Annex I

Report supporting Appropriate Assessment of Aquaculture in

Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC

(Site Code: 000627)

April 2015

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1 Preface

In Ireland, the implementation of Article 6 of the Habitats Directive in relation to aquaculture and fishing projects and plans that occur within designated sites is achieved through sub-Article 6(3) of the Directive. Fisheries not coming under the scope of Article 6.3, i.e. those fisheries not subject to secondary licencing, are subject to risk assessment. Identified risks to designated features can then be mitigated and deterioration of such features can be avoided as envisaged by sub-article 6.2.

Aquaculture activities are licenced by the Department of Agriculture, Food and the Marine (DAFM). Oyster fisheries are licenced by the Department of Communications Energy and Natural Resources (DCENR). The Habitats Directive is transposed in Ireland in the European Communities (Birds and Natural Habitats) Regulations 2011. Appropriate assessments and risk assessments 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.

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 aquaculture applications are then subject to AA. If the AA process finds that the possibility of significant effects cannot be discounted or that there is a likelihood of negative consequence for designated features then changes to the activities will need to occur in order to mitigate the risk, if they are to continue. These assessment reports are not always explicit on how this mitigation might be achieved but rather indicate whether mitigation is required or not and what results should be achieved.

2 Executive Summary

2.1 The SAC

Cummeen Strand/Drumcliff Bay is designated as a Special Area of Conservation (SAC) under the Habitats Directive. The marine area is designated for ‘estuaries’ and for ‘intertidal mudflats and sand flats not covered by seawater at low tide’. The bay supports a variety of sub-tidal and intertidal sedimentary and reef community types. The area is also designated for and supports significant numbers of Harbour Seal while Sea Lamprey, migrate through the Cummeen Strand portion to the

Garavogue River and Lough Gill. Conservation Objectives for these habitats and species (within the Cummeen Strand/Drumcliff Bay SAC) were identified by NPWS (2013a) 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, cohort structure and the distribution of the species in the Bay. Guidance on the conservation objectives is provided by NPWS (2013b).

2.2 Activities in the SAC

The only aquaculture activities carried out in the SAC are intertidal oyster and clam culture. The Pacific oyster (*Crassostrea gigas*) is cultured on trestles in intertidal areas. Clams are grown as seed in sediment-filled boxes raised in the intertidal area and finished under netting on the seafloor. The profile of the aquaculture industry in the Bay, used in this assessment, was prepared by BIM and is derived from the list of licence applications received by DAFM and provided to the MI for assessment in August 2014.

2.3 The appropriate assessment process

The function of an appropriate assessment is to determine if the 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 and in relation to the scale, frequency and intensity of the activities. NPWS (2013b) provide guidance on interpretation of the Conservation Objectives which are, in effect, management targets for habitats and species in the Bay. 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 habitat features (and/or constituent communities) a 15% threshold of spatial overlap between a disturbing activity and the feature in question is given in the NPWS guidance. Spatial overlap of the potentially disturbing activity (or combination of activities) below this threshold 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 process is divided into a number of stages consisting of a preliminary risk identification, and subsequent assessment (allied with mitigation measures if identified) which are covered in this report. The first stage of the AA 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 or possible) might be recommended 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 initial 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 unless otherwise indicated. In the case of risk assessments consequence and likelihood of the consequence occurring are scored categorically as separate components of risk. Risk scores are used to indicate the requirement for mitigation.

2.4 Data supports

Distribution of habitats and species population data are provided by NPWS[1]. Information on Aquaculture licences and applications are provided by DAFM[2]. 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 data supporting the assessment of individual activities vary and provides for varying degrees of confidence in the findings.

2.5 Findings

In Cummeen Strand/Drumcliff Bay SAC there are a range of aquaculture activities currently being carried out and proposed. Based upon this and the information provided in the aquaculture profiling (Section 5), the likely interaction between aquaculture methodology and conservation features (habitats and species) of the site was considered.

In relation to habitats an initial screening exercise resulted in a number of habitat features and species being excluded from further consideration. None of the aquaculture activities (existing or proposed) overlaps or likely interacts with the following features or species, and therefore these five habitats and 2 taxa were excluded from further consideration in the assessment:

- 1014 Marsh Snail *Vertigo angustior*
- 1099 River Lamprey *Lampetra fluviatilis*
- 2110 Embryonic shifting dunes

[1] NPWS Geodatabase Ver: May 2014 - http://www.npws.ie/mapsanddata/habitatspeciesdata/

[2] DAFM Aquaculture Database version Aquaculture: 16th July 2014

- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- 7220 Petrifying springs with tufa formation (Cratoneurion)

In addition, a number of constituent community complexes recorded within the qualifying interests of Estuaries (1130) and Mudflats and sandflats not covered by seawater at low tide (1140) also have no overlap with aquaculture activities and were excluded from further analysis. These community types are:

- Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex
- Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex
- *Zostera*-dominated community
- Sand to mixed sediment with amphipods community
- Intertidal reef community – (very small overlap (≈100m) with access route in only for which it is not a designated community type)

Finally, the aquaculture activities did not present a barrier to migration and on the (freshwater) attributes for the **Sea Lamprey (*Petromyzon marinus)*** and therefore was excluded from further analysis.

A full assessment was carried out on the likely interactions between aquaculture operations (as proposed) and the features Annex 1 habitats Mudflats and sandflats not covered by seawater at low tide (1140) and Estuaries (1130). The likely effects of the aquaculture activities were considered in light of the sensitivity of the constituent communities of these Annex 1 habitats. The appropriate assessment and risk assessment finds that the majority of activities, at the current and proposed or likely future scale and frequency of activity are consistent with the Conservation Objectives. Some general conclusions and recommendations follow:

Conclusion 1 – On the basis that aquaculture activities which might be considered potentially disturbing to Annex 1 habitat conservation features occur at an acceptable level, the activities will unlikely have any detrimental impact on the habitat conservation features for the site.

Conclusion 2. Given the short residence time (5-10 days) identified 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 SAC is considered low.

Conclusion 3: Intertidal oyster and clam culture in Drumcliff Bay is considered disturbing to 'Mytilidae-dominated community complex'. It is recommended that the site boundaries be redrawn to exclude this community type and a suitable buffer zone be applied in order to allow for mapping anomalies and enforcement measures.

10.2 Annex II Species

The likely interactions between the proposed aquaculture activities and the Annex II Species Harbour Seal (*Phoca vitulina*) was also assessed. The objectives for this species in the SAC focus upon maintaining the good conservation status of the population. It is acknowledged in this assessment that the favourable conservation status of the Harbour Seal (*Phoca vitulina*) has been achieved given current levels of aquaculture production within the SAC. The aspect of the culture activities that could potentially disturb the Harbour Seal status relates to the locations of structures at one site and the movement of people and vehicles to and from as well as within the sites.

Conclusion 4: The current levels of licenced aquaculture (existing) are considered non-disturbing to Harbour Seal conservation features in all areas of the SAC. One exception is that at a site in Drumcliff Bay, oyster trestles should be positioned so as not to impede seal movement between the resting/breeding location and the main drainage channel. In addition, operators should note sensitive times of years for seals and continue to tailor their activities to minimise potential disturbance.

Conclusion 5: In relation to new licence applications, given the potential broad range of Harbour Seal within the SAC, the risk of disturbance to Harbour Seals posed by an expansion of aquaculture is not considered significant given the locations of areas for which applications have been received (tend to be more confined to Cummeen Strand or adjacent to existing aquaculture activities) and thus away from identified seal haul-out sites (sheltered areas). Notwithstanding, operators should note sensitive times of years for seals and adapt their activities to minimise any potential disturbance at all locations within the SAC.

3 Introduction

This document assesses the potential ecological interactions of aquaculture activities within Cummeen Strand/Drumcliff Bay SAC (Site Code 000627) on the Conservation Objectives of the site (COs).

The information upon which this assessment was carried out was based upon a list of applications and extant licences for aquaculture activities administered by the Department of Agriculture Food and the Marine (DAFM) and forwarded to the Marine Institute during August 2014, as well as aquaculture profiling information provided on behalf of the operators by Bord Iascaigh Mara (BIM) and fishery information generated by the Marine Institute. The spatial extent of aquaculture licences was derived from a database managed by the DAFM[3] and shared with the Marine Institute.

4 Conservation Objectives

The appropriate assessment of aquaculture in relation to the Conservation Objectives for Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627) is based on Version 1.0 of the objectives (NPWS 2013a -18 September 2013) and supporting documentation (NPWS 2013b - July 2013). The spatial data for conservation features was also provided by NPWS[4].

4.1 Cummeen Strand/Drumcliff Bay SAC extent

Cummeen Strand/Drumcliff Bay SAC (Figure 1) is a site situated on the northwest coast of Ireland, comprising predominantly intertidal and marine features. In addition, 3 aquatic species as well as one mammal are designated within the site. Specific to marine habitats, the site is comprised of two Annex I habitats, Estuaries and Mudflats and sandflats not covered by seawater at low tide.

