renewal of licence T6/202 and other projects in the vicinity (existing or permitted) was examined during the AA procedure.

The only projects that could have the potential to give rise to in-combination effects are salmon farms within Kenmare Bay.

The Aquaculture Licence GIS Database[29] indicates that aquaculture in the Kenmare River SAC largely focuses on shellfish species and finfish (Salmon). The main cultured shellfish species is mussels with smaller quantities of oysters. Sites in the SAC are also licenced for scallops and clams, but the species are not currently produced in the area. There are five locations dedicated to the culture of Atlantic Salmon (including the Deenish site):

- T06/064/7 Doon Point,
- T06/064A Kilmakilloge Harbour
- T06/064B Kilmakilloge Harbour
- T05/233 Inishfarnard Island

The sites considered in the assessment of potential in-combination effect include salmon farms at Doon Point, Kilmakilloge Harbour, and at Inishfarnard Island. The sites at Doon Point and Kilmakilloge Harbour are currently unstocked and have been so for some time. The sites could be potentially restocked at the same time as Deenish. However, the Doon Point and Kilmakilloge sites are located over 14km from the Deenish and separated by the deep Kenmare Bay channel with limited northerly or southerly flows (i.e. limited hydraulic connection between the sites). Given this distance and hydrography cumulative effects from the sites can be excluded.

The Inishfarnard island site is currently operated by MOWI. As part of a licence renewal application for the Inishfarnard site an '*Appropriate Assessment Screening and Natura Impact Statement*' report[30] (AA Screening and NIS) has been prepared to address Article 6(3) obligations under EC Directive 92/43/EEC and an EIA[31] undertaken to address the Directive 2011/92/EU as amended by Directive 2014/52/EU. The AA Screening and NIS, and the EIA concluded that operations at the Inishfarnard site will not result in significant environmental effects on the site or the wider surrounding environment

[29] Aquaculture Licence GIS Data 23-12-2019:

https://www.agriculture.gov.ie/seafood/engineering/publications/gisdata/

[30] Document File Name: *JN1524 Screening for Appropriate Assessment and Natura Impact Statement - Volume 1 Main Report, Volume 2 Appendices - Licence Renewal of Marine Finfish Licence at Inishfarnard Island, Co. Cork - Licence Ref: AQ198 – Licence Site Ref: T5/233'.*

[31] Document File Name: *JN1524 Environmental Impact Assessment - Volume 1 Non-technical Summary, Volume 2 Main Report, Volume 3 Appendices - Licence Renewal of Marine Finfish Licence at Inishfarnard Island, Co. Cork - Licence Ref: AQ198 – Licence Site Ref: T5/233'.*

For the current study, the assessment of potential in-combination impacts identified that the only aspects of the Deenish and Inishfarnard projects that could potentially give rise to in-combination impacts are discharges from the farms. For the Deenish[32] and Inishfarnard[33] sites three-dimensional hydrodynamic simulation modelling exercises were undertaken to determine the fate of discharges from the sites. The discharges considered in the modelling exercises included sea lice larvae, and discharges that have the potential to impacts on water quality (i.e. settleable solids, nutrient levels, oxygen demand and dangerous substances). The modelling exercises indicated that as plumes of discharges from the respective sites do not combine, being separated by the deep Kenmare Bay channel with limited northerly or southerly flows (i.e. limited hydraulic connection between the sites), in-combination impact are unlikely to occur. In conclusion, given that the spatial footprint of discharges from the farms do not overlap it is concluded that there will be **no in-combination effects**.

In addition, as outlined in the AA of aquaculture activity in Kenmare River SAC (see **Appendix 1**[34]) undertaken by the Marine Institute the level of aquaculture activity (both existing and proposed) at the time of the assessment (which included those licences listed above) are consistent with the Conservation Objectives for the Annex I Habitats and Annex II Species; consequently in-combination effects with other aquaculture activities in the area were excluded.

3.11. Natura Impact Statement Concluding Statement

This report has been prepared with regard to the relevant provisions of the EU Council Directive 92/43/EEC and Ireland's EU (Birds and Natural Habitats) Regulations 2011 (as amended).

This NIS has been prepared as it was not possible at the Screening for AA stage to rule out, as a matter of scientific certainty, that the proposed operation at the Deenish Island site will not have a likely significant effect on SAC and SPAs.

The NIS has examined and analysed, in light of the best scientific knowledge, how the proposed operations could impact on the Qualifying Features of SACs and SPAs and whether the predicted impacts would adversely affect the integrity of protected sites.

[32] Deenish modelling exercise presented in Appendix 8 of *JN1524 Deenish NIS - Volume 2 - Appendices*

[33] Inishfarnard modelling exercise presented in Appendix 8 *JN1524 Inishfarnard NIS - Volume 2 - Appendices*

[34] Appendices included in '*Appropriate assessment Screening and Natura Impact Statement - Volume 2 - Appendices - Licence Renewal of Marine Finfish Farm at Deenish Island, Co. Kerry (Ref. T6/202)*'.

Mitigation measures have been identified which ensure that any impacts on the Conservation Objectives of Qualifying Features for which SACs and SPAs are designated will be avoided such that there will be no risk of adverse effects to the protected sites.

It has been objectively concluded following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed operations together with the mitigation measures proposed, that the proposed operations will not pose a risk of adversely affecting (either directly or indirectly) the integrity of SACs or SPAs, either alone or in combination with other plans and projects, and that there is no reasonable scientific doubt in relation to this conclusion.

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