Report supporting Appropriate Assessment of Aquaculture in West of Ardara/Maas Road SAC (Site code: 000197)

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1 PREFACE

The Habitats Directive is transposed in Ireland by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011). Appropriate assessments (AA) of aquaculture and risk assessments (RA) of fishing activities are carried out against the conservation objectives (COs), and more specifically on the version of the COs that are available at the time of the Assessment, for designated ecological features, within the site, as defined by the National Parks and Wildlife Service (NPWS). NPWS are the competent authority for the management of Natura 2000 sites in Ireland. Obviously, aquaculture and fishing operations existed in coastal areas prior to the designation of such areas under the Directives. Ireland is thereby assessing both existing and proposed aquaculture and fishing activities in such sites. This is an incremental process, as agreed with the EU Commission in 2009, and will eventually cover all fishing and aquaculture activities in all Natura 2000 sites.

The process of identifying existing and proposed activities and submitting these for assessment is, in the case of fisheries projects and plans, outlined in S.I. 290 of 2013. Fisheries projects or plans are taken to mean those fisheries that are subject to annual secondary licencing or authorization. Here, the industry or the Minister may bring forward fishing proposals or plans which become subject to assessment. These Fishery Natura Plans (FNPs) may simply be descriptions of existing activities or may also include modifications to activities that mitigate, prior to the assessment, perceived effects to the ecology of a designated feature in the site. In the case of other fisheries, that are not projects or plans, data on activity are collated and subject to a risk assessment against the CO's. Oyster fisheries, managed by DCCAE, do not come under the remit of S.I. 290 of 2013 but are defined as projects or plans as they are authorized annually and therefore should be subject to AA.

In the case of aquaculture, DAFM receives applications to undertake such activity and submits a set of applications, at a defined point in time, for assessment. The FNPs and aquaculture applications are then subject to AA. If the AA or the RA process finds that the possibility of significant effects cannot be discounted or that there is a likelihood of negative consequence for designated features then such activities will need to be mitigated further if they are to continue. The assessments are not explicit on how this mitigation should be implemented but rather indicate whether mitigation is required or not and what results should be achieved.

2 EXECUTIVE SUMMARY

2.1 THE SAC

The West of Ardara/Maas Road SAC (Site code: 000197), an extensive site on the Donegal coast, is designated as a Special Area of Conservation (SAC) under the Habitats Directive. The marine area is designated for Estuaries (1130), Mudflats and sand flats not covered by seawater at low tide (1140) and Large Shallow inlets and bays (1160) which support a variety of soft sedimentary communities and community complexes. The area is also designated for otter, harbour seal and salmon. Conservation Objectives for marine habitats and constituent communities (within the West of Ardara/Maas Road SAC) were identified by NPWS (2015a) and relate primarily to the requirement to maintain habitat distribution, structure and function, as defined by characterizing (dominant) species in these habitats. For designated species the objective is to maintain various attributes of the populations including population size, habitats quality and the distribution of the species.

2.2 AQUACULTURE ACTIVITIES IN THE SAC

There are currently no aquaculture activities occurring within the West of Ardara/Maas Road SAC but there are however six applications for shellfish culture, four for the cultivation of the Pacific oyster *Crassostrea gigas* on trestles and two for clam culture under netting on the seafloor. All applications are in intertidal areas within Loughros Mór Bay. The profile (prepared by BIM) of the aquaculture industry in the Bay, used in this assessment, is derived from the list of licence applications received by DAFM and provided to the MI for assessment in February 2015.

2.3 THE APPROPRIATE ASSESSMENT PROCESS

The function of an appropriate assessment and risk assessment is to determine if any ongoing and proposed aquaculture activities are consistent with the Conservation Objectives for the Natura site or if such activities will lead to deterioration in the attributes of the habitats and species over time. NPWS (2015b) provide guidance on interpretation of the Conservation Objectives which are, in effect, management targets for habitats and species in the SAC. This guidance is scaled relative to the anticipated sensitivity of habitats and species to disturbance by the proposed activities. Some activities are deemed to be wholly inconsistent with long term maintenance of certain sensitive habitats while other habitats can tolerate a range of activities. For the practical purpose of management of sedimentary habitats, a 15% threshold of overlap between a disturbing activity and a habitat is given in the NPWS guidance. Below this threshold, 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 appropriate assessment and risk assessment process is divided into a number of stages consisting of a preliminary risk identification, and subsequent assessment (allied with mitigation measures if necessary) which are covered in this report. The first stage of the process is an initial screening wherein activities which cannot have, because they do not spatially overlap with a given habitat or have a clear pathway for interaction, any impact on the conservation features and are therefore excluded from further consideration. The next phase is the Natura Impact Statement (NIS) where interactions (or risk of) are identified. Further to this, an assessment on the significance of the likely interactions between

activities and conservation features is conducted. Mitigation measures (if necessary) will be introduced in situations where the risk of significant disturbance is identified. In situations where there is no obvious mitigation to reduce the risk of significant impact, it is advised that caution should be applied in licencing decisions. Overall the Appropriate Assessment is both the process and the assessment undertaken by the competent authority to effectively validate this Screening Report and/or NIS. It is important to note that the screening process is considered conservative in that other activities which may overlap with habitats but which may have very benign effects are retained for full assessment.

2.4 DATA SUPPORTS

Distribution of habitats and species population data are provided by NPWS[1]. Scientific reports on the potential effects of various activities on habitats and species have been compiled by the MI and provide the evidence base for the findings. The profile of aquaculture activities was provided by BIM. The data supporting the assessment of individual activities vary and provides for varying degrees of confidence in the findings.

2.5 FINDINGS

2.5.1 Aquaculture and Habitats/Species:

In the West of Ardara/Maas Road SAC there are six applications for shellfish cultivation within Loughros Mór Bay (4 oyster and 2 clam). The likely interaction between aquaculture activity and conservation features (habitats and species) of the site was considered. An initial screening exercise resulted in a number of habitat features and species being excluded from further consideration. None of the proposed aquaculture applications overlap or likely interact with the following features or species, and therefore, the following habitats and species were excluded from further consideration in the assessment report:

- [1160] Large Shallow Inlets and Bays
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [2120] Marram Dunes (White Dunes)
- [2130] Fixed Dunes (Grey Dunes)*
- [2140] Decalcified *Empetrum* Dunes*
- [2150] Decalcified Dune Heath*
- [2170] Dunes with Creeping Willow
- [2190] Humid Dune Slacks
- [21A0] Machairs*
- [3110] Oligotrophic Waters containing very few minerals
- [4010] Wet Heath
- [4030] Dry Heath
- [4060] Alpine and Subalpine Heath
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [6410] *Molinia* Meadows
- [6510] Lowland Hay Meadows

[1] NPWS Geodatabase Ver: January 2016 - http://www.npws.ie/maps-and-data/habitat-and-species-data

- [7130] Blanket Bogs (Active)*
- [7150] Rhynchosporion Vegetation
- [7230] Alkaline Fens
- [1013] Geyer's Whorl Snail (*Vertigo geyeri*)
- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1065] Marsh Fritillary (*Euphydryas aurinia*)
- [1395] Petalwort (*Petalophyllum ralfsii*)
- [1833] Slender Naiad (Najas flexilis)

Two community types were identified within the qualifying interests 1130 and 1140. Sand with amphipods, polychaetes and *Tellina tenuis* community complex (1130 and 1140) and Estuarine sand with oligochaetes community complex (1130 only). One community type (i.e. Estuarine sand with oligochaetes community complex), was shown to have no overlap with the proposed aquaculture areas and was unlikely to have any interaction and thus, was excluded from further analysis.

An assessment was carried out on the likely interactions between the proposed aquaculture operations and the feature Annex 1 habitats Estuaries (1140) and Mudflat and sandflat not covered by seawater at low tide (1140), with likely effects of proposed aquaculture activities considered in light of the sensitivity of the constituent community Sand with amphipods, polychaetes and *Tellina tenuis* community complex.

The report finds that the proposed activities do not pose a risk of significant disturbance to the conservation of the designated habitat feature of Estuaries (1130) and Mudflat and sandflat not covered by seawater at low tide (1140) or their constituent community types.

Given the wide spatial distribution of Otter (*Lutra lutra* [1355]), Atlantic Salmon (*Salmo salar* [1106]) and Common (Harbour) Seal (*Phoca vitulina* [1365]) within the West of Ardara/Maas Road SAC it is deemed possible that the species may interact with aquaculture activities. However, based on the extent, nature and timing of the proposed activities it was determined that activities were unlikely to negatively impact the Conservation Objectives for Otter, Atlantic Salmon. While the likely interaction with Harbour Seal is considered non-disturbing the prevention of migration into the inner part of the bay from aquaculture structures might be considered further.

3 INTRODUCTION

This document assesses the potential ecological interactions of proposed aquaculture within the West of Ardara/Maas Road SAC (Site code: 000197) on the Conservation Objectives (COs) of the site. The information upon which this assessment is based is a list of applications and extant licences for aquaculture activities administered by the Department of Agriculture Food and Marine (DAFM) and forwarded to the Marine Institute as of February 2015 as well as aquaculture and fishery profiling information provided on behalf of the operators by Bord Iascaigh Mara. The spatial extent of aquaculture licences is derived from a database managed by the DAFM[2] and shared with the Marine Institute.

4 CONSERVATION OBJECTIVES FOR WEST OF ARDARA/MAAS ROAD SAC

This appropriate assessment report of aquaculture in relation to the Conservation Objectives for the West of Ardara/Maas Road SAC is based on Version 1.0 of the objectives (NPWS 2015a - Version 1 August 2015) and supporting documentation (NPWS 2015b - Version 1 July 2015; NPWS 2015c - Version 1 July 2015). The spatial data for conservation features was provided by NPWS[3].

4.1 THE SAC EXTENT

The West of Ardara/Maas Road SAC is a large site immediately north of Ardara on the southwest coast of Co. Donegal. The SAC stretches from Ardara to the Gweebarra River and Doocharry (**Figure 4.1**). The SAC itself is of scientific importance and includes a large number of coastal habitats and species listed in the E.U. Habitats Directive (specifically, six priority habitats, 17 non-priority habitats and eight species). The West of Ardara/Maas Road SAC is designated for the marine Annex I qualifying interest of Estuaries (1130), Mudflats and sandflats not covered by seawater at low tide (1140) and Large shallow inlets and bays (1160). The SAC is also considered an important site for Otter (*Lutra* lutra), Atlantic Salmon (*Salmo salar*) and Common (Harbour) Seal (*Phoca vitulina*). The extent of the SAC is shown in **Figure 4.1** below.

4.2 QUALIFYING INTERESTS (SAC)

The SAC is designated for the following habitats and species (NPWS 2015a), as listed in Annex I and Annex II of the Habitats Directive:

- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1160] Large Shallow Inlets and Bays
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [2120] Marram Dunes (White Dunes)
- [2130] Fixed Dunes (Grey Dunes)*
- [2140] Decalcified *Empetrum* Dunes*

[2] DAFM Aquaculture Database version Aquaculture: February 4, 2015
[3] NPWS Geodatabase Ver: January 2016 - http://www.npws.ie/maps-and-data/habitat-and-species-data

- [2150] Decalcified Dune Heath*
- [2170] Dunes with Creeping Willow
- [2190] Humid Dune Slacks
- [21A0] Machairs*
- [3110] Oligotrophic Waters containing very few minerals
- [4010] Wet Heath
- [4030] Dry Heath
- [4060] Alpine and Subalpine Heath
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [6410] *Molinia* Meadows
- [6510] Lowland Hay Meadows
- [7130] Blanket Bogs (Active)*
- [7150] Rhynchosporion Vegetation
- [7230] Alkaline Fens
- [1013] Geyer's Whorl Snail (*Vertigo geyeri*)
- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1065] Marsh Fritillary (*Euphydryas aurinia*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra lutra*)
- [1365] Common (Harbour) Seal (*Phoca vitulina*)
- [1395] Petalwort (*Petalophyllum ralfsii*)
- [1833] Slender Naiad (*Najas flexilis*)

The spatial extent of the qualifying interest Annex 1 marine habitats 1130 Estuaries, 1140 Mudflats and sandflats not covered by seawater at low tide and Large shallow inlets and bays (1160) are illustrated in **Figure 4.2** to **Figure 4.4** (from NPWS 2015b).

Constituent marine community types recorded within the qualifying interest Annex 1 marine habitats (i.e. 1130 Estuaries, 1140 Mudflats and sandflats not covered by seawater at low tide and 1160 Large shallow inlets and bays) are listed in NPWS (2015b) and listed in **Table 4.1** and illustrated in **Figure 4.5**.

The West of Ardara/Maas Road SAC is designated for the Otter, *Lutra lutra*. This species is listed in Annex IV(a) of the habitats directive and is afforded strict protection. According to the NPWS (2009) although otter numbers had declined from 88% in 1980/81 to 70% in 2004/05, otters remain widespread in Ireland. Recent estimates are more positive with the recent Article 17 assessment indicating a favourable conservation status nationally (NPWS 2013).

The West of Ardara/Maas Road SAC is also designated for the Annex II species Harbour Seal (*Phoca vitulina*). The harbour seal moult takes place predominantly during the months of August to September. A combined total of 59 harbour seals were recorded ashore within West of Ardara/Maas Road SAC during a national aerial survey for the species in August 2003. A repeat aerial survey in August 2011 recorded 102 harbour seals within the SAC. Sites used during the moulting season may be widely dispersed within Gweebarra Bay including various intertidal sandbanks, skerries and around O'Boyle's Island, Herring Island and Illannahorna, while some occurrence in Loughros Mór Bay is also described. Suitable habitat area for the species along with known breeding, resting and moult haul-out locations in West of Ardara/Maas Road SAC are indicated in **Figures 4.6**.

The West of Ardara/Maas Road SAC is designated for the Annex II species [1106] Atlantic Salmon (*Salmo salar*). The main salmon rivers running into the SAC are the Owenea/Stracashel and Owentocker rivers.