[3] DAFM Aquaculture Database version Aquaculture: October 2014
[4] NPWS Geodatabase Ver: September 2014 - http://www.npws.ie/mapsanddata/habitatspeciesdata/

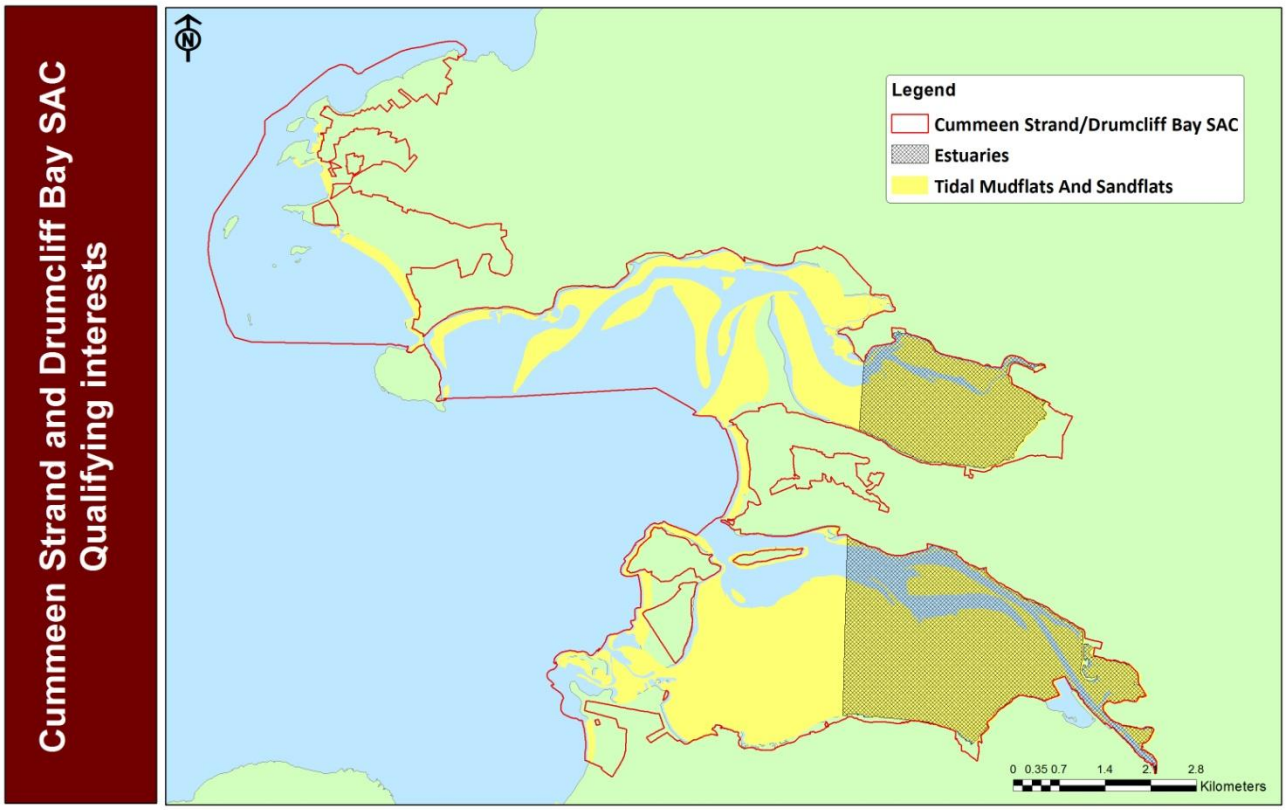

Figure 1 The extent of Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627) and qualifying marine habitats.

4.1.1 Qualifying interests (SAC)

The SAC is designated for the following habitats and species (NPWS 2013a), as listed in Annex I and II of the Habitats Directive:

- 1014 Marsh Snail *Vertigo angustior*
- 1095 Sea Lamprey *Petromyzon marinus*
- 1099 River Lamprey *Lampetra fluviatilis*
- 1130 Estuaries
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1365 Harbour seal *Phoca vitulina*
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- 7220 Petrifying springs with tufa formation (Cratoneurion)

A number of constituent community complexes recorded within the qualifying interests of Estuaries (1130) and Mudflats and sandflats not covered by seawater at low tide (1140) are listed below (NPWS 2013a Ver 1) and illustrated in Figure 2.

- Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex
- Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex
- Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex
- *Zostera*-dominated community
- Mytilidae-dominated community complex
- Fine sand with *Angulus* spp. and *Nephtys* spp. community complex
- Sand to mixed sediment with amphipods community
- Intertidal reef community

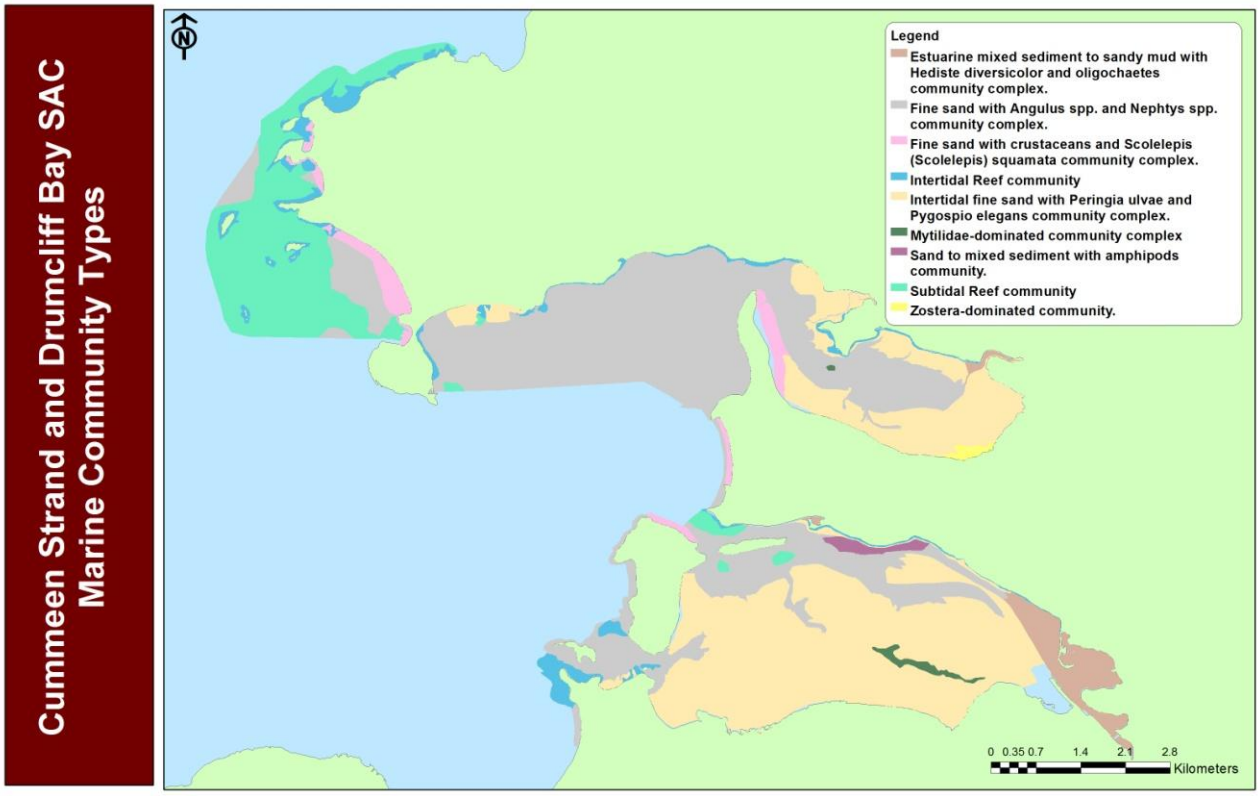

Figure 2 Principal benthic communities recorded within the qualifying interests of Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627) and Ravens Point Nature Reserve SAC (NPWS, 2011a, c).

The Cummeen Strand/Drumcliff Bay SAC is also designated for the Harbour Seal (*Phoca vitulina*). Prior to 2004 and on the basis of targeted surveys (Lyons 2004) the site appears to host consistent

number of seals. Seals at the site appear confined to the Drumcliff area only. From 1978 to 2003, counts range 51 (including 17 pups) to 40. Further aerial thermal imaging on 18 August, 2011 identified 23 harbour seals along with 4 grey seals in Drumcliff on the sheltered side (east) of the sand spit at the Lower Rosses. A number of different locations have been identified within the SAC and are considered important to the overall welfare and health of the populations at the site. Figure 3 identifies these locations and distinguishes between breeding, moulting and resting sites. These sites are broadly concentrated on sandbanks at the central portion of the SAC. Both moulting and breeding locations are considered particularly sensitive periods in the life cycle of the seals, i.e. NPWS. The pupping season (May-July) and moulting season (August-September) are clearly defined and important to the overall health of the population in the SAC and any disturbance during these times should be kept to a minimum. Less information is known about resting period (October-April) and resting areas throughout the SAC. However, the resting locations provided on Figure 3 are identified on the basis of sightings; however, all sheltered areas within the entire SAC are considered suitable habitat for resting (NPWS, 2013a). The importance of the resting sites are likely a function of the abundance of seals using the site and/or the degree of shelter afforded the location.

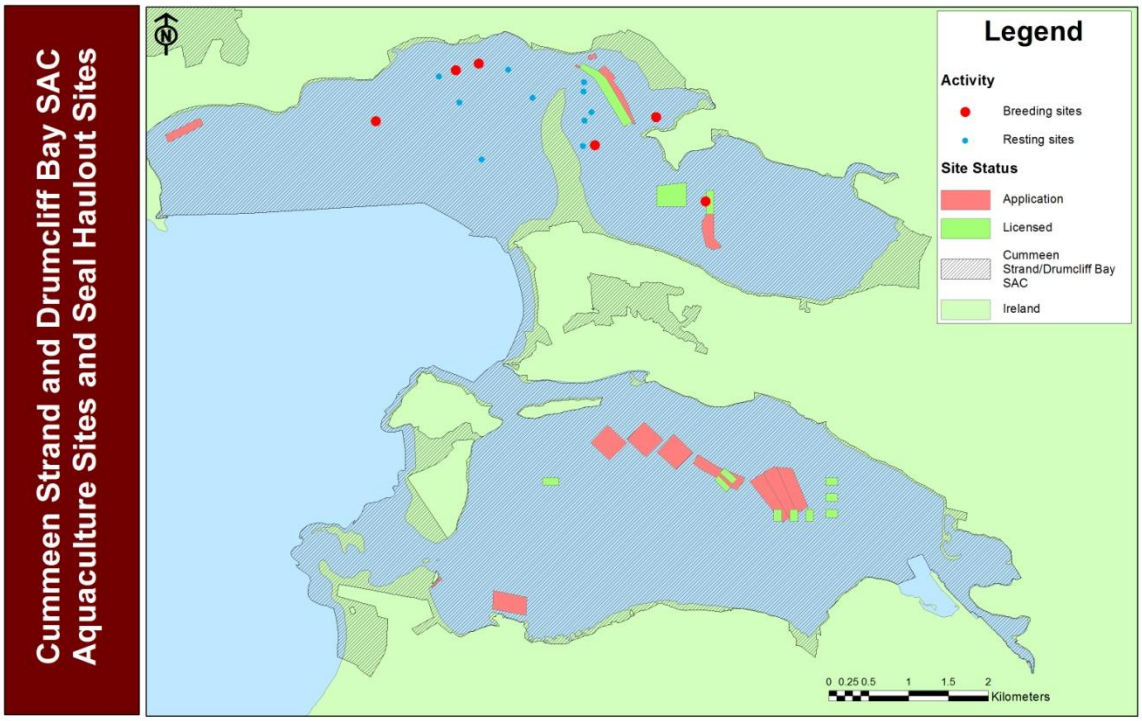

Figure 3 Harbour Seal (*Phoca vitulina*) locations in Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627) (NPWS, 2013a).

4.1.2 Conservation objectives

The conservation objectives for the qualifying interests of the Cummeen Strand/Drumcliff Bay SAC (000627) were identified by NPWS (2013a) and NPWS (2013b), respectively. 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 SACs are listed in Table 1 below.

Table 1. Conservation objectives and targets for marine habitats and species in Cummeen Strand/Drumcliff Bay SAC (000627) (NPWS 2011a). Annex I and II features listed in bold.

QUALIFYING INTEREST (COMMUNITY TYPE)	OOBJECTIVE	TARGET
1130 ESTUARIES	Maintain favourable conservation condition	1258ha; Permanent habitat is stable or increasing, subject to natural processes
Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex		796 ha; Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex		136ha; Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Zostera-dominated community		11 ha; Conserved in a natural condition, significant continuous or ongoing disturbance should be avoided.
Mytilidae-dominated community complex		18ha; Conserved in a natural condition, significant continuous or ongoing disturbance should be avoided.
Fine sand with *Angulus* spp. and *Nephtys* spp. community complex		258ha: Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Sand to mixed sediment with amphipods community		22ha: Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Intertidal reef community		13ha: Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Subtidal reef community		No details provided
1140 MUDFLATS AND SANDFLATS NOT COVERED BY SEAWATER AT LOW TIDE	Maintain favourable conservation condition	2288ha; Permanent habitat is stable or increasing, subject to natural processes
Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex		1423 ha; Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area

QUALIFYING INTEREST (COMMUNITY TYPE)	**OOBJECTIVE**	**TARGET**
Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex		102ha; Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex		90ha; Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
Zostera-dominated community		11 ha; Conserved in a natural condition, significant continuous or ongoing disturbance should be avoided.
Mytilidae-dominated community complex		18ha; Conserved in a natural condition, significant continuous or ongoing disturbance should be avoided.
Fine sand with *Angulus* spp. and *Nephtys* spp. community complex		644ha: Conserved in a natural condition, significant continuous or ongoing disturbance should not exceed <15% of area
1014 MARSH SNAIL *VERTIGO ANGUSTIOR*	Maintain favourable conservation condition	A single site is identified for this species and targets relate to maintaining adult and sub-adult densities and overall habitat quality.
1095 SEA LAMPREY *PETROMYZON MARINUS*	Restore to favourable conservation condition	For a number of attributes - Greater than 75% of main stem length of rivers accessible from estuary; At least three age/size groups present; Juvenile density at least 1/m²; No decline in extent and distribution of spawning beds; Improved dispersal of spawning beds into areas upstream of barriers; More than 50% of sample sites positive.
1099 RIVER LAMPREY *LAMPETRA FLUVIATILIS*	Restore to favourable conservation condition	For a number of attributes - Greater than 75% of main stem length of rivers accessible from estuary; At least three age/size groups of river lamprey present; Mean catchment juvenile density of brook/river lamprey at least 2/m²; No decline in extent and distribution of spawning beds; More than 50% of sample sites positive

QUALIFYING INTEREST (COMMUNITY TYPE)	OOBJECTIVE	TARGET
1365 HARBOUR SEAL *PHOCA VITULINA*	Maintain favourable conservation condition	The range of use within the site should not be restricted by artificial barriers; all sites (breeding, moult haul-out, resting) should be maintained in natural condition; human activities should occur at levels that do not adversely affect Harbour Seal population at the site.
2110 EMBRYONIC SHIFTING DUNES	Restore to favourable conservation condition	1.13ha; 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.
2120 SHIFTING DUNES ALONG THE SHORELINE WITH *AMMOPHILA ARENARIA* ("WHITE DUNES")	Restore to favourable conservation condition	9.38ha; 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 COASTAL DUNES WITH HERBACEOUS VEGETATION (GREY DUNES)	Restore to favourable conservation condition	22.65ha; 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.
5130 *JUNIPERUS COMMUNIS* FORMATIONS ON HEATHS OR CALCAREOUS GRASSLANDS	Restore to favourable conservation conditions	Targets are identified that focus on a wide range of attributes with the ultimate goal of increasing area subject to natural processes maintaining function and diversity of favourable species i.e., *Juniperus communis* and managing levels of negative species.
7220 PETRIFYING SPRINGS WITH TULFA FORMATION(CRATONEURION)	Maintain favourable conservation status	150m^2; Targets focus upon maintaining existing habitat area, maintaining water chemistry to ensure oligotrophic and calcareous conditions and conditions favouable to typical species.

4.4 Screening of Adjacent SACs

In addition to the SAC under consideration in this report, there is one other Natura 2000 site (Ballysadare Bay SAC) proximate to the proposed activities (Figure 4). The characteristic features of this site are identified in Table 2 wherein a preliminary screening is carried out on the likely interaction with aquaculture activities within Cummeen Strand/Drumcliff Bay SAC based primarily

upon the likelihood of spatial overlap or other interactions (*ex-situ* effects). All qualifying features that screen out are not considered further in this assessment. One feature, the Harbour Seal (*Phoca vitulina*) by virtue of its inclusion as a feature in Cummeen Strand/Drumcliff Bay SAC and potential for migration between the two SACs may have some interaction with aquaculture activities and is therefore, assessed further.

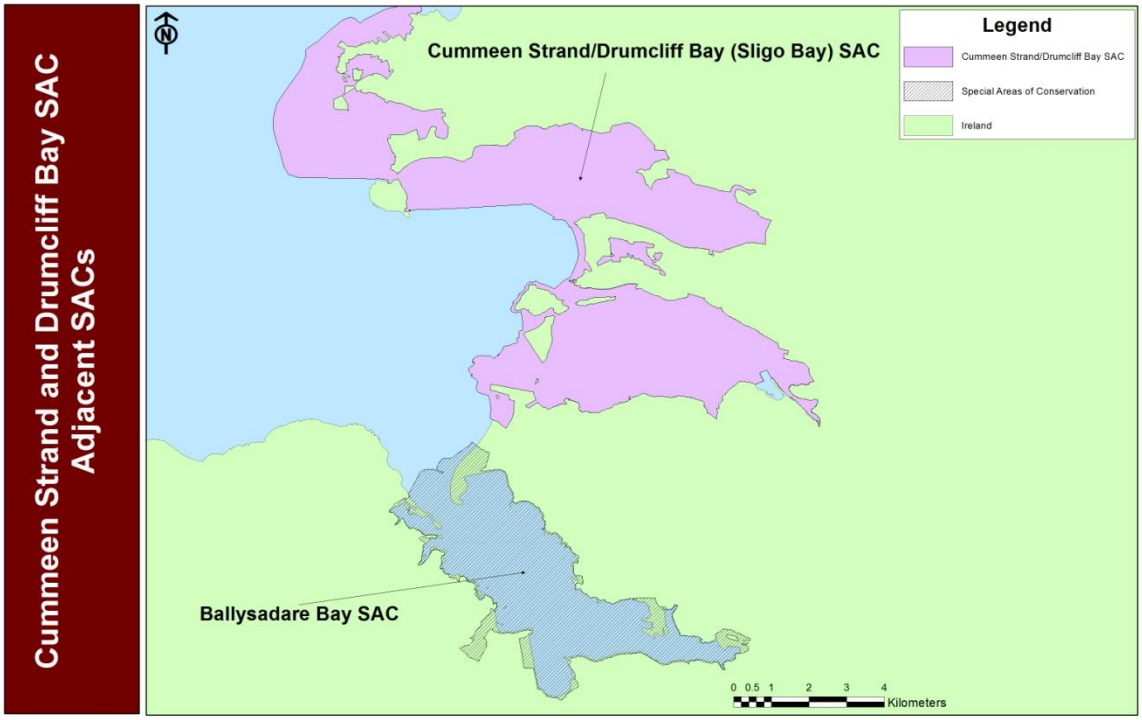

Figure 4. Natura 2000 sites adjacent to the Cummeen Strand/Drumcliff Bay SAC.

Table 2: Qualifying features of the Natura Site adjacent to Cummeen Strand/Drumcliff Bay SAC and qualifying features with initial screening assessment on likely interactions with aquaculture activities

NATURA SITE	QUALIFYING INTEREST [HABITAT CODE]	FISHERY AND AQUACULTURE INITIAL SCREENING
Ballysadare Bay SAC (000622)	Mudflats and sandflats not covered by seawater at low tide [1140]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Marsh snail (*Vertigo angustior*) [1014]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Estuaries [1130]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Common seal (*Phoca vitulina*) [1365]	Seal may migrate between Ballysadare and Drumcliff Bay therefore some potential interaction with Aquaculture activities may be possible – **carry forward for further assessment in Section 8**
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Embryonic shifting dunes [2110]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis
	Humid dune slacks [2190]	No spatial overlap or likely interaction with aquaculture activities in Cummeen Strand/Drumcliff Bay – excluded from further analysis

5 Aquaculture Activities

5.1 Shellfish Aquaculture

Aquaculture in Cummeen Strand/Drumcliff Bay SAC focuses solely on two shellfish species (oysters and clams; Figure 5). Spatial extents of existing and proposed activities within the qualifying interests (Mudflats and sandflats not covered by sea water at low tide (1140), Estuaries (1130)) within the SAC were calculated using coordinates of activity areas in a Geographic Information System (GIS).