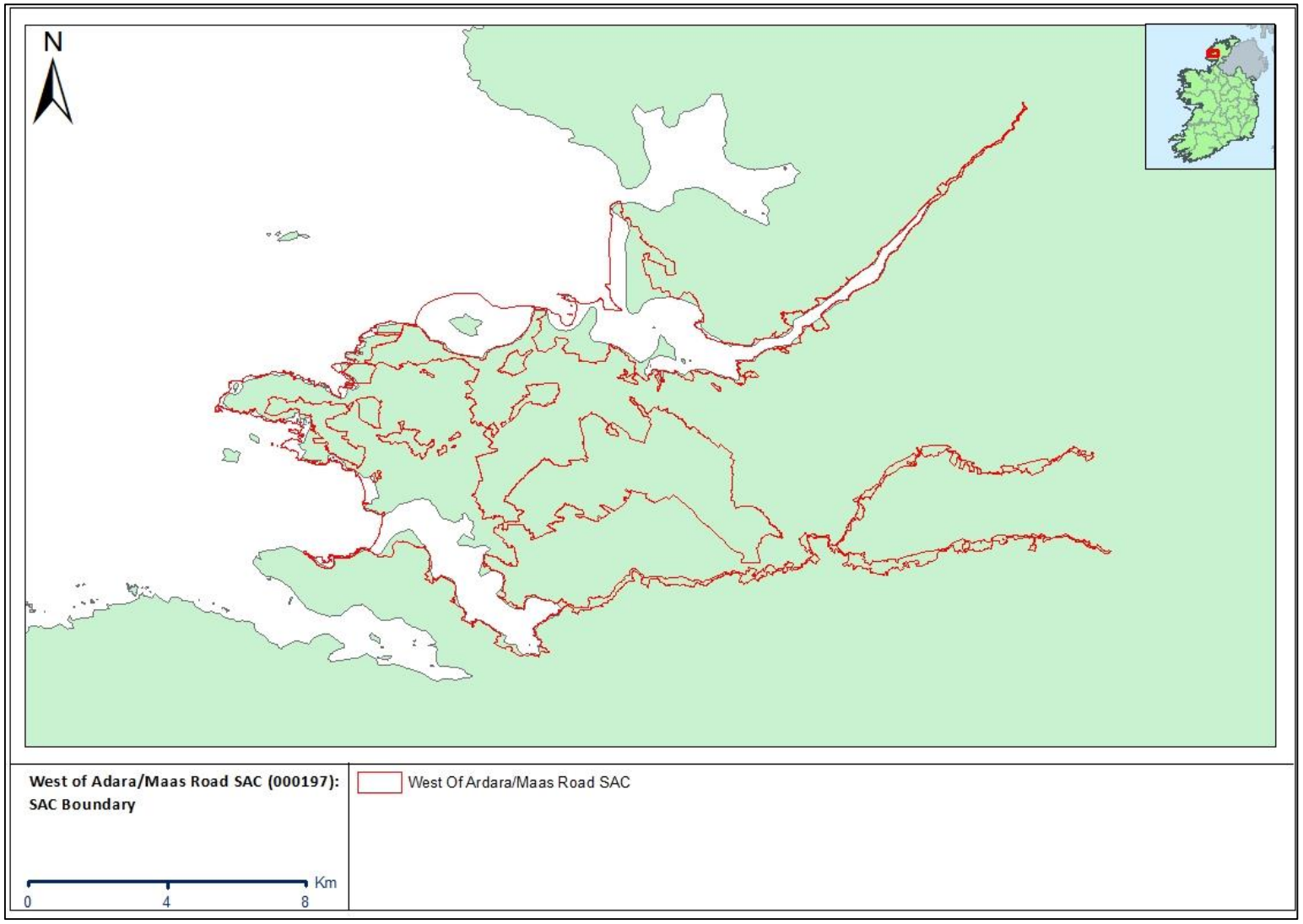

Figure 4-1 - The extent of the West of Ardara/Maas Road SAC (NPWS 2015b).

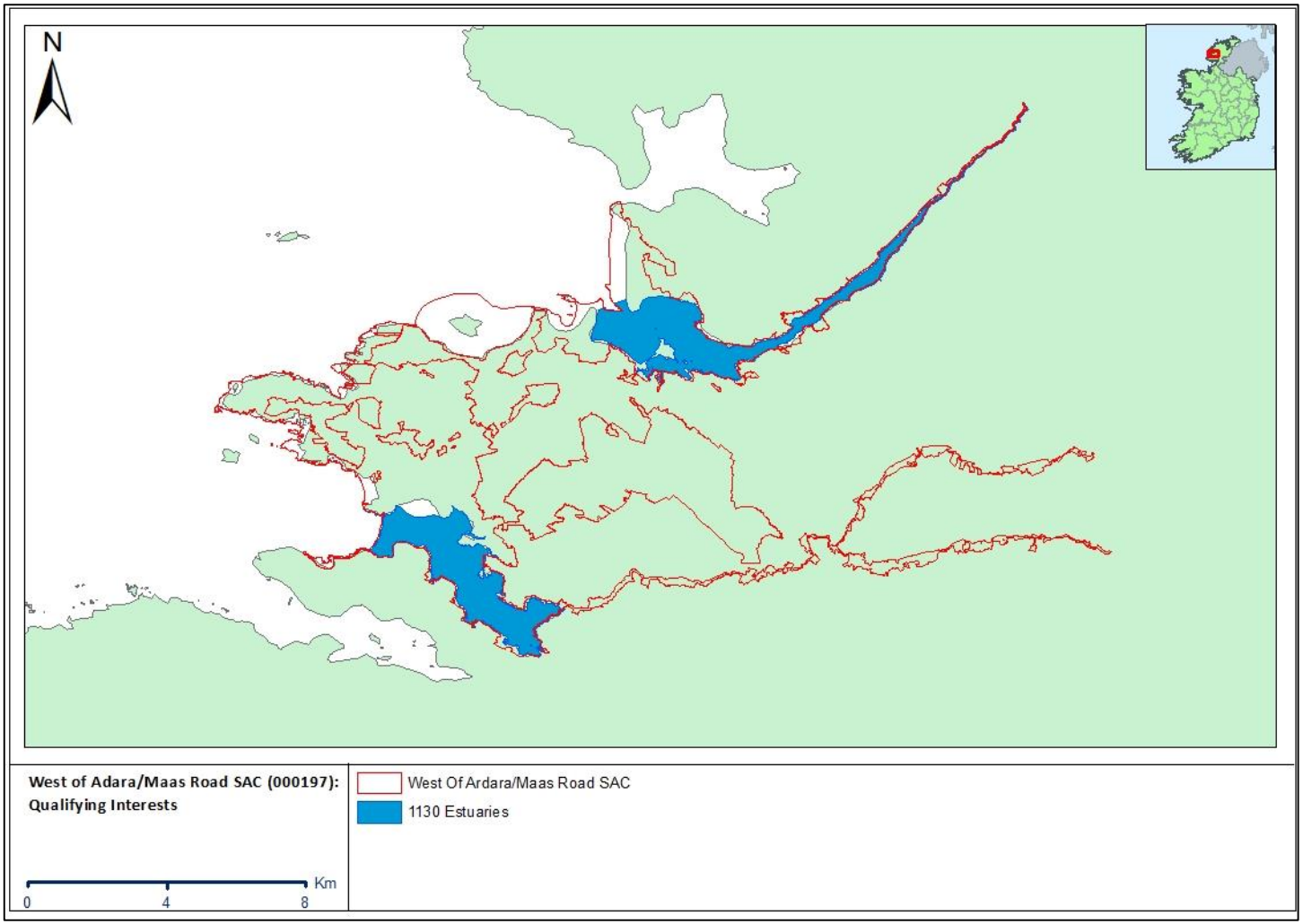

Figure 4-2 - Marine Annex I qualifying interest of Estuaries (1130) within the West of Ardara/Maas Road SAC (NPWS 2015b).

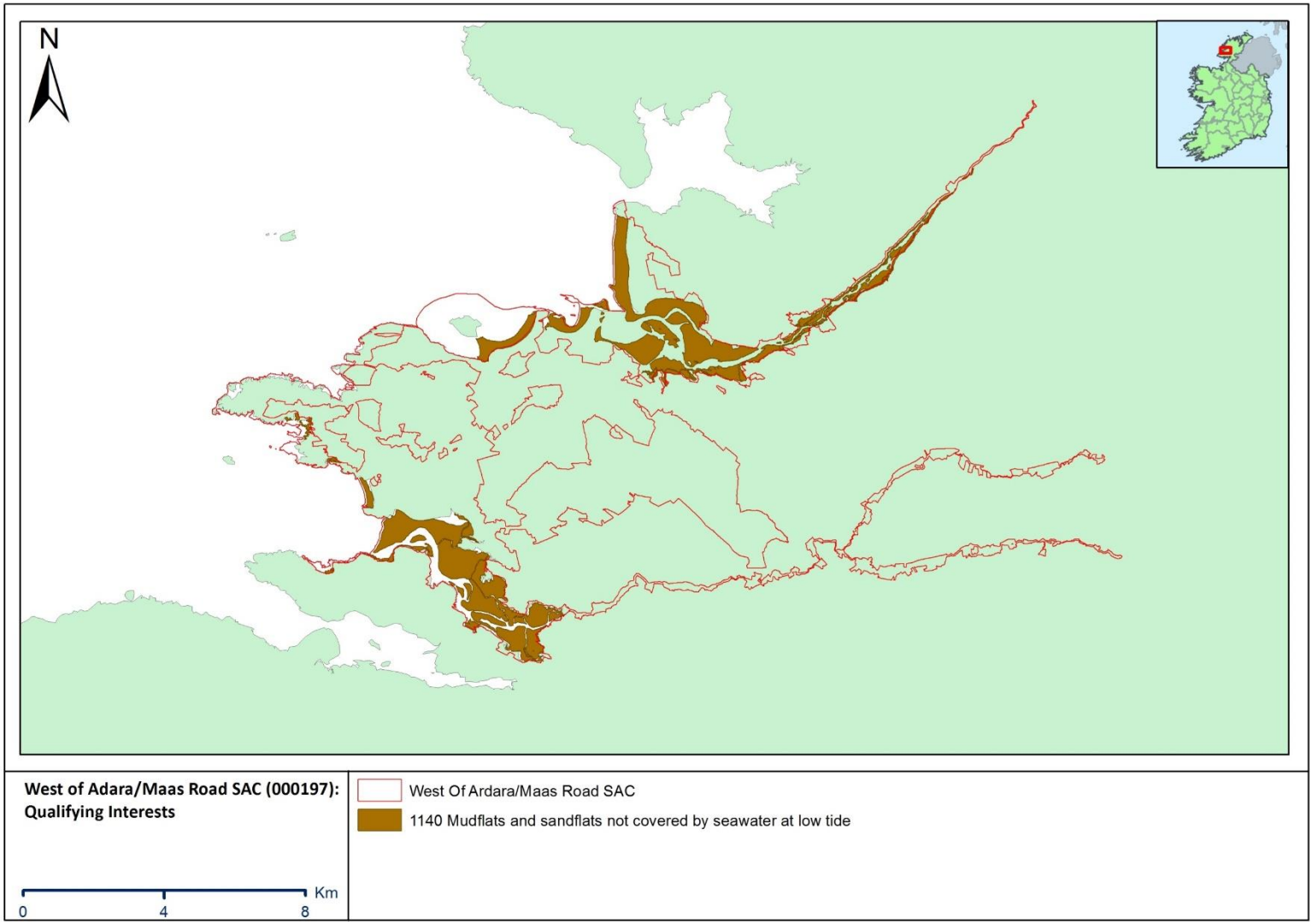

Figure 4-3 - Marine Annex I qualifying interest of Mudflats and sandflats not covered by seawater at low tide (1140) within the West of Ardara/Maas Road SAC (NPWS 2015b).

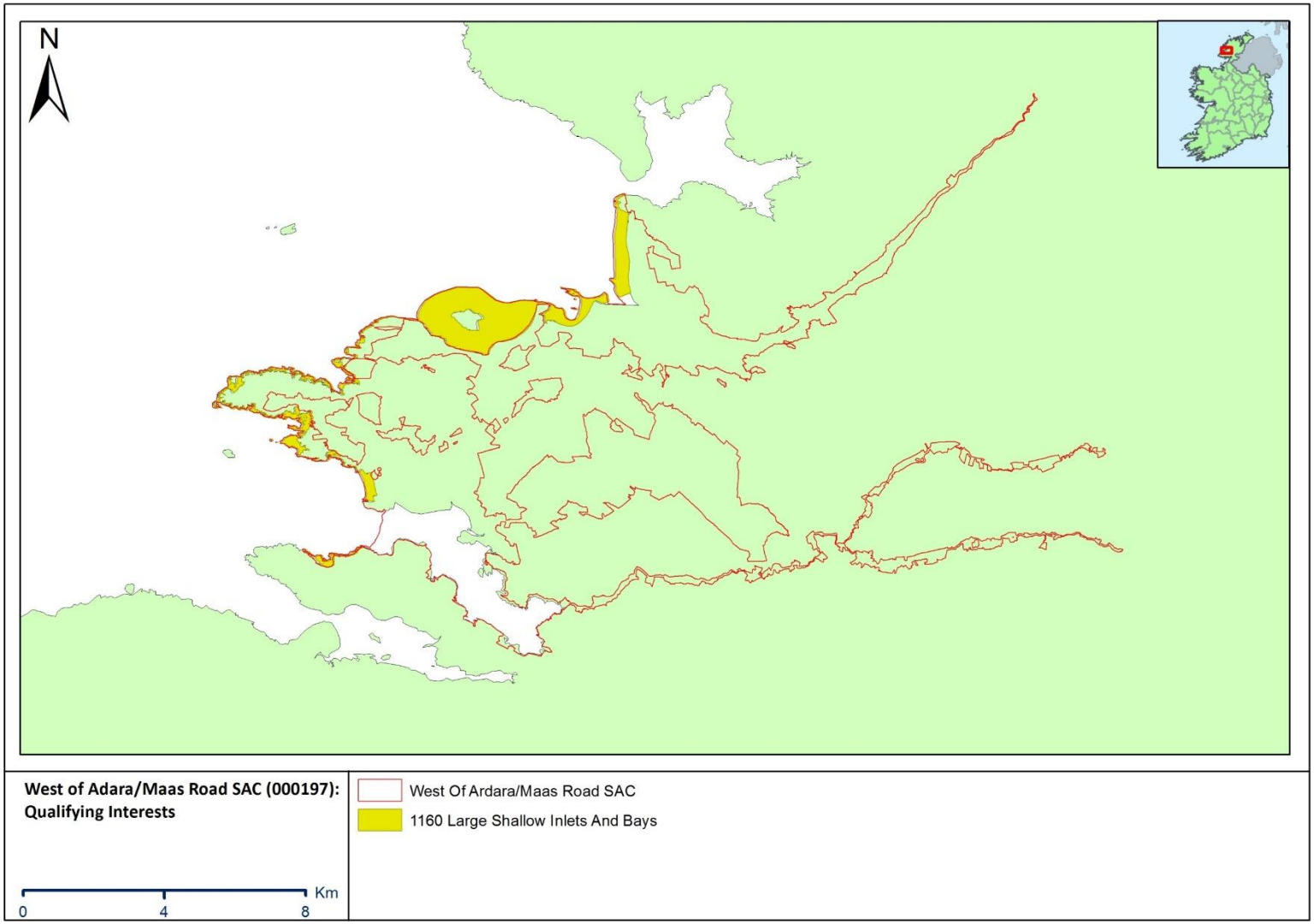

Figure 4-4 - Marine Annex I qualifying interest of Large Shallow Inlets and Bays (1160) within the West of Ardara/Maas Road SAC (NPWS 2015b).