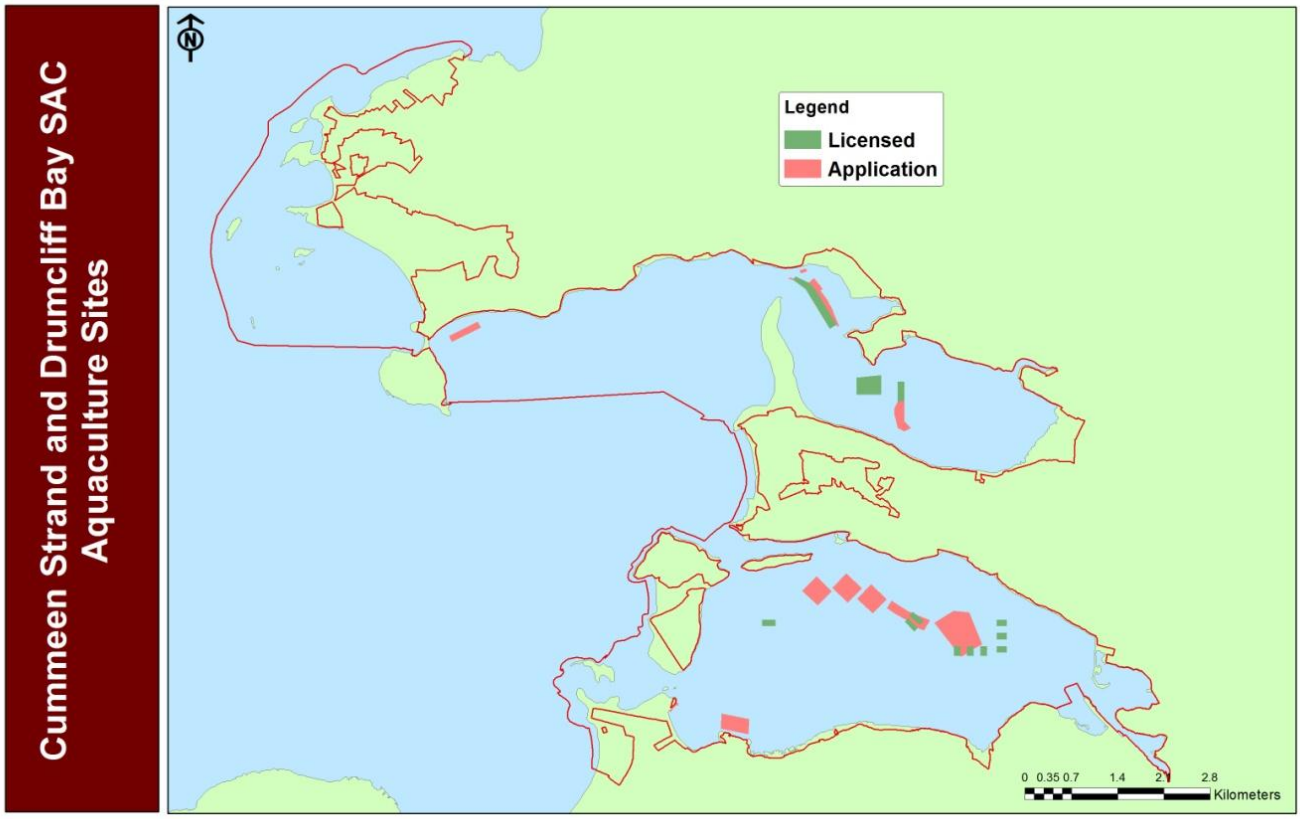

Figure 5. Proposed and existing shellfish culture activity within the Cummeen Strand/Drumcliff Bay SAC.

The spatial extent of the various aquaculture activities (current and proposed) overlapping the habitat features of the Cummeen Strand/Drumcliff Bay SAC is presented in Table 3. Overall, the level of spatial overlap between aquaculture activities and Mudflats and sandflats not covered by sea water at low tide is 110.3ha, which represents 4.81% of this Annex I habitat feature within the SAC; between aquaculture activities and Estuaries is, approximately, 73.4ha which is equivalent to 5.84% of the feature.

Table 3: Spatial extent (ha) of aquaculture activities overlapping with the marine qualifying interests in Cummeen Strand/Drumcliff Bay SAC presented according to culture species, method of cultivation and license status.

Species	Status	Location	1130 Estuaries (1,257ha)		1140 Mudflats and sandflats not covered by seawater at low tide (2,287ha)	
			Area (ha)	% Feature	Area (ha)	% Feature
Oysters	Application	Intertidal	45.6	3.63	68.1	2.98
Clams	Licensed	Intertidal	19.2	1.53	29.4	1.28
Clams	Application	Intertidal	6.2	0.49	6.6	0.28
Access Routes		Intertidal	2.4	0.19	6.2	0.27
Totals			73.4	5.84%	110.3	4.81%

5.1.1 Shellfish Culture - Cummeen Strand

Currently in Cummeen Strand there are a total of six licenced sites for oysters and clams combined (Figure 5). These sites are all three hectares or less in size. Of these licensed sites, only oysters are currently being cultivated. Clam sites in the area have not been seeded in three years due to Brown ring disease which currently has caused all operators in Cummeen Strand to cease clam farming until fallowing of sites has taken place which is taking a number of years.

The three operators in the bay that were farming clams only in the bay have harvested out the final ten tonnes of Clam crop during 2014. The operators that have license renewals in for clams foresee that it will be unlikely clams will be seeded for a number of years due to the Brown ring issue. However they are keen to farm Clams in the future.

Oyster Production

The oyster production in Cummeen Strand currently is being carried out by one operator and production is at 10 tonne for 2014. The production cycle begins when diploid seed (2mm) is introduced in early spring from Lissadell Hatchery and the growth cycle is 3 years to 3 ½ years. As the oysters grow stocking densities are reduced. Bag sizes used on site are 2mm to 9mm. Initial stocking densities when deployed into 4mm bags is 2000 seed per bag. As the oysters grow densities are reduced. Generally seed if stocked over 2000/bag is split in the first couple of months to lower density and by the end of year one the density is between 400 and 1000 oysters per bag. By the time

they reach market size of 80 grams after 3-31/2 years, the stocking density is down to 150 oysters per bag

Grading takes place every year between October and April. Grading and harvesting activities entails actually removing the bags from the inter-tidal zone to a land-based site. They are collected by hand, loaded onto trailers and transported by tractor off-site.

Maintenance activities on-site include shaking and turning of bags. The bags are shaken and turned on site. Tractor movements in this instance are simply for the transport of staff to and from site. Harvesting occurs between Septembers to June and involves loading of bags on tractor and trailer to be brought ashore. Frequency of site access is daily by one tractor.

Clam farming

Clams were grown in one main intertidal area on a few sites in Cummeen Strand in bags, tray mesh containers and on the seabed in clam parks and 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 was gained from Lissadell hatchery Co. Sligo at size 8mm – 12mm and grown in trays and bags for one year after which time they were sown on intertidal ground under mesh. The netting is buried in the ground down around 10 cm and is 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 reach harvestable market size around 3 years. They are sold onto the local and regional retail marketplace and into France.

New license Applications

There are a further nine new applications for Oyster production (Figure 5). Eight of these are north of Cummeen Strand and one is south. New (oyster) applicants, all have indicated their source of seed will be from local hatcheries in Ireland, Lissadell Hatchery, Carton Point Hatchery or Tralee Hatchery. All new applicants are to use bag and trestles as the method of cultivating their oysters. There will be both diploid and triploid (if available) seed used on site.

Access route

There are two main access routes in Cummeen Strand (Figure 6), one for the north sites and one for the southern site (which is accessed directly from the shore). In Cummeen Strand, access to the aquaculture sites is achieved through a single linear approach originating from the public access route (accessible at low tide) linking Coney Island with the mainland (Figure 6). There will be tractors and trailers in use, for those applications in the north portion of Cummeen strand.

5.1.2 Shellfish Culture – Drumcliff Bay

Background

Currently in Drumcliff Bay there are three operators, cultivating clams and oysters (Figure 5). Clam farms in the area have not been seeded in three years due to 'Brown Ring disease' which currently has caused all operators in Drumcliff bay to cease Clam farming until fallowing of sites has taken place which is taking a number of years. The three operators in the bay that were farming clams in the bay have harvested out the final 8 tonnes of Clam crop during 2014.

The operators that have license renewals in for clams foresee that it will be unlikely clams will be seeded for a number of years due to the 'brown ring' issue. However, they are keen to farm Clams in the future, when the issue has been resolved so hence are keen to go ahead with any applications in Clam farming. As a consequence, oysters will be the primary species. Clams will be the secondary species. The oyster production in the bay currently is being produced by one operator and production is at 70 tonne.

Clam Culture

Seed (sourced from the Lissadell Hatchery) is placed on the foreshore in April and held in specially designed wooden frames covered with 1.2mm mesh. At 8-9mm it is graded and thinned, and this is allowed to grow over the summer until by September it has reached 10-12mm. The young clams are then allowed to over-winter in the frames.

In the second year, when the young clams are 12-14mm they are ready to plant. The year old clams are laid in the park in April at a density of 250 per square metre. By the end of the first year (April) they grow to 10-12 grams, at which time they were ideal for the Italian market where clams are eaten small. The end product (20 gram clams), is usually harvested later in the year.

Oyster Culture

The production cycle begins when diploid seed at a size of 2 mm is introduced during April/March from Lissadell Hatchery and the growth cycle is 3 years to 3 ½ years. Initial stocking densities when deployed into 4mm bags can vary from 800 up to 5000 oyster seed per bag. As the oysters grow stocking densities are reduced. Generally seed if stocked over 2000/bag is split in the first couple of months to lower density and by the end of year one the density is between 400 and 1000 oysters per bag. The intertidal area is typically accessed during spring tides (at low tide) using a single tractor. Grading and packing, preparation of bags and trestles and general maintenance is carried out in the outhouse buildings near lissadell.

<u>New license Applications</u>

New applicants all have said their source of seed for oysters will be from local hatcheries in Ireland,

Lissadell Hatchery, Carton point Hatchery or Tralee Hatchery. All new applicants are to use bag and trestles as the method of cultivating their oysters. There will be both diploid and triploid seed used if available.

Access points

There are three access points to sites in Drumcliff Bay (Figure 6). In the north of the bay, there is access from a small byroad onto Ballgiligan Strand. The south of the bay is accessed from the Lower Rosses, where there is an access road. The access point to the application at Ardtermon Strand will be by boat from Raghly Harbour.

Calculation of area of access routes in both Drumcliff Bay and Cummeen Strand is linear length (in metres) by a putative route width of 10m, which is considered a sufficiently precautionary estimate. The spatial coverage of access routes is presented in Tables 3, 6 and 7.

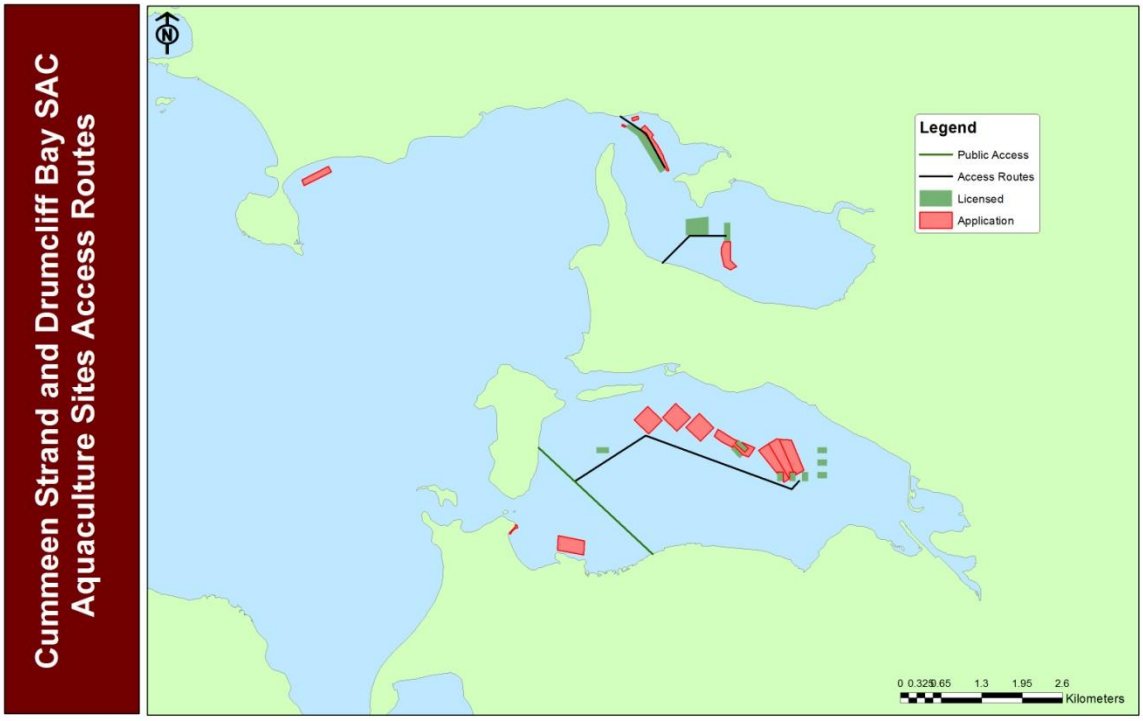

Figure 6. Access routes to aquaculture sites in Cummeen Strand/Drumcliff Bay SAC.

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 aquaculture structures and human activities associated with culture on designated species, intertidal and sub-tidal community types within the habitat features (e.g., 1130 and 1140). The overall effect on the conservation status will depend on the spatial and temporal extent of 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 and Habitat Features

Within the Cummeen Strand/Drumcliff Bay SAC, the species cultured are:

1. Oysters (*Crassostrea gigas*) in suspended culture (bags & trestles) confined to intertidal areas.
2. Clams (*Ruditapes philippinarum*) on-bottom in intertidal areas.

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 4, 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 shellfish culture (e.g. Barber, 1996; Black 2001; McKindsey et al. 2007; National Research Council 2010; O'Beirn et al 2012; Cranford et al 2012; ABPMer, 2013a-h; Forde et al., in press).

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 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 (McKindsey et al., 2007; Brenner et al., 2014). When the seed is sourced locally (e.g. suspended 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 considerably greater given that the stock will have been grown in the wild for a prolonged period (i.e. ½-grown stock).

Furthermore, the culture of a non-native species (e.g. the Pacific Oyster - *Crassostrea gigas*) also presents 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). Factors deemed to influence the successful recruitment of *C. gigas* include; residence time, presence of suitable habitat (hard substrata and/or biogenic reef) and large intertidal areas (Kochmann et al., 2013). However, a recent study (Kochmann and Crowe, 2014) has identified that heavy macroalgal cover may mitigate against successful recruitment; areas with higher algal cover seemed to result in lower recruitment where other factors (above) were considered equal? The use of triploid (putatively non-reproducing) stock is a method recommended to manage the situation if the risk of successful reproduction is identified.

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 (*Crassostrea gigas*) 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 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.

Intertidal oyster culture: 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. The habitat impact from oyster trestle culture is typically localised to areas directly beneath the culture systems. The physical presence of the trestles and bags can 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. Whether material accumulates is dictated by a number of factors, including:

1. Hydrography – low current speeds (or 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 (Mallet et al., 2006).
2. 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 and have a tolerance to variable levels of suspended matter (Barillé et al., 2000). If currents in the vicinity are generally low, elevated suspended matter can result in increase build-up of material beneath culture structures.
3. 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.
4. 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 re-suspend and disperse material from the trestles (Bouchet and Sauriau, 2008).

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 culture of shellfish (subtidal and intertidal) may facilitate the introduction and establishment and 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. While the movement of shellfish stock may facilitate the spread of this species, occurrences in Ireland and the UK may also appear to be associated with marinas and vessel movements.

Intertidal Clam Culture: 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).

Other considerations: Due to the nature of the culture methods (i.e. high density) the risk of transmission of disease within cultured stock is high. The risk of disease transmission from cultured oysters/clams to other species is unknown.

Physical disturbance caused by compaction of sediment from foot traffic and vehicular traffic has been shown to significantly alter the community types (DeGrave et al., 1998; Forde et al., in press). 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.

Table 4. Potential indicative environmental pressures of aquaculture and fishing activities within Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627).

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

CULTURE METHOD	PRESSURE CATEGORY	PRESSURE	POTENTIAL EFFECTS	EQUIPMENT	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY/EFFECTS
		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

6.2 Aquaculture and marine mammal interactions

Potential interactions between mariculture and marine mammals are broadly summarized in Table 5. 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). Furthermore, none of the studies published to explore impacts on marine mammals and in particular harbour seal, were specifically designed to detect ecological impacts on this species (National Research Council 2009; Becker et al., 2009, 2011). Even where studies have been carried out around shellfish farms, uncertainty over spatial and temporal variation in both the location of structures (Watson-Capps and Mann, 2005) and levels of disturbance (Becker et al., 2009; 2011) constrain the conclusions that can be drawn about the impacts of mariculture on critical life history features such as reproduction and foraging.

Mariculture operations are considered a source of marine litter (Johnson, 2008). Ingestion of marine litter has also been shown to cause mortality in birds, marine mammals, and marine turtles (Derraik, 2002). Mariculture structures can provide shelter, roost, or haul-out sites for birds and seals (Roycroft et al., 2004). This is unlikely to have negative effects on bird or seal populations, but it may increase the likelihood that these species cause faecal contamination of mollusc beds.

Harbour Seal (*Phoca vitulina*)

Little information is available on the potential interactions between seals and the activities in question (see National Research Council 2009). There has been no targeted research conducted in similar ecosystems that has directly assessed the impact of this type of aquaculture on harbor seals or indeed any other seal populations. There has, however, been considerable research on short-term responses of harbor seals to disturbance from other sources, and these can be used to inform assessments the potential impacts of disturbance from aquaculture activities currently underway and proposed in Cummeen Strand/Drumcliff Bay SAC. These disturbance studies have focused on impacts upon groups of seals that are already ashore at haul-out sites. Sources of potential disturbance have varied widely, and include people and dogs (Allen et al., 1984; Brasseur & Fedak, 2003), recreational boaters (Johnson & Acevedo-Gutierrez, 2007; Lelli & Harris, 2001; Lewis & Mathews, 2000), commercial shipping (Jansen et al., 2006), industrial activity (Seuront & Prinzivalli, 2005) and aircraft (Perry et al., 2002). A harbor seal's response to disturbance may vary from an increase in alertness, movement towards the water, to actual entering into the water, i.e. flushing (Allen et al., 1984) and is typically governed by the location and nature of the disturbance activity. For example, kayaks may elicit a stronger response than power boats (Lewis & Mathews, 2000; Suryan & Harvey, 1999), and stationary boats have been shown to elicit a stronger response than boats moving along a predictable (or predetermined) route (Johnson & Acevedo-Gutierrez, 2007).

Furthermore, the mean distance at which seals are flushed into the water by small boats and people ranges between 80m and 530m, with some disturbances recorded at distances of over 1000m. In certain areas, these empirical studies have been used to inform management actions in marine protected areas, for example where a 1.5km buffer is set around harbor seal haul-out sites in the Dutch Wadden Sea to exclude recreational disturbance (Brasseur & Fedak, 2003).

Displacement from areas may also result from disturbances attributable to the activities of mariculture workers (Becker et al., 2009; 2011). This disturbance may be caused directly by the presence of workers on intertidal areas. However while disturbance from shellfish culture operations have been observed to influence the distribution of seal within a sheltered embayment, no inference can be made on the effect on broader population characteristics of Harbour Seals from this study (Becker 2011).

In the Cummeen Strand/Drumcliff Bay SAC it would appear that designated Harbour Seal sites are confined to the Drumcliff portion of the SAC. At these sites, it would appear that there is stable numbers of seals (ranging from 51 in July 1978 to 40 in November 2003). In 2011 aerial thermal imaging on one day (August 18), identified 23 harbour seals along with 4 grey seals in Drumcliff on the sheltered side (east) of the sand spit at the Lower Rosses. While no definitive conclusions can be drawn regarding the population status of harbour seals in Drumcliff Bay and more widely around Ireland, it is noted that from a conservation perspective, the population status is considered 'favourable' (NPWS, 2013a and c).

Table 5 Potential interactions between aquaculture activities and the Annex II species Harbour Seal (*Phoca vitulina*), within the Cummeen Strand/Drumcliff Bay SAC (000268).

CULTURE METHOD	PRESSURE CATEGORY	PRESSURE	POTENTIAL EFFECTS	EQUIPMENT	DURATION (DAYS)	TIME OF YEAR	FACTORS CONSTRAINING THE ACTIVITY/EFFECTS
All Aquaculture Methods	**Physical**	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.

7 Appropriate Assessment Screening

A screening assessment is an initial evaluation of the possible impacts that activities may have on the qualifying interests. The screening is a filter which may lead to exclusion of certain activities or qualifying interests from the 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 impact 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. Where there is relevant spatial overlap full assessment is warranted. Likewise if there is no spatial overlap and no obvious interaction is likely to occur, then the possibility of significant impact is discounted and further assessment of possible effects is deemed not to be necessary. Table 3 provides spatial overlap extent between designated marine habitat features and aquaculture activities within the qualifying interests of Cummeen Strand/Drumcliff Bay SAC.

7.1 Aquaculture Activity Screening

The spatial overlap between (existing and proposed) aquaculture activities and Qualifying Interests of the site (i.e. Estuaries (1130), Mudflat and sandflats not covered by seawater at low tide (1140)) are presented in Table 3.