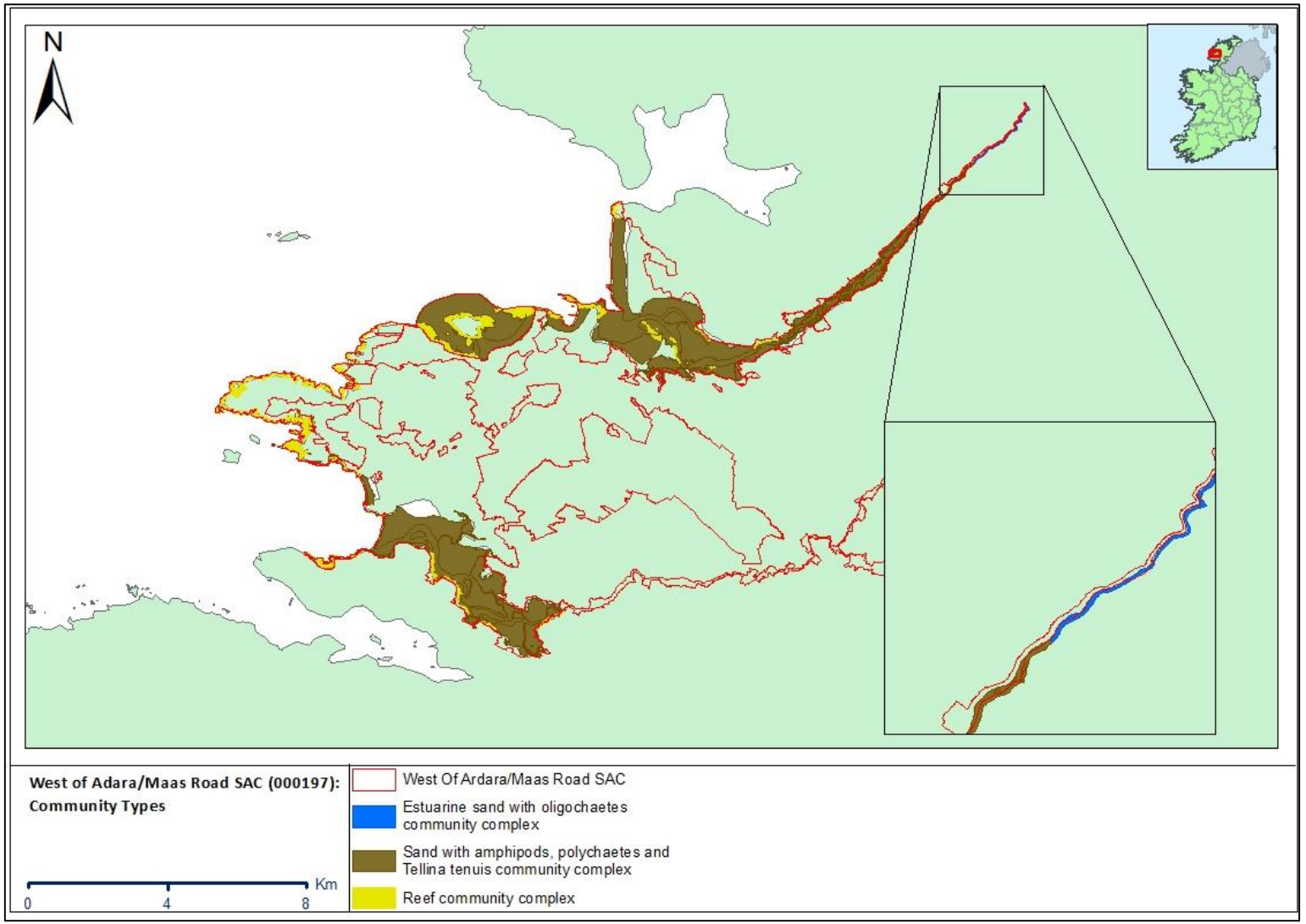

Figure 4-5 - Principal benthic communities recorded within the marine Annex I qualifying interests of the West of Ardara/Maas Road SAC (NPWS 2015b).

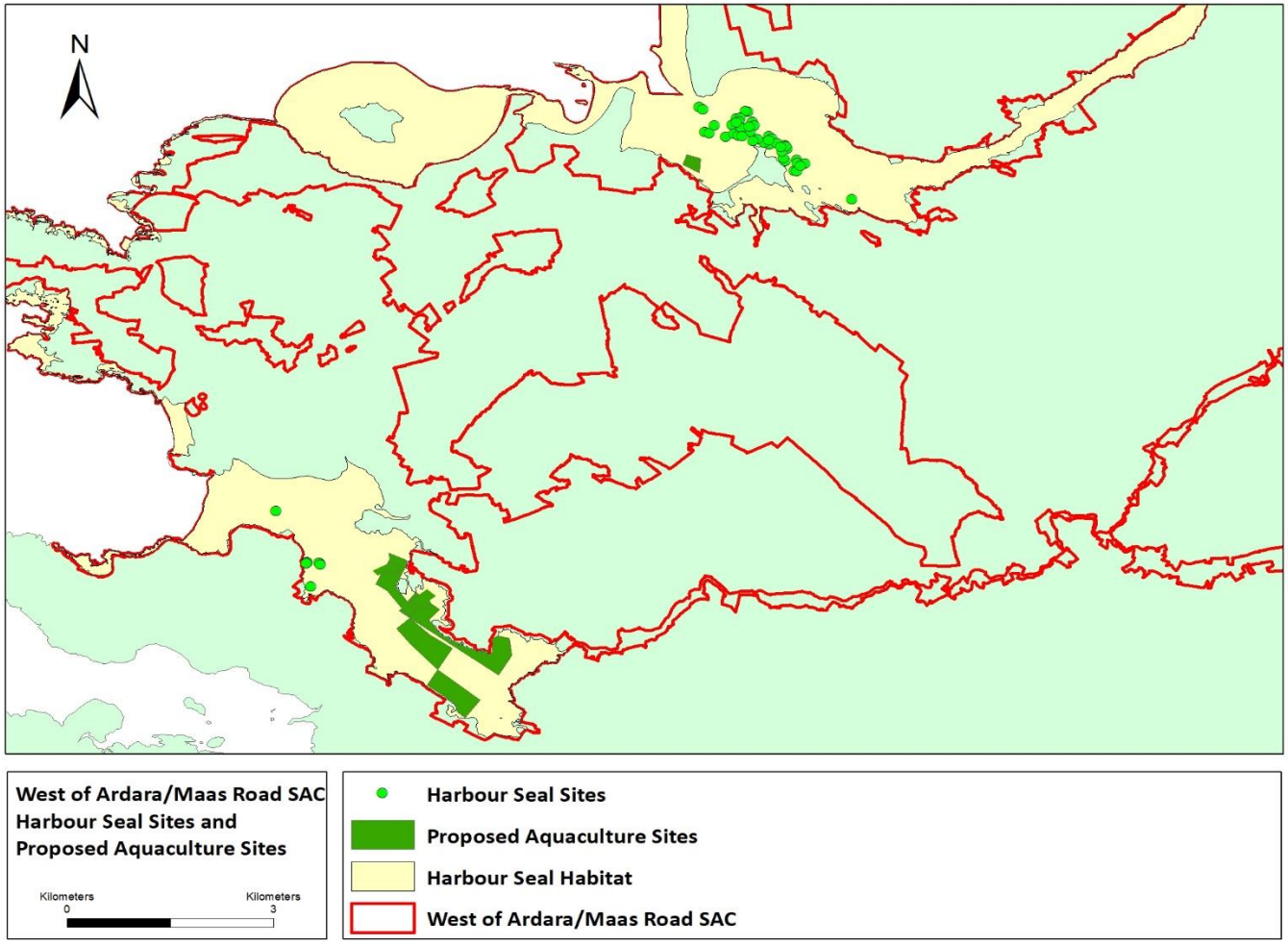

Figure 4-6 - Harbour Seal (*Phoca vitulina*) - Known haul-out sites in the West of Ardara/Maas Road SAC (NPWS 2015b).

Table 4.1 - The community types recorded in West Ardara/Maas Road SAC and their occurrence in the Annex I habitats for which the site is designated (NPWS 2015a).

Community Types	Annex I Habitats		
	Estuaries (1130)	Mudflats and sandflats not covered by seawater at low tide (1140)	Large shallow inlets and bays (1160)
Sand with amphipods, polychaetes and *Tellina tenuis* community complex.	✓	✓	✓
Estuarine sand with oligochaetes community complex	✓		
Reef community complex			✓

4.3 CONSERVATION OBJECTIVES FOR THE WEST OF ARDARA/MAAS ROAD SAC

The conservation objectives for the qualifying interests (SAC) were identified in NPWS (2015a). The natural condition of the designated features should be preserved with respect to their area, distribution, extent and community distribution. Habitat availability should be maintained for designated species and human disturbance should not adversely affect such species. The features, objectives and targets of each of the qualifying interests within the SAC are listed in **Table 4.2** below.

Table 4.2 - Conservation objectives and targets for habitats and species in the West of Ardara/Maas Road SAC (NPWS 2015a, 2015b, 2015c). Annex I and II features listed in **bold**.

Feature (Community Type)	Objective	Target(s)
[1130] Estuaries	Maintain favourable conservation condition	1,530ha; 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
Sand with amphipods, polychaetes and *Tellina tenuis* community complex.	Maintain favourable conservation condition	1,455ha; 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
Estuarine sand with oligochaetes community complex	Maintain favourable conservation condition	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
[1140] Tidal Mudflats and Sandflats	Maintain favourable conservation condition	1,259ha; Targets are identified that focus on a wide range of

Feature (Community Type)	Objective	Target(s)
		attributes with the ultimate goal of maintaining function and diversity of favourable species and managing levels of negative species
Sand with amphipods, polychaetes and *Tellina tenuis* community complex.	Maintain favourable conservation condition	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
[1160] Large Shallow Inlets and Bays	Maintain favourable conservation condition	688ha; 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
Sand with amphipods, polychaetes and *Tellina tenuis* community complex.	Maintain favourable conservation condition	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
Reef community complex	Maintain favourable conservation condition	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
[1330] Atlantic Salt Meadows (*Glauco-Puccinellietalia maritimae*)	Maintain favourable conservation condition	Two sub-sites that supported Atlantic Salt Meadow habitat mapped (15.57ha). A further 16.84ha of potential mapped habitat from two unsurveyed sub-sites were also mapped giving a total estimated area of 32.01ha (n.b. further unsurveyed areas may be present within the SAC); 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.
[1410] Mediterranean Salt Meadows (*Juncetalia maritimi*)	Maintain favourable conservation condition	Two subsites that support Mediterranean salt meadow were mapped (33.01ha). A further 14.39ha of potential habitat from two unsurveyed sub-sites were also mapped giving a total estimated area of 47.41ha (n.b. further unsurveyed areas may be

Feature (Community Type)	Objective	Target(s)
		present within the SAC); 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.
Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120)	Maintain favourable conservation condition	Habitat was recorded from four sub-sites, giving a total estimated area of 19.62ha. Habitat is very difficult to measure in view of its dynamic nature. 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.
[2130] Fixed Dunes (Grey Dunes)*	Maintain favourable conservation condition	Habitat was recorded from four sub-sites, giving a total estimated area of 408.64ha. 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.
[2140] Decalcified *Empetrum* Dunes*	Maintain favourable conservation condition	0.75ha; Habitat recorded at one subsite. Current status of habitat in Ireland is unclear and is under review.
[2150] Decalcified Dune Heath*	Maintain favourable conservation condition	10.20ha; Habitat is very difficult to measure in view of its dynamic nature. 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.
[2170] Dunes with Creeping Willow	Maintain favourable conservation condition	Habitat was recorded from one sub-site by giving a total estimated area of 2.50ha (n.b. additional unsurveyed areas may be present); 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.
[2190] Humid Dune Slacks	Maintain favourable conservation condition	Habitat was recorded from one sub-site giving a total estimated

Feature (Community Type)	Objective	Target(s)
		area of 12.31ha. 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.
[21A0] Machairs*	Maintain favourable conservation condition	Habitat was recorded from four sub-sites, giving a total estimated area of 88.58ha. Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[3110] Oligotrophic Waters containing very few minerals	Maintain favourable conservation condition	The selection of the SAC for habitat 3110 was based on the occurrence of numerous small to medium sized lakes surrounded by blanket bog, however, it is possible that habitat 3110 occurs elsewhere within the SAC; Targets relate to maintaining population densities and overall habitat quality (e.g. hydrological conditions), and managing levels of negative species.
[4010] Wet Heath	Maintain favourable conservation condition	Total area of this habitat has not been calculated, although it is known to be distributed throughout the SAC, usually occurring in mosaic with other habitats; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species, maintaining soil quality and composition.
[4030] Dry Heath	Maintain favourable conservation condition	Total area of this habitat has not been calculated, although it is known to be distributed throughout the SAC, usually occurring in mosaic with other habitats; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative

Feature (Community Type)	Objective	Target(s)
		species, maintaining soil quality and composition.
[4060] Alpine and Subalpine Heath	Maintain favourable conservation condition	Total area of this habitat has not been calculated. It occurs in mosaic with other habitats, including other heath habitats (4010, 4030), rocky outcrops and *Juniperus communis* formations on heaths or calcareous grasslands (5130). Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species, maintaining soil quality and composition.
[5130] Juniper Scrub	Maintain favourable conservation condition	Total area of this habitat has not been calculated; habitat usually occurs in mosaic with other habitats; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[6210] Orchid-rich Calcareous Grassland*	Maintain favourable conservation condition	The full extent of this habitat has not been mapped in detail in the SAC and thus the total area of the qualifying habitat is unknown. Very small fragmented areas recorded in association with other habitats in the SAC such as other grasslands, heath and sand dunes; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[6410] *Molinia* Meadows	Maintain favourable conservation condition	The full extent of this habitat has not been mapped in detail in the SAC and thus the total area of the qualifying habitat is unknown. Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing

Feature (Community Type)	Objective	Target(s)
		levels of negative species and maintaining soil quality and composition.
[6510] Lowland Hay Meadows	Maintain favourable conservation condition	Small number of species rich meadows that are cut for hay. Further work is required to establish the nature and extent of the Annex I habitat in the SAC, including the requirement for management by mowing; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[7130] Blanket Bogs (Active)*	Maintain favourable conservation condition	Blanket bogs have not been mapped in detail for this SAC and thus total area of the qualifying habitat is unknown. It occurs in mosaic with other habitats, including heath habitats (4010, 4030), saltmarshes (1330, 1410) and rocky outcrops; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[7150] Rhynchosporion Vegetation	Maintain favourable conservation condition	Depressions on peat substrates of the Rhynchosporion has not been mapped in detail for this SAC and thus total area of the qualifying habitat is unknown. It overlaps with blanket bogs (7130).; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition
[7230] Alkaline Fens	Maintain favourable conservation condition	The full extent of this fen habitat within the SAC is currently unknown. The main area occurs in the vicinity of Sheskinmore Lough where it grades into other habitats such as Machairs (21A0) (n.b.

Feature (Community Type)	Objective	Target(s)
		there may be other areas of Alkaline fen within the SAC); Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[1013] Geyer's Whorl Snail (*Vertigo geyeri*)	Maintain favourable conservation condition	There is one known site for this species in this SAC and targets relate to maintaining adult and sub-adult densities and overall habitat quality.
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)	Maintain favourable conservation condition	The conservation objective applies to the Owenea freshwater pearl mussel population. Mussels were found in the Stracashel tributary in 2012, however further survey is required to map the species' distribution in that river. Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[1065] Marsh Fritillary (*Euphydryas aurinia*)	Maintain favourable conservation condition	The mapped distribution 1995-2014 shows records from five of the six hectares that overlap this SAC (B70, B80, G69, G79, G89). There have been confirmed records since 2010 from three 1km squares in the SAC, G8393, G6895 and G6995 but there are considered to be other occupied and undocumented sites; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function and diversity of favourable species, managing levels of negative species and maintaining soil quality and composition.
[1106] Atlantic Salmon (*Salmo salar*)	Maintain favourable conservation condition	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas. There are a number of

Feature (Community Type)	Objective	Target(s)
		natural barriers to salmon migration on the Gweebarra river; Targets are identified that focus on a wide range of attributes with the ultimate goal of maintaining function of the species, managing levels of negative parasites and maintaining water quality.
[1355] Otter (*Lutra lutra*)	Maintain favourable conservation condition	Maintain distribution - 88% positive survey sites.
[1365] Common (Harbour) Seal (*Phoca vitulina*)	Maintain favourable conservation condition	The range of use within the site should not be restricted by artificial barriers; all sites should be maintained in natural condition; human activities should occur at levels that do not adversely affect harbour seal population at the site

4.4 SCREENING OF ADJACENT NATURA 2000 SITES OR FOR *EX-SITU* EFFECTS

In addition to the West of Ardara/Maas Road SAC there are three other SAC sites proximate to the aquaculture activities; namely Rutland Island & Sound SAC, Slieve Tooey / Tormore Island/ Loughros Beg Bay SAC and Termon Strand SAC (**Figure 4.7 and 4.8**). In addition there are 6 SPAs considered proximate to the SAC. These are Derryveagh and Glendowan Mountains SPA, Illancrone and Inishkeeragh SPA, Inishkeel SPA, Lough Nillan Bog SPA, Roaninish SPA, Sheskinmore Lough SPA, West Donegal Coast SPA and West Donegal Islands SPA (Figure 4-8). The characteristic features of these sites are identified in **Table 4.3** where a preliminary screening is carried out on the likely interaction with aquaculture activities based primarily upon the likelihood of spatial overlap. With the exception of *Phoca vitulina* (Common Seal) (designated for Rutland Island & Sound SAC), *Lutra lutra* (Otter) and *Halichoerus grypus* (Grey Seal) (which are designated species for the Slieve Tooey / Tormore Island / Loughros Beg Bay SAC),it was deemed that there are no *ex-situ* effects and therefore, all qualifying features of the adjacent SACs sites were screened out. The conservation objectives for habitats and species for which the Rutland Island & Sound SAC, Slieve Tooey/ Tormore Island/ Loughros Beg Bay SAC and Termon Strand are designated are detailed in NPWS 2013a, 2013b, 2013c, 2015d, 2015e, 2015f, 2015g.

It was concluded that the Otter, Common Seal, and Grey Seal may migrate from adjacent SAC into the West of Ardara/Maas Road SAC and could interact with aquaculture activities; on this basis these species were included as a feature in the Appropriate Assessment of aquaculture activities - i.e. carried forward to **Sections 8.4, 8.5 and 8.7.**

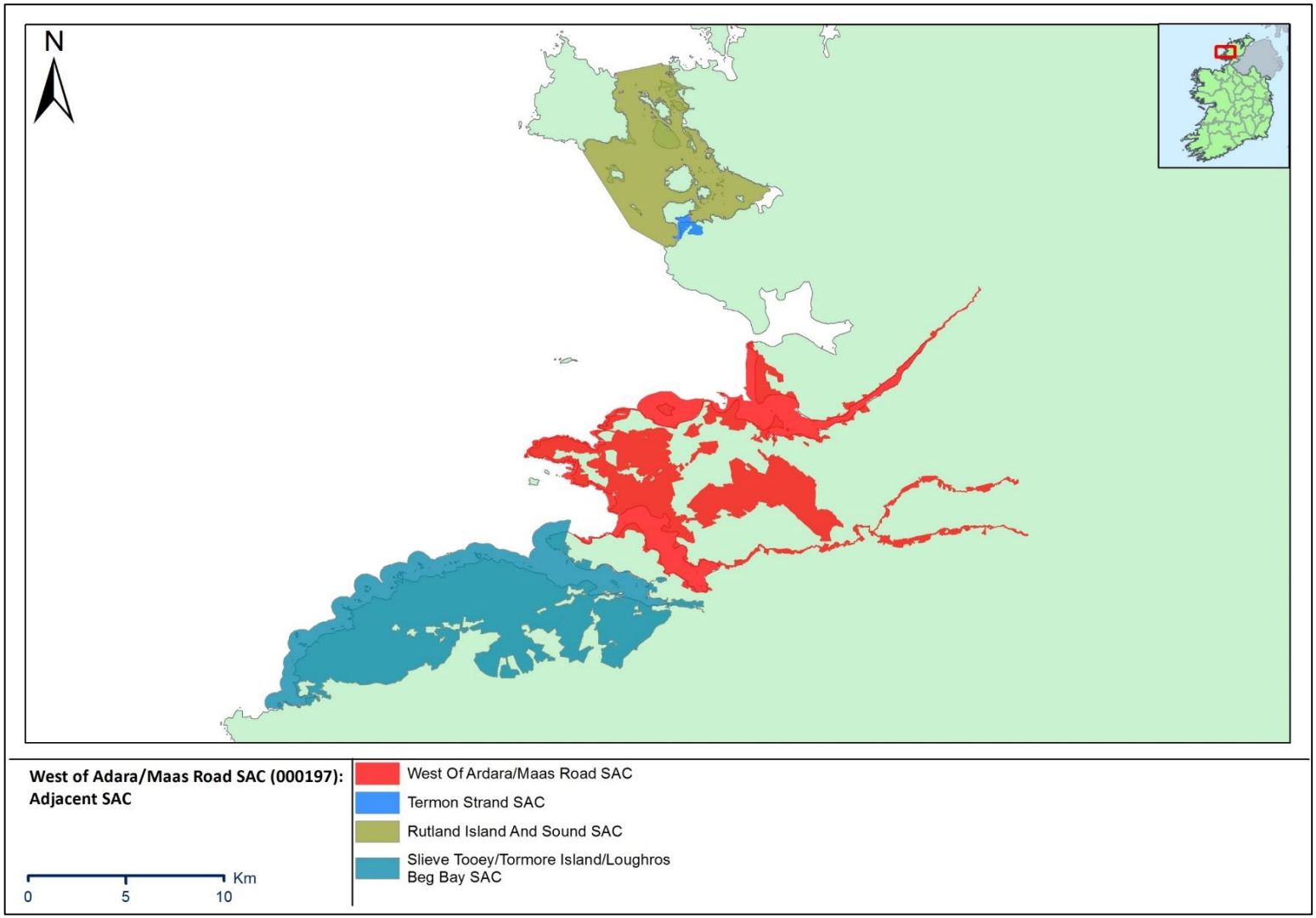

Figure 4-7 – SACs adjacent to the West of Ardara/Maas Road SAC.

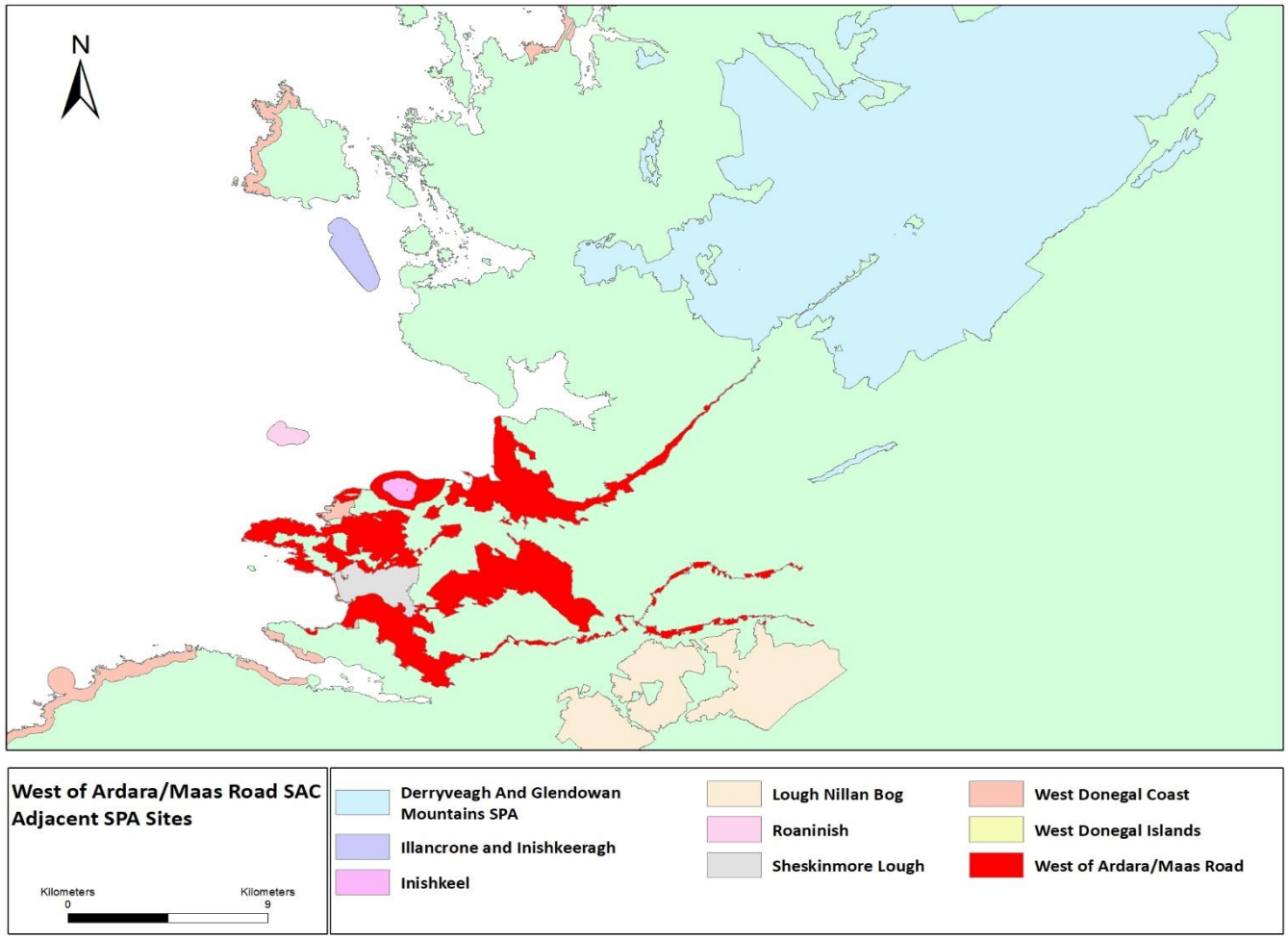

Figure 4-8 SPAs adjacent to the West of Ardara/Maas Road SAC.

Table 4.3 – SAC and SPA sites adjacent to the West of Ardara/Maas Road SAC and qualifying features with initial screening assessment on likely interactions with aquaculture activities. * denotes priority habitat.

Natura site	Qualifying features (habitat/species code)	Aquaculture initial screening
Rutland Island & Sound SAC (002283)	Coastal lagoons [1150]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Large shallow inlets and bays [1160]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Reefs [1170]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Annual vegetation of drift lines [1210]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Embryonic shifting dunes [2110]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Humid dune slacks [2190]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Phoca vitulina (Common Seal) [1365]	**Common Seal may migrate into the West of Ardara/Maas Road SAC and could interact with aquaculture activities – carry forward to Section 8.**
Slieve Tooey / Tormore Island / Loughros Beg Bay SAC (Site code; 000190)	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Embryonic shifting dunes [2110]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Decalcified fixed dunes with *Empetrum nigrum* [2140]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.

Natura site	Qualifying features (habitat/species code)	Aquaculture initial screening
	Alpine and Boreal heaths [4060]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Blanket bogs (* if active bog) [7130]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Vertigo angustior (Narrow-mouthed Whorl Snail) [1014]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
	Lutra lutra (Otter) [1355]	**Otter may migrate into the West of Ardara/Maas Road SAC and could interact with aquaculture activities – carry forward to Section 8.**
	Halichoerus grypus (Grey Seal) [1364]	**Grey seal may migrate into the West of Ardara/Maas Road SAC and could interact with aquaculture activities – carry forward to Section 8. .**
Termon Strand SAC (Site code; 001195)	Coastal Lagoons [1150]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
Derryveagh and Glendowan Mountains SPA (004039)	Red-throated Diver (*Gavia stellata*) [A001] Merlin (*Falco columbarius*) [A098] Peregrine (*Falco peregrinus*) [A103] Golden Plover (*Pluvialis apricaria*) [A140] Dunlin (*Calidris alpina schinzii*) [A466]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
Illancrone and Inishkeeragh SPA (004132)	Barnacle Goose (*Branta leucopsis)* [A045] Common Tern *(Sterna hirundo)* [A193] Arctic Tern (*Sterna paradisaea*) [A194] Little Tern (*Sterna albifrons*) [A195]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
Inishkeel SPA (004116)	Barnacle Goose (*Branta leucopsis)* [A045]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
Lough Nillan Bog SPA (004110)	Merlin (*Falco columbarius*) [A098] Golden Plover (*Pluvialis apricaria*) [A140] Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] Dunlin (*Calidris alpina schinzii)* [A466]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.

Natura site	Qualifying features (habitat/species code)	Aquaculture initial screening
Roaninish SPA (004121)	Barnacle Goose (*Branta leucopsis*) [A045] Herring Gull (*Larus argentatus*) [A184]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
Sheskinmore Lough SPA (004090)	Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395]	Loughros Mór Bay has been observed to the be used by Greenland W-F Goose from Sheskinmore Lough SPA. Carry forward for further assessment.
West Donegal Coast SPA (004150)	Fulmar (*Fulmarus glacialis*) [A009] Cormorant (*Phalacrocorax carbo*) [A017] Shag (*Phalacrocorax aristotelis*) [A018] Peregrine (*Falco peregrinus*) [A103] Herring Gull (*Larus argentatus*) [A184] Kittiwake (*Rissa tridactyla*) [A188] Razorbill (*Alca torda*) [A200] Chough (*Pyrrhocorax pyrrhocorax*) [A346]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.
West Donegal Islands SPA (004230)	Shag (*Phalacrocorax aristotelis)* [A018] Barnacle Goose (*Branta leucopsis*) [A045] Corncrake (*Crex crex*) [A122] Common Gull (*Larus canus*) [A182] Herring Gull (*Larus argentatus*) [A184]	No spatial overlap or likely interactions with aquaculture activities within the West of Ardara/Maas Road SAC – excluded from further analysis.

5 DETAILS OF THE PROPOSED PLANS AND PROJECTS

5.1 DESCRIPTION OF AQUACULTURE ACTIVITIES

Currently there are no aquaculture activities occurring within the SAC, however, there are six active applications for shellfish cultivation within Loughros Mór Bay and two in Gweebara Bay and fall within the qualifying interests of 1130 Estuaries and 1140 Mudflat and sandflat not covered by seawater at low tide, for which the West of Ardara/Mass Road SAC is designated. The spatial extents of the proposed aquaculture activities within the qualifying interest were calculated using coordinates of activity areas in a GIS. The spatial extent of the cultivation activities overlapping the habitat features is presented in **Table 5.1** and presented graphically in **Figure 5.1** (data provided by DAFM). It should be noted that there is overlap among applications for aquaculture activities within this SAC, i.e., oyster culture overlaps clam culture operations. In this event, what we consider to be the most disturbing activity (i.e. clam culture) will take precedence in terms of quantification of impact.

5.1.1 Proposed Oyster Cultivation Activity

All oyster applicants are to use bag and trestles as the method of cultivating their oysters within the intertidal zone, either to half-grown or fully-grown size. The bag and trestle method uses steel table-like structures which rise from the shore to just above knee height on the middle to lower intertidal zone, arrayed in double rows with wide gaps between the paired rows to allow for access. Trestles used are made from steel and are typically 3 metres in length, are approximately 1 metre in width and stand between 0.5 and 0.7 metres high. The oyster farms will be positioned between mean Low Water Spring and mean Low Water Neap, allowing on average between 2 and 5 hours exposure depending on location, tidal and weather conditions. Seed will be sourced from France Nissian. There will be both diploid and triploid (if available) seed used on site. The trestles will hold six HDPE mesh bags approximately 1m by 0.5m by 10cm, using rubber and wire clips to close the mesh bags and to fasten them to the trestles. As the oysters grow, they will be taken to the handling / sorting facility twice per year for grading and re-packing, and returned to the trestles. In the final stage they will be 'hardened' in the upper intertidal area, before removal, grading, bagging and delivery.

5.1.2 Clam Culture

Clams are to be grown in two intertidal sites in Loughrous Mór using tray mesh containers and on the seabed in clam parks under mesh. They are grown under netting, which is 25m x 2m, with 5mm x 5mm mesh size.

The seed is usually obtained in spring, April. Seed will be sourced from Lissadell hatchery Co. Sligo at size 8mm – 12mm and grown in trays and bags for one year after which time they are sown on intertidal ground under mesh. The netting will be buried in the ground down around 10 cm and will be kept in place with rope that is stapled around the edges with steel hooks. The netting is usually changed once in the cycle when mesh size is also increased. They will reach harvestable market size around 3 years.