An overview of overlap (ha, %) of aquaculture activities and specific community types within the broad habitat features (identified from Conservation Objectives, NPWS, 2013a) is provided in Tables 6 and 7. None of the aquaculture activities (existing or proposed) overlaps or likely interacts with the following features or species, and therefore **these five habitats and two taxa are excluded from further consideration in this assessment**:

- **1014 Marsh Snail *Vertigo angustior***
- **1099 River Lamprey *Lampetra fluviatilis***
- **2110 Embryonic shifting dunes**
- **2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")**
- **2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)**
- **5130 *Juniperus communis* formations on heaths or calcareous grasslands**
- **7220 Petrifying springs with tufa formation (Cratoneurion)**

In addition, a number of constituent community complexes recorded within the qualifying interests of 'Estuaries' (1130) and 'Mudflats and sandflats not covered by seawater at low tide' (1140) are listed below (NPWS 2013a) and illustrated in Figure 2 also have no overlap with aquaculture activities and are thus excluded from further analysis. These community types are:

- **Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex**
- **Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex**
- ***Zostera*-dominated community**
- **Sand to mixed sediment with amphipods community**
- **Intertidal reef community – (access route very small overlap (≈0.1ha) with access route outside of designated habitat (Estuaries)**

The **Sea Lamprey (*Petromyzon marinus*)** migrates through Cummeen Strand/Drumcliff Bay SAC into the Garavogue River. The aquaculture activities do not present a barrier to migration of these species, given that any structures used (oyster trestles), will be deployed in intertidal areas and not in tidal/freshwater channels. In any event, it is likely that lamprey can swim among and through the trestle structures. Given the activities carried out or proposed for the Cummeen Strand/Drumcliff Bay SAC, it is unlikely that they will impact upon the other attributes and their targets for Sea Lamprey, which are primarily freshwater in nature. The attributes are:

- Extent of anadromy
- Population structure (of juveniles for Sea Lamprey only)
- Juvenile density in fine sediment (Sea Lamprey only)
- Extent and distribution of spawning habitat
- Water Quality - O_2 levels (Twaite Shad only)
- Availability of juvenile habitat (Sea Lamprey only)
- Spawning habitat quality (Twaite Shad only)

On this basis, **Sea Lamprey (*Petromyzon marinus)* has been excluded from further analysis.**

Table 6 Habitat utilisation i.e. spatial overlap in hectares and proportion of specific community type (%) by aquaculture activity within the qualifying interest 1140 of Cummeen Strand/Drumcliff Bay SAC. (Based on licence database provided by DAFM. Habitat data provided in NPWS 2013a, 2013b).

			1140 - Mudflats and sandflats not covered by seawater at low tide (2288ha)	
Culture Species	**Status**	**Location**	**Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. (644ha)**	**Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex. (1423ha)**
Oyster	**Application**	**Intertidal**	**7.86 (1.22)**	**60.27 (4.24)**
Clam	**Licensed**	**Intertidal**	**15.42 (2.4)**	**13.95 (0.98)**
Clam	**Application**	**Intertidal**	**4.75 (0.74)**	**1.86 (0.13)**
Access routes			**0.74 (0.01)**	**5.44 (0.38)**
Totals			**28.77 (4.36)**	**81.52 (5.72)**

Table 7. Habitat utilisation i.e. spatial overlap in hectares and proportion of specific community type (%) by aquaculture activity within the qualifying interest 1130 of Cummeen Strand/Drumcliff Bay SAC. (Based on licence database provided by DAFM. Habitat data provided in NPWS 2013a, 2013b).

			1130 – Estuaries (1258ha)	
Culture Species	**Status**	**Location**	**Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. (258ha)**	**Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex. (796ha)**
Oyster	**Application**	**Intertidal**	**9.43 (3.66)**	**36.14 (4.54)**
Clam	**Licensed**	**Intertidal**	**7.25 (2.81)**	**11.96 (1.50)**
Clam	**Application**	**Intertidal**	**4.39 (1.70)**	**1.86 (0.23)**
Access Routes			**0.42 (0.2)**	**2.0 (0.25)**
Totals			**21.49 (8.37)**	**52.45 (6.52)**

8 Appropriate Assessment

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 constituent habitats and species (Figure 1-3 and NPWS 2013a, b).

Within the Cummeen Strand/Drumcliff Bay SAC the qualifying habitats/species considered further in this assessment are:

- 1130 Estuaries
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1365 Common (Harbour) seal *Phoca vitulina*

For broad habitats and sedimentary community types (Figures 1 and 2) significance of impact is determined in relation to, first and foremost, spatial overlap (see Section 7 and Tables 3, 6, and 7). 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 2013b) for constituent communities. The likelihood of change depends on the sensitivity of the characterising species to the aquaculture activities. Sensitivity is a function of intolerance to the activity and recoverability from the effects of the activity (see Section 8.2 following).
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 disturbed. In the case of spatial disturbance (continuous or ongoing) of more than 15% of any one community type (or qualifying interest), it is deemed to be significant.

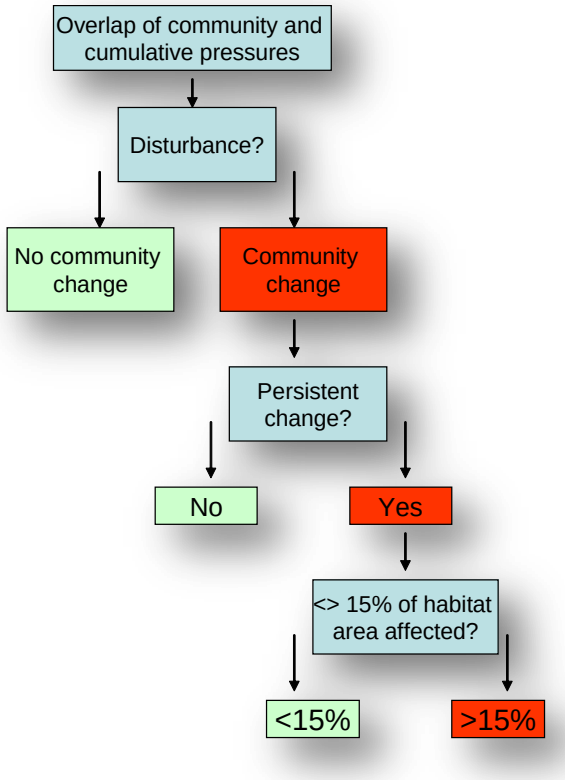

Figure 7. Determination of significant effects on community distribution, structure and function.

In relation to designated species (Harbour Seal) the capacity of the population to maintain itself in the face of anthropogenic induced disturbance at the site will need to accounted for in relation to the Conservation Objectives (CO's) 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 Cummeen Strand/Drumcliff Bay SAC. One source of information is a series of commissioned reviews 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 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 individually is difficult (NPWS 2013b). On this basis, they have proposed broad community complexes as management units. These complexes (for the most part) are general 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 (Table 8); exceptions to this are those biogenic community types

dominated by sensitive taxa, e.g. Mearl, *Mytilus* and *Zostera*. Other literature cited in the assessment does provide a greater degree of confidence in the conclusions. For example, the output of a recent study (Forde et al., in press) has provided greater confidence in terms of assessing likely interactions between intertidal oyster culture and marine habitats. In relation to species interactions, confidence estimates tend to be greater, presumably as a consequence of targeted research (Table 9).

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 2013b).
- 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 Cummeen Strand/Drumcliff Bay SAC to pressures similar to those caused by aquaculture (e.g. smothering, organic enrichment and physical disturbance) are listed, where available, in Table 8. 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 listed, where available, in Table 9. 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). Sensitivity is also considered 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 & Desrocher, 2004) cited in Hall *et al.*, 2008).

Table 8. Matrix showing the sensitivity to pressure scores (ABPMer 2013a-h) of communities recorded within Cummeen Strand/Drumcliff BaySAC (Site Code: 000627).
(Note: Table 11 provides the code for the various categorisation of sensitivity and confidence.)

	Pressure Type														
Community Type (EUNIS code)	**Surface Disturbance**	**Shallow Disturbance**	**Deep Disturbance**	**Trampling-Access by foot**	**Trampling-Access by vehicle**	**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 of sediments-sedimentation**	**Decrease in oxygen levels- sediment**	**Introduction of non-native species**
Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex (A2.24)	NS (***)	L (*)	L (***)	NS (*)	L (*)	L-M (*)	L-M (*)	L-M (*)	NS (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	L (*)
Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. (A5.23)	NS (*)	L (*)	L (*)	NE	NE	L-M (*)	L-M (*)	L-M (*)	M (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)

Table 9 Matrix showing the sensitivity to pressure scores (ABPMer 2013a-h) of characterising species recorded within Cummeen Strand/Drumcliff BaySAC (Site Code: 000627). (Note: Table 11 provides the code for the various categorisation of sensitivity and confidence.)

	Pressure Type														
	Surface Disturbance	**Shallow Disturbance**	**Deep Disturbance**	**Trampling-Access by foot**	**Trampling-Access by vehicle**	**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 of sediments-sedimentation**	**Decrease in oxygen levels- sediment**	**Introduction of non-native species**
Arenicola marina	NS (*)	NS (***)	L-M (***)	NS (***)	NS (***)	NS (*)	L-M (*)	L-M (***)	L-M (***)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	M (*)
Eteone sp.	NS (*)	L (*)	L (*)	NS (*)	L (*)	NS (*)	L-M (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)
Cerastoderma edule	L (*)	L-M (*)	L-M (***)	L-M (***)	L-M (*)	L (***)	L-M (*)	L-H (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (*)	L-M (*)	M (*)
Lanice conchilega	NS (*)	NS-L (***)	NS-L (***)	NS (*)	NS-L (*)	NS (*)	M-H (*)	NS (*)	NS (***)	NS (*)	NS (*)	NS (*)	NS (*)	M (*)	M-H (*)
Nephtys cirrosa	NS (*)	L (***)	L (***)	NS (*)	L (*)	NS (***)	NS (*)	L (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (*)	NS (*)	M (*)
Pygospio elegans	L (*)	L (**)	M (***)	L (*)	L (*)	L (***)	L-M (***)	L-M (*)	NS (**)	L-M (*)	NS (*)	NS (*)	NS (***)	L (**)	M (*)
Scoloplos armiger	NS (*)	L (*)	L-M (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	M (***)	M (*)
Tubificoides spp.	NS (*)	NS (*)	L (**)	L (*)	L (*)	NS (*)	L (*)	NS (*)	NS (*)	NS (***)	NS (*)	NS (*)	NS (***)	NS (***)	NS (*)
Peringia ulvae	L-NS (*)	L (***)	L (*)	L-NS (*)	L-NS (*)	NS (***)	L (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (*)	NS (***)	L (*)	L (*)
Angulus sp. (Moerella)	NS (*)	L (*)	L (***)	NS (*)	L (*)	NS (*)	H (*)	M-H (*)	NS (*)	L-M (*)	L (*)	NS (*)	Nev	NEv	M (*)

Table 10 Codes of sensitivity and confidence applying to species and pressure interactions.