5.1.3 Access Routes

Tractors and trailers will be used to access the cultivation sites at inner Loughros Mór Bay. All access activities will be confined to designated access routes. The routes proposed are presented in Figure 5.2. The extent of the access routes (area) is calculated by multiplying the linear measure of the routes by a putative width of 10m which is considered sufficiently conservative.

Table 5.1 - Spatial extent of proposed aquaculture activities in West of Ardara/Maas Road SAC overlapping (A) with the qualifying interests (1130 Estuaries), and (B) with the qualifying interest (1140 - Mudflats and sandflats not covered by seawater at low tide).

		Estuaries (1130) (1530ha)	
Culture Type	**No. of Licence Applications**	**Area (ha)**	**% Qualifying Interest 1130**
Oysters	6	105.44	6.9
Clams	2	9.69	0.63
Access Routes	-	2.49	0.016
Total		**117.62**	**7.69**

B.		Mudflats and sandflats not covered by seawater at low tide (1140) (1259ha)	
Culture Type	**No. of Licence Applications**	**Area (ha)**	**% Qualifying Interest 1130**
Oysters	6	95.7	7.6
Clams	2	9.54	0.76
Access Routes	-	2.49	0.02
Total		**107.73**	**8.38**

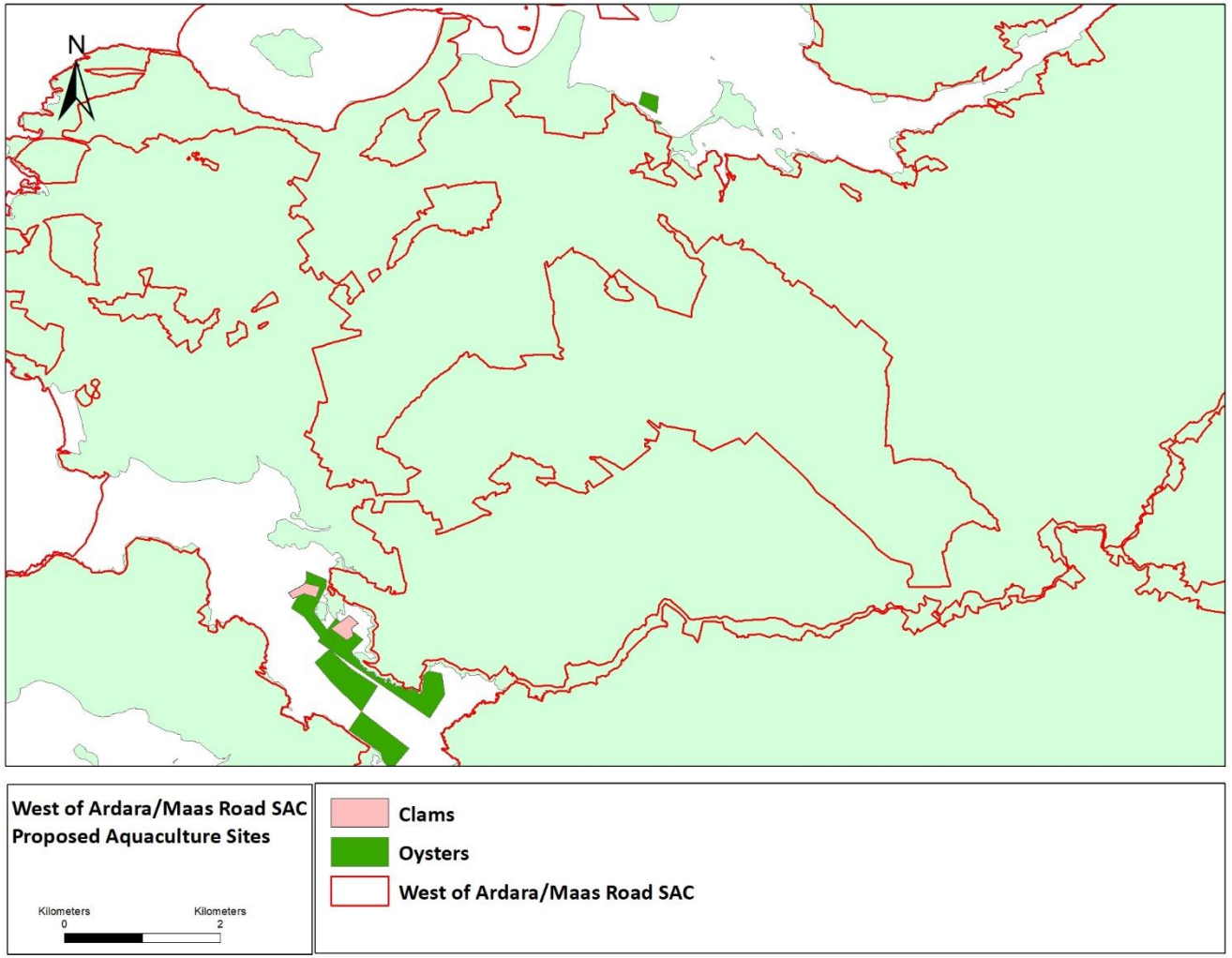

Figure 5-1 - Aquaculture site applications in the West of Ardara/Maas Road SAC.

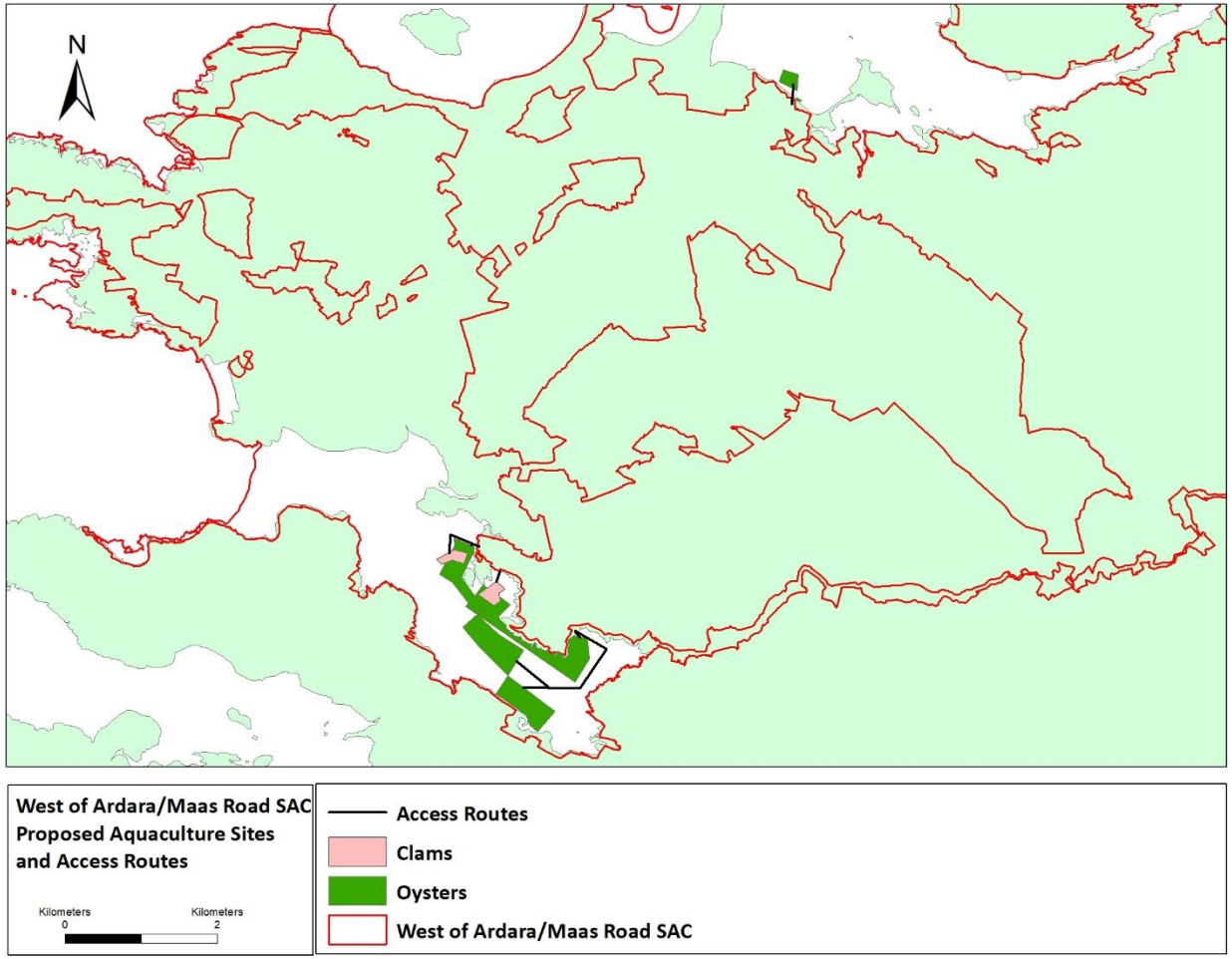

Figure 5-2 Proposed access routes to proposed aquaculture sites in the West of Ardara/Maas Road SAC.

6 NATURA IMPACT STATEMENT FOR THE PROPOSED ACTIVITIES

The potential ecological effects of activities on the conservation objectives for the site relate to the physical and biological effects of fishing gears, aquaculture cultivation structures and activities on designated species, intertidal habitats and invertebrate communities and biotopes within those broad habitat types. The overall effect on the conservation status will depend on the spatial and temporal extent of fishing and aquaculture activities during the lifetime of the proposed plans and projects and the nature of each of these activities in conjunction with the sensitivity of the receiving environment.

6.1 AQUACULTURE

Current aquaculture applications within the West of Ardara/Maas Road SAC relate to the cultivation of the Pacific oyster *C. gigas* in bags and trestles and culture of the Manila clam (*Ruditapes philippinarum*) using a combination of trays (during the nursery phase) and netting on the seafloor for grow-out. All culture activities will occur in intertidal area.

Details of the potential biological and physical effects of these aquaculture activities on the habitat features, their sources and the mechanism by which the impact may occur are summarised in **Table 6.1** below. The impact summaries identified in the table are derived from published primary literature and review documents that have specifically focused upon the environmental interactions of mariculture (e.g. Black 2001; McKindsey et al 2007; NRC 2010; O'Beirn et al 2012; Cranford et al 2012; ABPMer 2013a-h).

Filter feeding organisms, for the most part, feed at the lowest trophic level, usually relying primarily on ingestion of phytoplankton. The process is extractive in that it does not rely on the input of feedstuffs in order to produce growth. Suspension feeding bivalves such as oysters and mussels can modify their filtration to account for increasing loads of suspended matter in the water and can increase the production of faeces and pseudofaeces (non-ingested material) which result in the transfer of both organic and inorganic particles to the seafloor. This process is a component of benthic-pelagic coupling. The degree of deposition and accumulation of biologically derived material on the seafloor is a function of a number of factors discussed below.

One aspect to consider in relation to the culture of shellfish is the potential risk of alien species arriving into an area among consignments of seed or stock sourced from outside of the area under consideration. When the seed is sourced locally (e.g. mussel culture) the risk is likely zero. When seed is sourced at a small size from hatcheries in Ireland the risk is also small. When seed is sourced from hatcheries outside of Ireland (this represents the majority of cases particularly for oyster culture operations) the risk is also considered small, especially if the nursery phase has been short. When ½-grown stock (oysters and mussels) is introduced from another area (e.g. France, UK) the risk of introducing alien species (hitchhikers) is considered greater given that the stock will have been grown in the wild (open water) for a prolonged period (i.e. ½-grown stock).

Furthermore, the culture of a non-native species (e.g. the Pacific Oyster – *C. gigas*) may also present a risk of establishment of this species in the SAC. Recruitment of *C. gigas* has been documented in a number of bays in Ireland and appears to have become naturalised (i.e. establishment of a breeding population) in two locations (Kochmann et al 2012; 2013) and may compete with the native species for space and food.

The culture of another non-native species (e.g. Manila clams) may present a risk of establishment of this species in the SAC. It should be noted, however, that this taxa (*Ruditapes philippinarum*), as is the Pacific oyster, is exempted under Annex IV of the 'COUNCIL REGULATION (EC) No. 708/2007

concerning use of alien and locally absent species in aquaculture', and therefore is not subject to a full environmental risk assessment (Article 9/Annex 2) to identify the risk of escape, reproduction and/or naturalisation of this species. Hence the need to consider any risk in this document. Furthermore, this clam species has been in culture in Ireland since 1984 and, to the best of our knowledge, no recruitment in the wild has been recorded. Any operations would be solely reliant on hatchery seed and are fully contained at all stages of the production cycle. The risk of naturalisation of this species is therefore, considered low, at this time.

Oysters are typically cultured in the intertidal zone using a combination of plastic mesh bags and trestles. Their specific location in the intertidal is dependent upon the level of exposure of the site, the stage of culture and the accessibility of the site. Any habitat impact from oyster trestle culture is typically localised to areas directly beneath the culture systems. The physical presence of the trestles and bags may reduce water flow and allowing suspended material (silt, clay as well as faeces and pseudo-faeces) to fall out of suspension to the seafloor. The build-up of material will typically occur directly beneath the trestle structures and can result in accumulation of fine, organically rich sediments. These sediments may result in the development of infaunal communities distinct from the surrounding areas. Similar to suspended culture above, whether material accumulates beneath oyster trestles is dictated by a number of factors, including:

- Hydrography – low current speeds (or small tidal range) may result in material being deposited directly beneath the trestles. If tidal height is high and large volumes of water moved through the culture area an acceleration of water flow can occur beneath the trestles and bags, resulting in a scouring effect or erosion and no accumulation of material.

- Turbidity of water – as with suspended mussel culture, oysters have very plastic response to increasing suspended matter in the water column with a consequent increase in faecal or pseudo-faecal production. Oysters can be cultured in estuarine areas (given their polyhaline tolerance) and as a consequence can be exposed to elevated levels of suspended matter. If currents in the vicinity are generally low, elevated suspended matter can result in increased build-up of material beneath culture structures.

- Density of culture – the density of oysters in a bag and consequently the density of bags on a trestle will increase the likelihood of accumulation on the seafloor. In addition, if the trestles are located in close proximity a greater dampening effect can be realised with resultant accumulations. Close proximity may also result in impact on shellfish performance due to competitive interactions for food.

- Exposure of sites - the degree to which the aquaculture sites are exposed to prevailing weather conditions will also dictate the level of accumulated organic material in the area. As fronts move through culture areas increased wave action will resuspend and disperse material away from the trestles.

Shading may also be an issue as a consequence of the structures associated with intertidal oyster culture and impact on sensitive species (e.g. sea grasses) found underneath (Skinner et al., 2014).

The structures used for the culture of shellfish (subtidal and intertidal) may facilitate the introduction and establishment of some non-native species. For example, the sea squirt, *Didemnum vexillum*, has been recorded on aquaculture structures (trestles) in Galway Bay (NPWS 2014 - unpublished report) and Clew Bay. This invasive species has been implicated in harm to habitats and species (Valentine et al., 2007) in addition to aquaculture activities, particularly at earlier culture stages (e.g., Fletcher et al., 2013). This species can extend from structures to hard substrates (seabed habitats) and potentially occlude other species. The movement of shellfish stock may facilitate the spread of this species.

Seeding and dredging of clams from the intertidal sand flat may lead to changes in the sediment and benthic communities in this area. The high density of the culture organisms can lead to exclusion of native biota and the ground preparation and harvest methods (by mechanical means or by hand) can lead to considerable disturbance of biota characterising the habitat. Plots covered by meshes in fine sedimentary substrates can lead to localized sedimentation and an increase in the organic content of the sediment (Spencer et al. 1997, 1998).

Activities associated with the culture of intertidal shellfish include the travel to and from the culture sites and within the culture sites using tractors and trailers as well as the activities of workers within the site boundaries. Physical disturbance is caused by compaction of sediment from foot traffic and vehicular traffic.

Other considerations: Due to the nature of the (high density) of shellfish culture methods the risk of transmission of disease within cultured stock is high. However, given that *C. gigas* does not appear to occur in the wild the risk of disease transmission to 'wild' stock is considered low. The risk of disease transmission from cultured oysters to other species is unknown.

Table 6.1 - Potential indicative environmental pressures of aquaculture activities within the qualifying interest of Estuaries (1130) within the West of Ardara/Maas Road SAC.

CULTURE METHOD	PRESSURE CATEGORY	PRESSURE	POTENTIAL EFFECTS	EQUIPMENT	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY/EFFECTS
Shellfish Culture (Oysters and Clams)	**Biological**	Deposition	Faecal and pseudofaecal deposition on seabed potentially altering sediment and community composition		365	All year	Hydrography, Turbidity, Culture/structure density
		Seston filtration	Alteration of phyto/zooplankton communities and potential impact on carrying capacity		365	All year	Culture density, Turbidity
		Shading	Prevention of light penetration to seabed potentially impacting light sensitive species		365	All year	Culture/structure density
		Introduction of non-native species	Potential for non-native culture and 'hitchhiker' species to become naturalized. Potential for structures to act as habitat for non-native species.				Screening/ Culture method/ Introduce biosecurity plan/seed from low-risk sources
		Disease risk	Potential for disease introduction and uncontrolled spread				Screening/ Introduce biosecurity plan
	Physical	Current alteration	Structures may alter the current regime resulting in increased deposition of fines or scouring therefore changing sedimentary composition	Bags, Trestles, Netting etc	365	All year	Culture/structure density
		Surface disturbance	Ancillary activities at sites increase the risk of sediment compaction resulting in sediment changes and associated community changes.	Site services, human & vehicular traffic			
		Shading	Structures prevent light penetration to the seabed and therefore potentially impact on light sensitive species	Bags, Trestles etc	365	All year	Culture/structure density

7 SCREENING OF AQUACULTURE ACTIVITIES

A screening assessment is an initial evaluation of the possible impacts that activities (existing and/or proposed) may have on the qualifying interests. The screening, is a filter, which may lead to exclusion of certain activities or qualifying interests from appropriate assessment proper, thereby simplifying the assessments, if this can be justified unambiguously using limited and clear cut criteria. Screening is a conservative filter that minimises the risk of false negatives.

In this assessment, screening of the qualifying interests against the proposed activities is based primarily on spatial overlap i.e. if the qualifying interests overlap spatially with the proposed activities then significant impacts due to these activities on the conservation objectives for the qualifying interests is not discounted (not screened out) except where there is absolute and clear rationale for doing so. Therefore, if there is no spatial overlap identified and no obvious interaction is likely to occur between the proposed activity and the qualifying feature, then the possibility of significant impact is discounted and further assessment of possible effects is deemed not to be necessary.

Therefore, on the basis of the criteria identified above, the following habitats and species are excluded from further consideration of aquaculture interactions:

- [1160] Large Shallow Inlets and Bays
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [2120] Marram Dunes (White Dunes)
- [2130] Fixed Dunes (Grey Dunes)*
- [2140] Decalcified *Empetrum* Dunes*
- [2150] Decalcified Dune Heath*
- [2170] Dunes with Creeping Willow
- [2190] Humid Dune Slacks
- [21A0] Machairs*
- [3110] Oligotrophic Waters containing very few minerals
- [4010] Wet Heath
- [4030] Dry Heath
- [4060] Alpine and Subalpine Heath
- [5130] Juniper Scrub
- [6210] Orchid-rich Calcareous Grassland*
- [6410] *Molinia* Meadows
- [6510] Lowland Hay Meadows
- [7130] Blanket Bogs (Active)*
- [7150] Rhynchosporion Vegetation
- [7230] Alkaline Fens
- [1013] Geyer's Whorl Snail (*Vertigo geyeri*)
- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1065] Marsh Fritillary (*Euphydryas aurinia*)
- [1395] Petalwort (*Petalophyllum ralfsii*)
- [1833] Slender Naiad (Najas flexilis)

Furthermore, of the two marine community types (see **Table 4.1**) listed under the habitat features of Estuaries (1130), one (i.e. Estuarine sand with oligochaetes community complex) has no spatial

overlap with any aquaculture activities. On this basis, the community type is excluded from further analysis of aquaculture interactions.

When overlap between aquaculture activity and a community habitat type and/or a feature of interest was observed it was quantified in a GIS application and presented on the basis of coverage of specific activity (representing different pressure types), intersecting with designated conservation features and/or sub-features (community types). **Table 5.1** highlights the spatial overlap between proposed aquaculture activities and qualifying habitat feature of Estuaries (1130) and Mudflats and sandflats not covered by seawater at low tide (1140) while **Table 7.1** below provides an overview of overlap of aquaculture activities and specific marine community type of Sand with amphipods, polychaetes and *Tellina tenuis* community complex (identified from Conservation Objectives (i.e. NPWS 2014a)) within the broad habitat feature 1130. A full assessment (see **Section 8**) was carried out on the likely interactions of aquaculture activities with the community type of Sand with amphipods, polychaetes and *Tellina tenuis* community complex.

Given the wide spatial distribution of Otter (*Lutra lutra* [1355]), Atlantic Salmon (*Salmo salar* [1106]) and Common (Harbour) Seal (*Phoca vitulina* [1365]) within the West of Ardara/Maas Road SAC it is possible the species may interact with aquaculture activities. Consequently, a full assessment was carried out on the likely interactions (see **Section 8**).

Table 7.1 Maximum habitat overlap i.e. spatial overlap in hectares and percentage of proposed aquaculture activities over the community type of Sand with amphipods, polychaetes and *Tellina tenuis* community complex within the qualifying interest 1130 Estuaries and 1140 Mudflats and sandflat not covered by seawater at low tide in the West of Ardara/Maas Road SAC. Spatial data based on licence database provided by DAFM. Habitat data provided in NPWS 2015b.

Culture Type	No. of Licence Applications	Marine Community Type (MCT) Sand with amphipods, polychaetes and *Tellina tenuis* community complex (1455ha)	
		Area (ha)	% MCT
Oysters	6	105.44	7.25
Clams	2	9.69	0.66
Access Routes		2.49	0.017
Total		**117.62**	**7.91**

8 ASSESSMENT OF AQUACULTURE ACTIVITIES

8.1 DETERMINING SIGNIFICANCE

The significance of the possible effects of the proposed activities on habitats, as outlined in the Natura Impact Statement (**Section 6**) and subsequent screening exercise (**Section 7**), is determined here in the assessment. The significance of effects is determined on the basis of Conservation Objective guidance for qualifying habitats and constituent habitats and species (**Figures 4.2**, **4.3** and NPWS 2015a, 2015b, 2015c).

Within the West of Ardara/Maas Road SAC the qualifying habitats/species considered subject to potential disturbance and therefore, carried further in this assessment are:

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Otter (*Lutra lutra* [1355]),
- Atlantic Salmon (*Salmo salar* [1106])
- Common (Harbour) Seal (*Phoca vitulina*) [1365])

For broad habitats and community types (**Figures 4.2, 4.3 and 4.5**) significance of impact is determined in relation to, first and foremost, spatial overlap (see **Section 7**; **Tables 7.1**). Subsequent disturbance and the persistence of disturbance are considered as follows:

1. The degree to which the activity will disturb the qualifying interest. By disturb is meant change in the characterising species, as listed in the Conservation Objective guidance (NPWS 2015b) for constituent communities. The likelihood of change depends on the sensitivity of the characterising species to the activities in question. Sensitivity results from a combination of intolerance to the activity and/or recoverability from the effects of the activity (see **Section 8.2** below).

2. The persistence of the disturbance in relation to the intolerance of the community. If the activities are persistent (high frequency, high intensity) and the receiving community has a high intolerance to the activity (i.e. the characterising species of the communities are sensitive and consequently impacted) then such communities could be said to be persistently disturbed.

3. The area of communities or proportion of populations disturbed. In the case of community disturbance (continuous or ongoing) of more than 15% of the community area it is deemed to be significant.

Effects will be deemed to be significant when cumulatively they lead to long term change (persistent disturbance) in broad habitat/features (or constituent communities) resulting in an impact greater than 15% of the area.

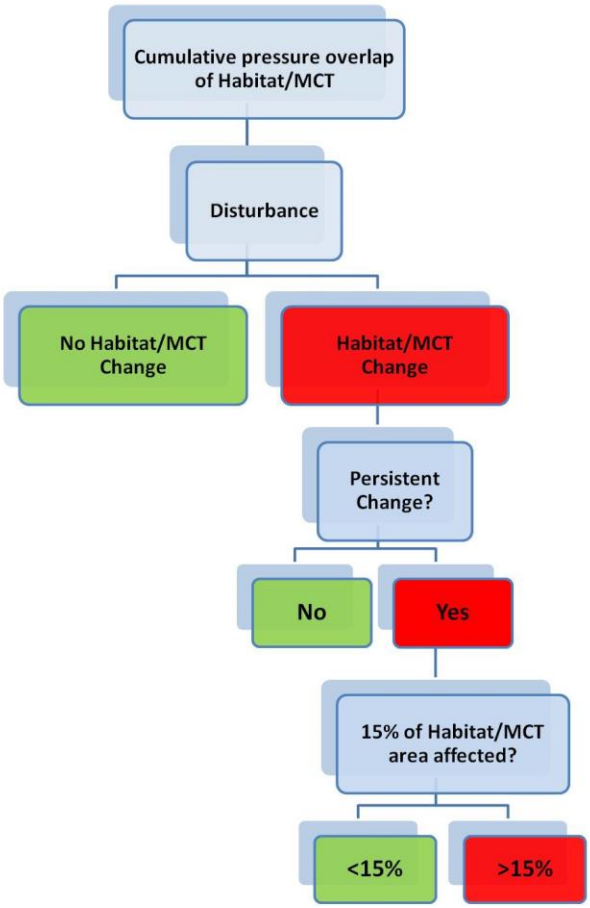

Figure 8-1 - Determination of significant effects on community distribution, structure and function for sedimentary habitats (following NPWS 2015b).

In relation to the designated species Otter (*Lutra lutra* [1355]), Atlantic Salmon (*Salmo salar* [1106]) and Common (Harbour) Seal (*Phoca vitulina* [1365]) the capacity of the populations to maintain themselves in the face of anthropogenic induced disturbance or mortality at the site will need to be taken into account in relation to the Conservation Objectives (COs) on a case by case basis.

8.2 SENSITIVITY AND ASSESSMENT RATIONALE

This assessment used a number of sources of information in assessing the sensitivity of the characterising species of each community recorded within the benthic habitats of the West of Ardara/Maas Road SAC. One source of information is a series of reviews commissioned by the Marine Institute which identify habitat and species sensitivity to a range of pressures likely to result from aquaculture and fishery activities (ABPMer 2013a-h). These reviews draw from the broader literature, including the MarLIN Sensitivity Assessment (Marlin.ac.uk) and the AMBI Sensitivity Scale (Borja et al 2000) and other primary literature. It must be noted that the authors of the Conservation Objectives, NPWS, have acknowledged that given the wide range of community types that can be found in marine environments, the application of conservation targets to these would be difficult (NPWS 2015b); therefore, NPWS have proposed broad community complexes as management units. These complexes (for the most part) are very broad in their description and do not have clear surrogates which might have been considered in targeted studies and thus reported in the scientific literature. On this basis, the confidence assigned to likely interactions of the community types with anthropogenic activities are by necessity relatively low, with the exception of community types dominated by sensitive taxa,

e.g. Maerl and *Zostera*. Other literature cited in the assessment does provide a greater degree of confidence in the conclusions. For example, the outputs of recent studies (Forde et al 2015; O'Carroll et al 2016) have provided greater confidence in terms of assessing likely interactions between intertidal oyster culture and marine habitats (De Grave et al 2008). Sensitivity of a species to a given pressure is the product of the intolerance (the susceptibility of the species to damage, or death, from an external factor) of the species to the particular pressure and the time taken for its subsequent recovery (recoverability is the ability to return to a state close to that which existed before the activity or event caused change). Life history and biological traits are important determinants of sensitivity of species to pressures from aquaculture.

In the case of species, communities and habitats of conservation interest, the separate components of sensitivity (intolerance, recoverability) are relevant in relation to the persistence of the pressure:

- For persistent pressures i.e. activities that occur frequently and throughout the year, recovery capacity may be of little relevance except for species/habitats that may have extremely rapid (days/weeks) recovery capacity or whose populations can reproduce and recruit in balance with population damage caused by aquaculture. In all but these cases and if sensitivity is moderate or high then the species/habitats may be negatively affected and will exist in a modified state. Such interactions between aquaculture and species/habitat/community represent persistent disturbance. They become significantly disturbing if more than 15% of the community is thus exposed (NPWS 2015b).

- In the case of episodic pressures i.e. activities that are seasonal or discrete in time both the intolerance and recovery components of sensitivity are relevant. If sensitivity is high but recoverability is also high relative to the frequency of application of the pressure then the species/habitat/community will be in favourable conservation status for at least a proportion of time.

The sensitivities of the community types (or surrogates) found within the West of Ardara/Maas Road SAC to pressures similar to those caused by aquaculture (e.g. smothering, organic enrichment and physical disturbance) are identified in **Table 8.1**. The sensitivities of species which are characteristic (as listed in the Conservation Objective supporting document) of benthic communities to pressures similar to those caused by aquaculture (e.g. smothering, organic enrichment and physical disturbance) are identified, where available, in **Table 8.2**. The following guidelines broadly underpin the analysis and conclusions of the species and habitat sensitivity assessment:

- Sensitivity of certain taxonomic groups such as emergent sessile epifauna to physical pressures is expected to be generally high or moderate because of their form and structure (Roberts et al 2010). Also high for those with large bodies and with fragile shells/structures, but low for those with smaller body size. Body size (Bergman and van Santbrink 2000) and fragility are regarded as indicative of a high intolerance to physical abrasion caused by fishing gears (i.e. dredges). However, even species with a high intolerance may not be sensitive to the disturbance if their recovery is rapid once the pressure has ceased.

- Sensitivity of certain taxonomic groups to increased sedimentation is expected to be low for species which live within the sediment, deposit and suspension feeders; and high for those sensitive to clogging of respiratory or feeding apparatus by silt or fine material.

- Recoverability of species depends on biological traits (Tillin et al 2006) such as reproductive capacity, recruitment rates and generation times. Species with high reproductive capacity,

short generation times, high mobility or dispersal capacity may maintain their populations even when faced with persistent pressures; but such environments may become dominated by these (r-selected) species. Slow recovery is correlated with slow growth rates, low fecundity, low and/or irregular recruitment, limited dispersal capacity and long generation times. Recoverability, as listed by MarLIN, assumes that the impacting factor has been removed or stopped and the habitat returned to a state capable of supporting the species or community in question. The recovery process is complex and therefore the recovery of one species does not signify that the associated biomass and functioning of the full ecosystem has recovered (Anand and Desrocher 2004) cited in Hall et al 2008).

8.3 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR HABITAT FEATURES IN THE WEST OF ARDARA/MAAS ROAD SAC.

Aquaculture pressures on a given habitat are related to vulnerability (spatial overlap or exposure of the habitat to the equipment/culture organism combined with the sensitivity of the habitat) to the pressures induced by culture activities. To this end, the location and orientation of structures associated with the culture organism, the density of culture organisms, the duration of the culture activity and the type of activity are all important considerations when considering risk of disturbance to habitats and species.