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

8.3 Assessment of the effects of aquaculture production on the Conservation Objectives for habitat features in Cummeen Strand/Drumcliff BaySAC.

For **Mudflats and sandflats not covered by seawater at low tide (1140)** and **Estuaries (1130)** there are a number of relevant attributes (with associated targets) relating to the following broad habitat features;

1. **Habitat Area:** It is unlikely that the activities proposed will reduce the overall extent of permanent habitat within the feature Mudflats and Sandflats not Covered by Seawater at Low Tide and Estuaries. The habitat area in these qualifying interests is likely to remain stable.
2. **Community Distribution - (conserve a range of community types in a natural condition):** Following from the initial screening (Section 7), the following community types, found within the qualifying interest 1140 and 1130 of the SAC have overlap with aquaculture activities:
    - **Fine sand with *Angulus* spp. and *Nephtys* spp. community complex.**
    - **Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex.**

    The community types listed above will be exposed to differing ranges of pressures from aquaculture activities. Table 8 lists the community types (or surrogates) and Table 9 lists their constituent taxa and both provide a commentary of sensitivity to a range of pressures. The risk scores in Table 8 and 9 are derived from a range of sources identified above. The pressures are listed as those likely to result from the primary aquaculture activities carried

out in the Cummeen Strand/Drumcliff Bay SAC. Specifically considered were intertidal oyster culture (bag and trestle) and intertidal on-bottom clam culture. Intertidal oyster culture is not considered 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., in press). 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., in press).

Tables 11 and 12 below identify the likely interactions between the relevant aquaculture activities and the broad habitat features 1140 and 1130, respectively and their constituent community types, with a broad conclusion and justification on whether the activities are 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 (Tables 11 and 12). In addition, combined activities listed overlap with 4.81% and 5.84% of habitat features (1140) Mudflats and Sandflats not covered by seawater at low tide and Estuaries, respectively (Table 3).

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.

3. **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). In addition to large number of oysters in culture, Kochmann et al (2013) identified long residence times, large intertidal areas and suitable substrate (mixed or biogenic) as factors likely contributing to the successful recruitment of oysters in Irish bays. Drumcliff Bay is dominated by fine sedimentary habitats. In addition, Drumcliff Bay the estimated residence time range between 1 day and 7 days and in Cummeen Strand the residence time ranges between 5 days and 10 days, depending upon which model is applied (S. O'Boyle, EPA – personal

communication). Therefore, given the residence times predicted are below the threshold identified by Kochmann et al (2013)(i.e. 21-28 days) it is unlikely larval oysters will be retained in the systems. This feature allied with the dominance of fine substrate within the bay suggests the risk of successful establishment of the Pacific oyster in Drumcliff Bay/Cummeen Strand SAC is 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 and given the short residence times calculated for the SAC, 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 (1-10 days) 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 Cummeen Strand/Drumcliff Bay SAC is considered low.

Table 11 Assessment of effect of aquaculture activities on 1140 community types recorded within Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627).

		1140 - Mudflats and sandflats not covered by seawater at low tide (2288ha)	
Culture Species	**Status**	**Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. (644ha)**	**Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex. (1423ha)**
Oyster	**Application**	**Disturbing:** No **Justification:** The community type and species are considered tolerant to pressures from activity.	**Disturbing:** No **Justification:** The community type and species are considered tolerant to pressures from this activity.
Clam	**Licensed**	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 2.4% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.98% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Clam	**Application**	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.74% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.13% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Access routes		**Disturbing: Y**es **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.32% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.44% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Total (% overlap) of potentially disturbing activities		**3.45%**	**1.54%**

Table 12 Assessment of effect of aquaculture activities on 1130 community types recorded within Cummeen Strand/Drumcliff Bay SAC (Site Code: 000627)

		1130 – Estuaries (1258ha)	
Culture Species	**Status**	**Fine sand with *Angulus* spp. and *Nephtys* spp. community complex. (258ha)**	**Intertidal fine sand with *Peringia ulvae* and *Pygospio elegans* community complex. (796ha)**
Oyster	**Application**	**Disturbing:** No **Justification:** The community type and species are considered tolerant to pressures from activity.	**Disturbing:** No **Justification:** The community type and species are considered tolerant to pressures from activity.
Clam	**Licensed**	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 2.81% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 1.5% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Clam	**Application**	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 1.7% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.13% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Access routes		**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.2% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.	**Disturbing:** Yes **Justification:** The community type and species are considered susceptible to pressures from the activity. Disturbance cannot be discounted. However, the spatial overlap is 0.3% of this community type. Both the individual and cumulative overlap is less than the 15% threshold.
Total (% overlap) of potentially disturbing activities		**4.01%**	**1.93%**

8.4 Assessment of the effects of shellfish production on the Conservation Objectives for Harbour seal (*Phoca vitulina*) in Cummeen Strand/Drumcliff BaySAC.

Cummeen Strand/Drumcliff Bay SAC is designated for the Harbour seal (*Phoca vitulina*). The broad distribution of Harbour seal habitat and sites use are identified in Figure 3. The conservation objectives for this species are listed in Table 1 and can be found in detail in NPWS (2013a; 2013b). While the conservation status of the species is considered favourable at the site (NPWS 2013c), the interactions between harbour seals and the features and aquaculture activities carried out in the SAC must be ascertained.

The interactions between aquaculture operations and aquatic mammal species are 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 or is access to locations restricted?

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

The proposed activities must be considered in light of the following attributes and measures for the Harbour Seal:

- 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 (Figure 3). 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 at sites and during movement to and from culture sites may also result a 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 impacts of these

disturbances at the population level have not been studied more broadly (National Research Council 2009).

Shellfish production has been conducted in Drumcliff Bay since 1984. The current level of production is represented as licenced activities in Figures 3 and 8. It is considered that, given the favourable conservation status of Harbour Seals in Ireland (NPWS 2013c), that the current shellfish production levels (and activities associated with them) are conducive with the favourable conservation status.

However, given the configuration of the aquaculture sites (allied with their likely future use, i.e. oyster culture) and the Harbour seal sites there may be some potential interactions, particularly if mitigating measures are not employed. In Figure 8, at site marked No. 1, the proximity of the oyster trestles to the location might appear to present a barrier and a risk to free movement to the site. However, it is likely the seal site is accessed via the channel of the Carney River. Assuming this channel is not blocked and access to the sandbank from the river channel is not restricted, then the free movement of seals to the site is unlikely to be impacted upon.

At the site marked No. 2 in Figure 8, the current use of the site is clam culture which is unlikely to impact on harbour seal utility of the site, given the nature of the netting (flush with the seabed) and the frequency of access to the site. However, there may be some negative interactions if oyster trestles are deployed at the site instead of clam netting, whereby access to the tidal channel by the seals might be restricted upon the deployment of oyster trestles as opposed to clam netting. In order to mitigate this risk, it is recommended that the access to the channel from the location (see figure 8) should not be impeded by the presence of oyster trestles by agreement with the operators or realignment of the site.

It might be assumed that there is some disturbance to the seal population by activity involved in these culture operations in the bay. This would be especially true at the sensitive times of the year (breeding and moulting, i.e. May to September). However, it must also be noted that it is expected that seals have become habituated or at the least, tolerant of regular/predictable activities (including aquaculture operations which have been in operation since 1984) and as a consequence disturbance is likely minimised. On this basis, it will be important that operators adhere to a strict maintenance schedule and strongly adhere to the conditions identified in any licence relating to their activity which might be designed to minimise any potential disturbance of wildlife, e.g. the use of scaring devices.

Conclusion 3: The current levels of licenced aquaculture (existing) are considered non-disturbing to Harbour seal conservation features in all areas of the SAC. One exception might occur at site No. 2

(see Figure 8). If oyster trestles are utilised they should not be positioned to impede seal movement between the resting/breeding location and the main drainage channel. In addition, operators should note sensitive times of years for seals and continue to tailor their activities to minimise potential disturbance.

Conclusion 4: In relation to new licence applications, given the potential broad range of Harbour Seal within the SAC, the risk of disturbance to Harbour seal posed by an expansion of aquaculture is not considered significant given the locations of areas for which applications have been received (tend to be more confined to Cummeen Strand or adjacent to existing aquaculture activities) and thus away from identified seal haul-out sites (sheltered areas). Notwithstanding, operators should note sensitive times of years for seals and adapt their activities to minimise any potential disturbance at all locations within the SAC.

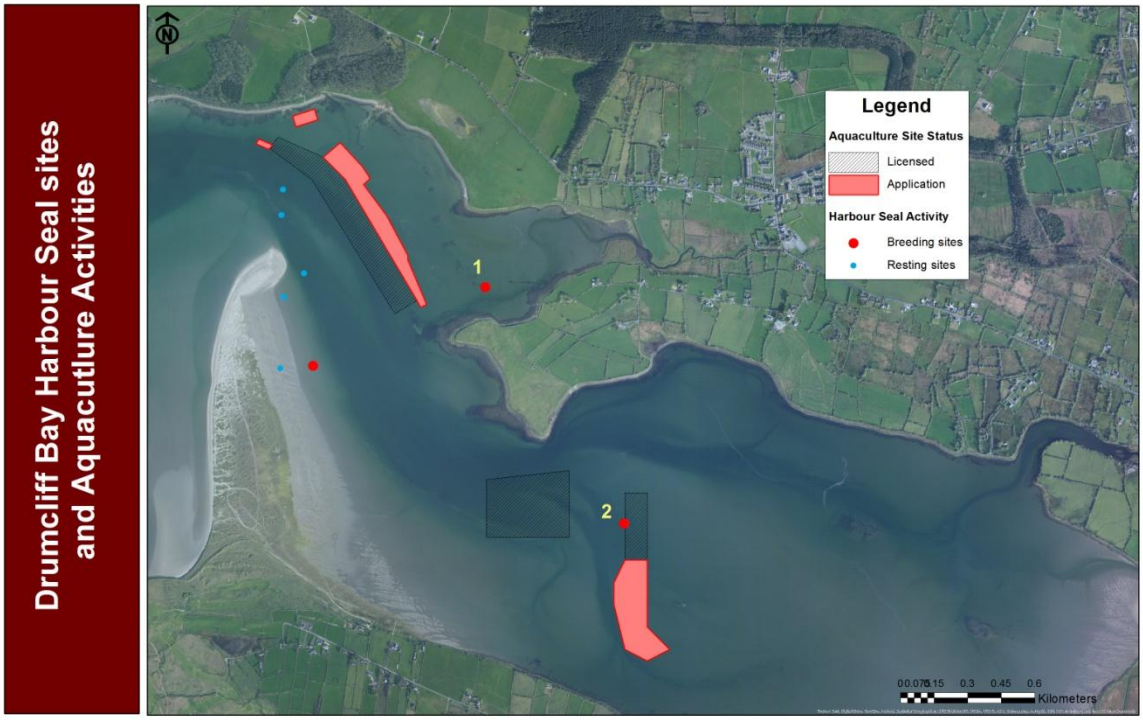

Figure 8. Harbour seal Sites and Aquaculture Sites (licenced and applications) Drumcliff Bay part of the Cummeen Strand/Drumcliff Bay SAC (Site Code 00627).