NPWS (2015a) provide lists of species characteristic of benthic communities that are defined in the Conservation Objectives. The species defined are typical of fine sedimentary intertidal habitats (tolerant of desiccation and physical stress). For the most part, these intertidal communities are typically impoverished with low numbers of species and overall abundances.

The constituent communities identified in the broad Annex 1 feature **1130 Estuaries** and **1140 Mudflats and sandflats not covered by seawater at low tide** are:

- Sand with amphipods, polychaetes and *Tellina tenuis* community complex
- Estuarine sand with oligochaetes community complex ***(No overlap with aquaculture)***

For qualifying features **1130** and **1140** there are a number of attributes (with associated targets) relating to the following broad habitat features as well as constituent community types;

1. **Habitat Area -** it is unlikely that the activities proposed will reduce the overall extent of permanent habitat within the feature Estuaries (**1130**) and Mudflats and sandflats not covered by seawater at low tide (**1140**). The habitat area is likely to remain stable.

2. **Community Distribution - (conserve a range of community types in a natural condition) -** this attribute considered potential interactions with the one relevant community type listed above. Proposed aquaculture activities were shown to be confined to interact with the community type **Sand with amphipods, polychaetes and *Tellina tenuis* community complex**. This community type is muddy sand to sandy habitat type and given it is intertidal, is exposed to a range of physical and hydrodynamic pressures. **Table 8.1** lists the habitats (or surrogates) and **Table 8.2** lists the constituent taxa and both provide a commentary of sensitivity to a range of pressures. The risk scores are derived from a range of sources identified above. The pressures are listed as those likely to result from intertidal oyster culture within the SAC (see **Table 6.1**).

Specifically considered were intertidal oyster culture (bag and trestle) and intertidal on-bottom clam culture. Intertidal oyster culture is considered non-disturbing to habitats on the basis of high tolerance of taxa to the pressures and hydrographic conditions at sites such that accumulations of sediments and organic matter beneath the cages is low (Forde et al., 2015). Clam culture may result in more chronic and long-term changes in community composition which were considered during the assessment process. High density clam culture may result in exclusion of native fauna and build-up of sedimentary material as a consequence of the netting. In addition, transport routes from terrestrial bases to the aquaculture sites will result in some disturbance to intertidal communities (Forde et al., 2015).

Table 8.4 below identifies the likely interactions between proposed aquaculture activities and the broad habitat features 1130 and 1140 and the constituent community types, with a broad conclusion and justification on whether the activity is considered disturbing to the feature in question. While some activities (e.g. access routes) might result in long-term change to the community types identified above; in all cases, no potentially disturbing activity (individually or combined) extends beyond 15% of the community types (**Table 8.4**). In addition, combined activities listed (Clam culture and access routes) overlap with 0.78% and 0.65% of habitat features (1140) Mudflats and Sandflats not covered by seawater at low tide and (1130) Estuaries, respectively (Table 5.1). Simliarly, the proposed cultivation sites extend over 7.3% of the marine community type, Sand with amphipods, polychaetes and *Tellina tenuis* community complex (**Table 7.1**), yet disturbing activities only overlap with 0.69% of this marine community type.

Conclusion 1 – On the basis that aquaculture activities which might be considered potentially disturbing to Annex 1 habitat conservation features occur below the 15% threshold, the activities will unlikely have any detrimental impact on the habitat conservation features (habitat area and community distribution) for the site.

Introduction of non-native species: As already outlined, oyster culture may present a risk in terms of the introduction of non-native species as the Pacific oyster (*Crassostrea gigas*) itself is a non-native species. Recruitment of *C. gigas* has been documented in a number of Bays in Ireland and appears to have become naturalised (i.e. establishment of a breeding population) in two locations (Kochmann et al 2012; 2013) and may compete with the native species for space and food. In addition to having large numbers of oysters in culture, Kochmann et al (2013) identified long residence times and large intertidal areas of mixed substrate as factors likely contributing to the successful recruitment of oysters in Irish bays. While the residence time is unknown, the fact that the majority of the Bay (Loughros Mór) is intertidal and empties on an ebbing tide, the residence time is likely to be short. On this basis the risk of successful establishment of the pacific oyster in West of Ardara/Maas Road SAC is considered low.

In relation to the Manila clam (*Ruditapes philippinarum*), this species has been in culture in Ireland since 1984 and, to the best of our knowledge, no recruitment in the wild has been recorded. The operations are totally reliant on hatchery seed and are fully contained at all stages of the production cycle. The risk of naturalisation of this species is considered low, but should be kept under surveillance.

Conclusion 2. Given the short residence time in the SAC and (in the case of oysters) the lack of available habitat, the risk of establishment of the Pacific oyster and the Manila clam within the West of Ardara/Maas Road SAC is considered low.

Table 8.1 - **Matrix showing the characterising habitats sensitivity scores x pressure categories for intertidal habitats (or surrogates) in N West of Ardara/Maas Road SAC (ABPMer 2013a-h)** (Table 8.3 provides the code for the various categorisation of sensitivity and confidence.).

Community Type (EUNIS code)	Surface Disturbance	Shallow Disturbance	Deep Disturbance	Trampling – access by foot	Trampling – access by vehicle	Extraction	Siltation (addition of fine sediments, pseudofaeces, fish food)	Smothering (addition of materials biological or non-biological to the surface)	Changes to sediment composition- increased coarseness	Changes to sediment composition- increased fine sediment proportion	Changes to water flow	Increase in turbidity/suspended sediment	Decrease in turbidity/suspended sediment	Organic enrichment-water column	Organic enrichment of sediments-sedimentation	Increased removal of primary production-phytoplankton	Decrease in oxygen levels- sediment	Decrease in oxygen levels-water column	Introduction of non-native species	Removal of Target Species	Removal of Non-target species	Introduction of antifoulants	Introduction of medicines	Introduction of hydrocarbons	Prevention of light reaching seabed/features
A2.23 – Polychaete / amphipod-dominated fine sand shore [Surrogate for Sand with amphipods, polychaetes and *Tellina tenuis* community complex]	NS (*)	L (*)	L (*)	NS (*)	L-NS (*)	L-M (*)	L-M (*)	L-M (*)	L-M (*)	M (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	L-NS (*)	L-NS (*)	NS (***)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	NS (*)
A2.24 – Polychaete / bivalve dominated fine sand shores) [Surrogate for Sand with amphipods, polychaetes and *Tellina tenuis* community complex]	NS (***)	L (*)	L (***)	NS (*)	L (*)	L-M (*)	L-M (*)	L-M (*)	L-M (*)	NS (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	L (*)	H (***)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)	NS (*)

Table 8.2 - **Matrix showing the characterising species sensitivity scores x pressure categories for taxa (or surrogates) in West of Ardara/Maas Road SAC (ABPMer 2013a-h)** (Table 8.3 provides the code for the various categorisation of sensitivity and confidence.)

Species	Surface Disturbance	Shallow Disturbance	Deep Disturbance	Trampling – access by foot	Trampling – access by vehicle	Extraction	Siltation (addition of fine sediments, pseudofaeces, fish food)	Smothering (addition of materials biological or non-biological to the surface)	Changes to sediment composition- increased coarseness	Changes to sediment composition- increased fine sediment proportion	Changes to water flow	Increase in turbidity/suspended sediment	Decrease in turbidity/suspended sediment	Organic enrichment-water column	Organic enrichment of sediments-sedimentation	Increased removal of primary production-phytoplankton	Decrease in oxygen levels- sediment	Decrease in oxygen levels-water column	Introduction of non-native species	Removal of Target Species	Removal of Non-target species	Introduction of antifoulants	Introduction of medicines	Introduction of hydrocarbons	Prevention of light reaching seabed/features
Angulus tenuis	NS (*)	L (*)	L (***)	NS (*)	L (*)	M (*)	NS (*)	H (*)	M-H (*)	NS (*)	L-M (*)	L (*)	NS (*)	NS (*)	Nev	L-NS (*)	NEv	NEv	M (*)	NS (*)	NS (*)	NS (*)	NEv	NEv	NS (*)
Arenicola marina	NS (*)	NS (***)	L-M (***)	NS (***)	NS (***)	L-M (*)	NS (*)	L-M (*)	L-M (***)	L-M (***)		NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	NS (***)	M (*)	L-M (*)	NS (*)	NS (***)	L (**)		NS (*)
Capitella sp.	L (*)	L (**)	L (**)	L (***)	L (*)	L (*)	L (*)	NS (*)	NS (*)	NS (***)	NS (*)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)	L (***)	L (***)	NS (*)	NS (*)	NS (*)	NS (***)	L (***)	NS (***)	NS (*)
Cerastoderma edule	L (*)	L-M (*)	L-M (***)	L-M (***)	L-M (*)	L-H (*)	L (***)	L-M (*)	L-H (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (*)	NS (**)	L-NS (*)	L-M (*)	L-M (*)	M (*)	M (*)	NS (*)	NS (*)	NEv	L-M (*)	NS (*)
Corophium volutator	L (***)	L (***)	L (***)	L (*)	L (*)	L (*)	L (***)	L (***)	M (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)	L (***)	L (***)	Nev	NS (*)	NS (*)	NA	NEv	L (***)	NS (*)
Nephtys cirrosa	NS (*)	L (***)	L (***)	NS (*)	L (*)	L (*)	NS (***)	NS (*)	L (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	M (*)	M (*)	NS (*)	NS (*)	NEv	NEv	NS (*)
Nephtys hombergii	NS (*)	L (*)	L (***)	NS (*)	L (*)	L (*)	NS (**)	NS (*)	L (*)	NS (*)	NS (**)	NS (*)	NS (*)	NS (*)	NS (**)	NS (*)	NS (***)	NS (***)	NS (*)	M (*)	NS (*)	NS (**)	NEv	M (***)	NS (*)
Pygospio elegans	L (*)	L (**)	M (***)	L (*)	L (*)	L-M (*)	L (***)	L-M (***)	L-M (*)	NS (**)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (***)	NS (*)	L (**)	L (**)	M (*)	NS (*)	NS (*)	NS (*)	NEv	NEv	NS (*)
Spiophanes bombyx	L (*)	L (***)	L (***)	L (*)	L (*)	L (*)	NS (*)	L (*)	L (*)	L (*)	NS (*)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)	L (***)	L (***)	L (*)	NS (*)	NS (*)	NS (*)	NEv	L (***)	NS (*)
Tubificoides sp.	NS (*)	NS (*)	L (**)	L (*)	L (*)	M (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (***)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)	NS (***)	NS (***)	NS (*)	NS (*)	NS (*)	IS (**)	Nev	Nev	IS (**)

Table 8.3 - Codes of sensitivity and confidence applying to species and pressure interactions presented in Tables 8.1 and 8.2.

Pressure interaction codes for Table 8.1 and 8.2	
NA	Not Assessed
Nev	No Evidence
NE	Not Exposed
NS	Not Sensitive
L	Low
M	Medium
H	High
VH	Very High
*	Low confidence
**	Medium confidence
***	High Confidence

Table 8.4 - Interactions between the proposed aquaculture activities and constituent community of the habitat feature Estuaries (1130) and Mudflat and sandflat not covered by seawater at low tide (1140), with a broad conclusion on the significance of the interactions.

	1130 – Estuaries and 1140 Mudflats and sandflats not covered by seawater at low tide and Marine Community Type (Sand with amphipods, polychaetes and *Tellina tenuis* community complex
Culture Type	**Sand with amphipods, polychaetes and *Tellina tenuis* community complex**
Oysters	**Disturbing: No** **Justification:** The high density of stock will impact on the seafloor due to organic enrichment (faeces and pseudofaeces). However the habitat and community type have high recoverability and are tolerant of the proposed activity. The stock is confined in bags, is sourced from hatcheries and is typically diploid/triploid.
Clams	**Disturbing: Yes** **Justification:** While this activity may result in long term changes in habitat species and sediment composition. This activity is considered non-disturbing by virtue of the spatial overlap with the habitat features 1130, 1140 and marine community type is, 0.63%, 0.76% and 0.67%, respectively (<15% threshold).
Access Routes	**Disturbing: Yes** **Justification:** While the compaction of sediments on access routes can lead to long-term disturbance, the maximum disturbance by this activity is only 0.019%, 0.015% and 0.02% on habitat feature 1140, 1130 and this community type, respectively (<15% threshold).
	Disturbing: No **Justification: The combined level of disturbance over the habitat features 1130, 1140 and Marine Community Type (Sand with amphipods, polychaetes and *Tellina tenuis* community complex) are 0.649%, 0.775% and 0.69%, which are less than the threshold of 15%.**

8.4 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR OTTER *LUTRA LUTRA*.

As the proposed aquaculture production activities within the SAC spatially overlap with otter (*Lutra lutra*) territory, these activities may have negative effects on the abundance and distribution of populations of the species.

The West of Ardara/Maas Road SAC and the Slieve Tooey/Tormore Island/Loughros Beg Bay SAC are designated for the otter (*Lutra lutra*).

The risk of negative interactions between aquaculture and aquatic mammal species is a function of:

1. The location and type of structures used in the culture operations- is there a risk of entanglement or physical harm to the animals from the structures?

2. The schedule of operations on the site – is the frequency such that they can cause disturbance to the animals?

Shellfish Culture: Shellfish culture operations are likely to be carried out in daylight hours. The interaction with the otter is likely to be minimal given that otter foraging is primarily crepuscular. It is unlikely that the proposed culture activities pose a risk to otter populations. Impacts can be discounted on the basis of the points below: The proposed activities will not lead to any modification of the following attributes for otter:

- Extent of terrestrial habitat,

- Extent of marine habitat / freshwater habitat.

- The activity involves net input rather than extraction of fish biomass so that no negative impact on the essential food base (fish biomass) is expected

- The number of couching sites and holts or, therefore, the distribution, will not be directly affected by aquaculture and fisheries activities.

- Shellfish production activities are unlikely to pose any risk to otter populations through entrapment or direct physical injury.

- This form of oyster culture has structures which are raised from the seabed (0.5m - 1m) and are oriented in rows, thus allowing free movement through and within the site.

- Disturbance associated with vessel and foot traffic could potentially affect the distribution of otters at the site. However, the level of disturbance is likely to be very low given the likely encounter rates will be low dictated primarily by tidal state and in daylight hours.

- In the threat response plan, NPWS (2009) state “Little evidence has come to light in recent studies to suggest that disturbance by recreation is a significant pressure”. Recreation in the NPWS report is defined as angling, boating and mariculture.

Proposed shellfish culture activities are likely to be **non-disturbing** to otter.

8.5 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR HARBOUR SEAL *PHOCA VITULINA*

The West of Ardara/Maas Road SAC is designated for the Habitats Directive Annex II Species Harbour seal (*Phoca vitulina*). The distribution of the harbour seal sites within the West of Ardara/Maas Road SAC are illustrated in **Figures 4.6** - **4.8**. The vast majority of Harbour Seal sites are located in Gweebarra Bay with a small number of sites identified in Loughros Mor Bay.

Rutland Island & Sound SAC (002283), located to the north of the West of Ardara/Maas Road SAC (000197), is designated for Harbour seal (*Phoca vitulina*). Harbour seal may migrate from Rutland Island & Sound SAC into the West of Ardara/Maas Road SAC and interact with aquaculture production activities within the SAC. Site specific Conservation Objectives for the species within the SACs are summarised in **Table 8.5** and detailed in NPWS 2015a and NPWS 2015b respectively. Conservation Objectives for the species within both SACs relate primarily to the requirement to maintain various attributes of the populations including population size and the distribution of the species.

Table 8.5 - Conservation objectives and targets for the Harbour Seal *Phoca vitulina* in West of Ardara/Maas Road SAC (Site code 000197) (NPWS 2015a) and Rutland Island & Sound SAC (Site code 002283) (NPWS 2013a).

Site (Site code)	Objective	Target(s)
West of Ardara/Maas Road SAC (Site code 000197)	Maintain favourable conservation condition	The range of use within the site should not be restricted by artificial barriers; all sites (i.e. breeding, moulting and resting haul-out sites) should be maintained in a natural condition; human activities should occur at levels that do not adversely affect harbour seal population at the site.
Rutland Island & Sound SAC (Site code 002283)		

While the favourable conservation status of the Harbour Seal has been achieved for both the West of Ardara/Maas Road SAC (NPWS 2015a) and Rutland Island & Sound SAC (NPWS 2013a), potential interactions between harbour seals and aquaculture activities carried out in the SAC must be assessed. Potential interactions cultivation activities with Harbour Seal must be considered in light of:

- Access to suitable habitat – number of artificial barriers
- Disturbance – frequency and level of impact
- Harbour Seal Sites:
  - Breeding sites
  - Moulting sites
  - Resting sites

Restriction to suitable habitats and levels of disturbance are important pressures that must be considered to ensure the maintenance of favourable conservation status of the harbour seal and implies that the seals must be able to move freely within the site and to access locations considered

important to the maintenance of a healthy population. They are categorised according to various life history stages (important to the maintenance of the population) during the year. Specifically, they are breeding, moulting and resting sites. It is important that the access to these sites is not restricted and that disturbance, when at these sites, is kept to a minimum. The structures used in culture of oysters (bags on trestles) may form a physical barrier to seals when both submerged and exposed on the shoreline such that the access to haul-out locations might be blocked. Activities within sites and movements to and from culture sites may also result in disturbance events such that the seals may note an activity (head turn), move towards the water or actually flush into the water. While such disturbance events might have been documented, the impact of these disturbances at the population level has not been studied more broadly (National Research Council, 2009).

Six applications for shellfish cultivation within the West of Ardara/Mass Road SAC are located in inner Loughros Mór Bay and do not present a barrier to movement for seals to the haul out locations, into and out of the bay. Furthermore, in Loughros Mór Bay the proposed shellfish culture areas are located more that 700m from any identified Harbour Seal site (**Figure 4.6**) and given this distance, it is concluded that activities (should they be permitted) are likely to be **non-disturbing** to the Conservation Objective for the species within the West of Ardara/Maas Road SAC and Rutland Island & Sound. In Gweebara Bay, the aquaculture operations are located more that 400m from the closest Harbour Seal site. This distance is also considered non-disturbing to seal within the relevant SACs. Notwithstanding the lack of likely disturbance to haul-out locations, the location of proposed structures across the inner part of Loughros Mór Bay may present a barrier to seal movement to the inner part of the bay and should, therefore, be considered further.

8.6 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR ATLANTIC SALMON *SALMO SALAR*

The West of Ardara/Maas Road SAC (NPWS 2015a) is designated for the Atlantic Salmon (*Salmo salar*) (NPWS, 2015a).

Scientific advice from the Stating Scientific Committee on Wild Salmon Stocks (see SSCS 2015) indicates that salmon populations in the Owenea/Stracashel and Owentocker rivers, which run into the SAC, are currently exceeding their Conservation Limit (CLs) for spawning stock level estimates required to allow sustainable level of spawning. Given the intertidal nature of the structures to be used in the proposed culture activities, it is concluded that should proposed shellfish culture in the SAC be permitted the activities would not pose any significant risk to the following salmon attributes;

- Distribution (in freshwater)
- Fry abundance (freshwater)
- Population size of spawners (fish will not be impeded or captured by the proposed activity)
- Smolt abundance (out migrating smolts will not be impeded or captured by the proposed activity)
- Water quality (freshwater)

Should proposed aquaculture activities be permitted they are likely to be **non-disturbing** to the Conservation Objective for Atlantic Salmon within the West of Ardara/Maas Road SAC.

8.7 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR GREY SEAL HALICHOERUS GRYPUS MIGRATING IN THE WEST OF ARDARA – MAAS ROAD SAC

The Slieve Tooey / Tormore Island / Loughros Beg Bay SAC (Site code; 000190), located to the south of the West of Ardara – Maas Road sac, is designated for Grey seal *Halichoerus grypus.* Site specific Conservation Objectives for the species within the SAC (NPWS 2015f) have been identified (see **Table 8.5**) and relate primarily to the requirement to maintain various attributes of the populations including population size and the distribution of the species.

Potential interactions between aquaculture and marine mammals are broadly summarized in **Table 8.6**. It should be noted that direct demonstrations of these impacts are rare, and in most cases, potential effects are therefore predicted from the best existing information (National Research Council, 2010).

Given the distance from the proposed aquaculture operations to the identified locations for Grey Seal in Slieve Tooey / Tormore Island / Loughros Beg Bay SAC and the extreme shallow and sheltered nature of the aquaculture locations within the West of Ardara – Maas Road SAC, the proposed levels of shellfish culture within West of Ardara/Maas Road SAC are considered **non-disturbing** to the site

specific Conservation Objectives for the Grey seal *Halichoerus grypus* within Slieve Tooey/ Tormore Island/ Loughros Beg Bay SAC.

Table 8.6 - Site specific Conservation Objectives for Habitats Directive Annex II Species Grey seal *Halichoerus grypus* within the Slieve Tooey/ Tormore Island/ Loughros Beg Bay SAC (Site code; 000190 (NPWS 2015f).

Special Area of Conservation (Site code)	Species (Species code)	Objective	Target(s)
Slieve Tooey / Tormore Island / Loughros Beg Bay SAC (Site code; 000190)	Grey seal *Halichoerus grypus* (1364)	Maintain favourable conservation condition	The range of use within the site should not be restricted by artificial barriers; all sites (i.e. breeding, moulting and resting haul-out sites) should be maintained in a natural condition; human activities should occur at levels that do not adversely affect harbour seal population at the site.

8.8 ASSESSMENT OF THE EFFECTS OF AQUACULTURE PRODUCTION ON THE CONSERVATION OBJECTIVES FOR GREELAND WHITE-FRONTED GOOSE MIGRATING INTO THE WEST OF ARDARA – MAAS ROAD SAC

Studies have shown that Greenland White-fronted geese forage and roost within Loughros Mór Bay. It would appear that foraging is confined to the south shore primarily and roosting on a reef outcropping towards the mouth of the bay (Figure 8-2). At its closest point, the goose roosting site is approximately 300m from the closest proposed aquaculture operation. Furthermore, and on the basis of GPS tagging, the roost site is occupied primarily at night. This is outside of operational times for the proposed aquaculture operations. On the basis of these factors it is unlikely that the proposed aquaculture operations will result in disturbance the Greenland White-fronted geese originating from Sheskinmore Lough SPA.

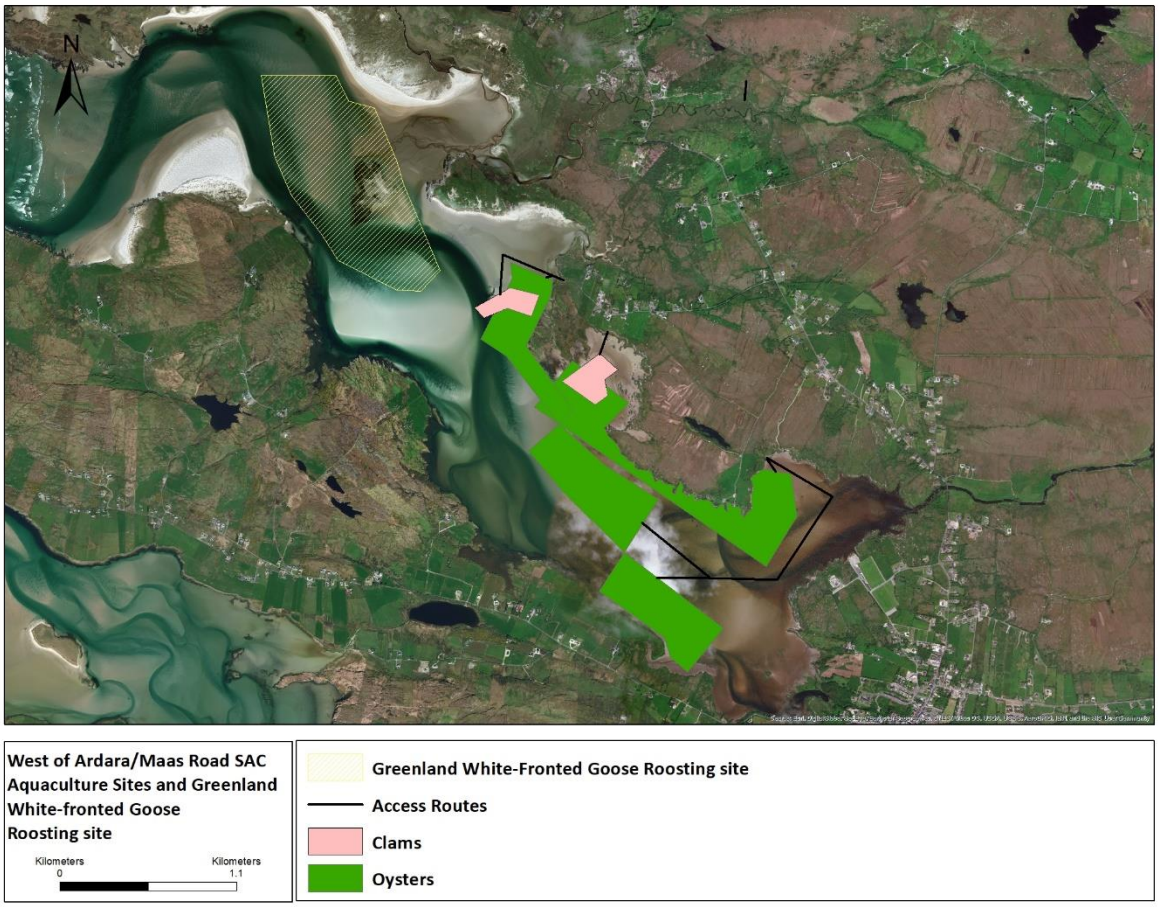

Figure 8-2 Proximity of estimated Greenland White-fronted Goose roost area to proposed Aquaculture operations.

Table 8.7 – Potential interactions between trestle aquaculture activities and the Annex II species Grey Seal *Halichoerus grypus* migrating within the Slieve Tooey/ Tormore Island/ Loughros Beg Bay SAC (Site code; 000190 (NPWS 2015f).

Pressure	Potential Effects	Equipment	Duration (days)	Time of Year	Factors Constraining the Activity/Effects
Habitat Exclusion	Structures may result in a barrier to movement of species.	Bags and trestles	365	All year	Spatial extent and location of structures used for culture.
Disturbance	Ancillary activities at sites increase the risk of disturbance to species at haul out sites (e.g. resting, breeding and/or moulting) or in the water.	Site services, human, boat and vehicular traffic	365	All year	Seasonal levels of activity relating to seeding, grading, and harvesting. Peak activities do not coincide with more sensitive periods for seals (i.e. pupping and moulting)
Entanglement	Entanglement of species from ropes or material used on structures or during operation of farms or during fishing.	Trestles, bags, ropes and/or nets used in day to day.	365	All year	Farm management practices, weather, closed season.
Ingestion	Ingestion of waste material used on farm	Ties used to secure bags and secure bags to trestle	365	All year	Farm management practices, weather, closed season.

9 IN-COMBINATION EFFECTS OF AQUACULTURE AND OTHER ACTIVITIES

9.1 FISHERIES

There are no known applications for a fishery, a Classified Production Area, or proposed fishery plans for the West of Ardara/Maas Road SAC. On this basis, there are not likely to be any in-combination impacts between fishery and aquaculture activities.

There is a draft net fishery for salmon in Loughros Mór Bay. This fishery occurs if there are a surplus of salmon stock in the Rivers Owenea and Owentocker. On the basis of licences being issued for the fishery it would assume that it will not impact on salmon conservation features and therefore, there is not likely to be any in-combination impact with aquaculture on salmon conservation features. As there are no significant interactions noted between proposed aquaculture operations and other Natura features (seals and/or birds) there are unlikely to be any other in-combination effects to assess.

9.2 POLLUTION PRESSURES

There are a number of activities which are terrestrial in origin that might result in impacts on the conservation features of the West of Ardara/Maas Road SAC. Primary among these are point source discharges from domestic sewage outfalls distributed around the harbour. The pressure derived from these point sources may impact upon levels of dissolved nutrients, suspended solids and some elemental components e.g. aluminium in the case of water treatment facilities.

Pressures resulting from aquaculture activities are primarily localised compaction of sediment along access routes. It is, therefore, concluded that, given the pressure resulting from point discharge location such as the urban waste-water treatment and/or combined sewer outfalls would likely impact on physico-chemical parameters in the water column, any in-combination effects with aquaculture activities are considered to be **minimal or negligible**.

10 SAC AQUACULTURE APPROPRIATE ASSESSMENT CONCLUDING STATEMENT AND RECOMMENDATIONS

10.1 AQUACULTURE

Currently within the West of Ardara/Maas Road SAC there are no aquaculture activities, however, there are four applications for oyster shellfish cultivation (using bags and trestles) and two applications for clam culture (using a combination of trays and netting) within Loughros Mór Bay and 2 applications for oyster trestle culture in Gweebara Bay. These applications fall within the qualifying interest of 1130 Estuaries and Mudflat and sandflat not covered by seawater at low tide (1140) for which the West of Ardara/Mass Road SAC is designated. Based upon this and the information provided in the aquaculture profiling carried out (**Section 5**), the likely interaction between this culture methodology and conservation features (habitats and species) of the site were considered.

10.1.1 Habitats

An initial screening exercise resulted in 21 Habitat features and five (5) species being excluded from further consideration by virtue of the fact that no spatial overlap (or likely interactions) of the proposed culture activities was expected to occur. The habitats and species excluded from further consideration are listed in **Section 7**. A full assessment was carried out on the likely interactions between proposed culture operations and the feature of the Annex 1 habitat 1130 (Estuaries) and 1140 (Mudflat and sandflat not covered by seawater at low tide). Furthermore, the likely effects of the aquaculture activities (Species, structures, transport routes) were considered in light of the sensitivity of one (of the two) community types, i.e., Sand with amphipods, polychaetes and *Tellina tenuis* and species of the Annex 1 habitats.

Based upon the scale of spatial overlap of proposed aquaculture activities and the relatively high tolerance levels of the habitats and associated species, the general conclusion is that proposed activities would be considered **non-disturbing to the Annex I habitats 1130 and 1140 and their constituent community types**.

To further minimise potential impacts it is recommended that, once identified there should be strict adherence to the access routes and that the movement of stock in and out of the West of Ardara/Maas Road SAC should adhere to relevant fish health legislation and follow best practice guidelines (e.g. http://invasivespeciesireland.com/cops/aquaculture/).

10.1.2 Species

The likely interactions between the proposed aquaculture activities and the Annex II Species Atlantic Salmon (*Salmo salar* [1106]), Otter (*Lutra lutra* [1355]) and Common (Harbour) Seal (*Phoca vitulina* [1365]) were also assessed. The objectives for these species in the SAC focus upon maintaining the good conservation status of populations. The main aspect of the culture activities that could potentially impact the designated species is the physical presence of trestles that may restrict access to certain habitats. However, given the locations of the structures and the low level of activity proposed it is concluded that activities would be **non-disturbing to the Annex II species found in West or Ardara/Maas Road SAC (00197)**.

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