8.5 Assessment of the effects of shellfish production on the Conservation Objectives for 'Mytilidae-dominated community complex' in the Drumcliff Bay/Cummeen Strand SAC.

Mytilidae-dominated community complex occurs in certain areas in both Drumcliff Bay and Cummeen Strand. The patch in Drumcliff Bay is outside of the Qualifying Interests for which the SAC is designated but is still within the SAC boundary. This community type is considered a keystone

community and is considered important to the overall structure and function of the SAC (NPWS, 2013a, b). As a consequence, this community type must be afforded protection.

Aquaculture activity (intertidal oyster and clam culture) within Drumcliff Bay spatially overlaps (1.94%) with this community type and by virtue of this overlap it may have negative effects on the distribution and quality of this community type (Figure 9). The potential effects of this aquaculture type, which are listed in Table 5, include current alteration, increased deposition, compaction due to foot and vehicular traffic. On this basis, the risk posed to this community type by aquaculture activity cannot be excluded. A mitigating feature is that the location of this community type appears to be in the main channel in the Bay and thus predominantly subtidal. It is likely this area is not or will not be used for aquaculture activities and therefore the risk may be reduced. It is recommended that the aquaculture site boundaries be redrawn to exclude any potential overlap with this community type and that a sufficient buffer (>30m) be included to allow for mapping error among other things.

Conclusion 5: Intertidal oyster and clam culture in Drumcliff Bay is considered disturbing to 'Mytilidae-dominated community complex'. It is recommended that the site boundaries be redrawn to exclude this community type. It is recommended that a suitable buffer zone be applied in order to allow for mapping anomalies and enforcement measures.

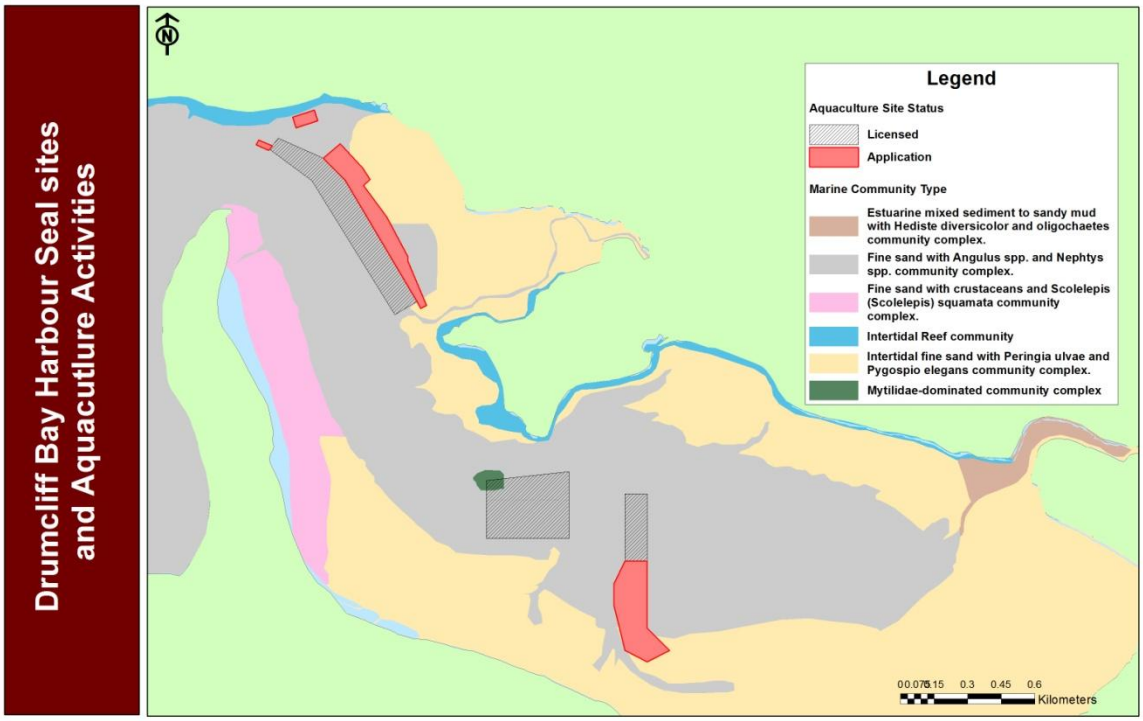

Figure 9. Aquaculture activities and marine community types in Drumcliff Bay/Cummeen Strand SAC, highlighting the overlap of an aquaculture activity with 'Mytilidae-dominated community complex' in Drumcliff Bay.

9 In-combination effects of activities

There are a number of Oyster Fishery Order areas within the SAC (particularly Drumcliff Bay). Sir Robert Gore Booth was granted licence to farm oysters off the Lissadell seashore in 1865 and that licence has been held at Lissadell to the present day. Currently the order is operated by Atlantic Clams (under aquaculture licence) for the production of oysters and clams. Therefore, activities currently carried out under this Fishery order have already been considered in this assessment.

There are no fisheries activities (potting, netting and dredging) that occur within the SAC and overlap with sensitive community types which if considered in-combination with aquaculture activities would likely exacerbate the extent of disturbance.

The Shellfish Water Characterisation Study prepared by the Department of Environment[5] was consulted in order to identify any pressures that might result in additive or synergistic pressures to those identified as originating from aquaculture activities. It is acknowledged that the pressures resulting from aquaculture activities are primarily morphological in nature. It was, therefore, concluded that given the pressure resulting from say, a point discharge location (e.g. urban waste-water treatment plant or combined sewer overflow – Table 13) would likely impact on physico-chemical parameters in the water column and given the short residence times observed in the Bays, the pressure would likely be short lived and not significantly disturbing to conservation features. Any in-combination effects with aquaculture activities were considered to be minimal or negligible. On this basis the activities identified (Table 13) were not considered a risk to conservation features, either individually or in-combination with other pressures. In summary, there are no likely in-combination effects between these other licenced activities and aquaculture.

Table 13. Wastewater treatment facilities in vicinity of Sligo Harbour Shellfish growing waters.

Name	Dist km	Status	Treatment level
Dromahair	10-20	Good	Secondary and nutrient removal
Rosses Point	0-5	High	Primary
Sligo	0-5	Good	Secondary with UV disinfection
Strandhill	0-5	nd	Secondary

Other activities that may occur in the SAC are primarily recreational activities (sailing, boating, fishing and beach activities). Visual examination of aerial images (www.bing.com/maps) reveal

[5]http://www.environ.ie/en/Publications/Environment/Water/PublicConsultations-ShellfishWatersDirective/FileDownLoad,21899,en.pdf

considerable vehicular activity at the Lower Rosses in Drumcliff Bay which may present a disturbance risk to seals as well as habitat damage due to compaction. It is unclear if these activities require consent.

10 Aquaculture Appropriate Assessment Conclusion

In Cummeen Strand/Drumcliff Bay SAC there are a range of aquaculture activities currently being carried out and proposed. Based upon this and the information provided in the aquaculture profiling (Section 5), the likely interaction between aquaculture methodology and conservation features (habitats and species) of the site was considered.

10.1 Annex I Habitats

In relation to habitats an initial screening exercise resulted in a number of habitat features and species being excluded from further consideration. None of the aquaculture activities (existing or proposed) overlaps or likely interacts with the following features or species, and therefore these five habitats and 2 taxa were excluded from further consideration in the assessment:

- 1014 Marsh Snail *Vertigo angustior*
- 1099 River Lamprey *Lampetra fluviatilis*
- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")
- 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- 7220 Petrifying springs with tufa formation (Cratoneurion)

In addition, a number of constituent community complexes recorded within the qualifying interests of Estuaries (1130) and Mudflats and sandflats not covered by seawater at low tide (1140) also have no overlap with aquaculture activities and were excluded from further analysis. These community types are:

- Estuarine mixed sediment to sandy mud with *Hediste diversicolor* and oligochaetes community complex
- Fine sand with crustaceans and *Scolelepis (Scolelepis) squamata* community complex
- *Zostera*-dominated community
- Sand to mixed sediment with amphipods community
- Intertidal reef community – (very small overlap (≈100m) with access route in only for which it is not a designated community type)

Finally, the aquaculture activities did not present a barrier to migration and on the (freshwater) attributes for the **Sea Lamprey (*Petromyzon marinus)*** and therefore was excluded from further analysis.

A full assessment was carried out on the likely interactions between aquaculture operations (as proposed) and the features Annex 1 habitats Mudflats and sandflats not covered by seawater at low tide (1140) and Estuaries (1130). The likely effects of the aquaculture activities were considered in light of the sensitivity of the constituent communities of these Annex 1 habitats. A number of issues were highlighted in Section 8.3 and relate to certain aquaculture and habitat/species interactions the conclusions and subsequent recommendations are presented below.

Conclusion 1 – On the basis that aquaculture activities which might be considered potentially disturbing to Annex 1 habitat conservation features occur at a level not considered significant, the activities will unlikely have any detrimental impact on the habitat conservation features for the site.

Conclusion 2. Given the short residence time 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 SAC is considered low.

Conclusion 3: Intertidal oyster and clam culture in Drumcliff Bay is considered disturbing to 'Mytilidae-dominated community complex'. It is recommended that the site boundaries be redrawn to exclude this community type and a suitable buffer zone be applied in order to allow for mapping anomalies and enforcement measures.

10.2 Annex II Species

The likely interactions between the proposed aquaculture activities and the Annex II Species Harbour Seal (*Phoca vitulina*) was also assessed. The objectives for this species in the SAC focus upon maintaining the good conservation status of the population.

It is acknowledged in this assessment that the favourable conservation status of the Harbour Seal (*Phoca vitulina*) has been achieved given current levels of aquaculture production within the SAC. The aspect of the culture activities that could potentially disturb the Harbour Seal status relates to the locations of structures at one site and the movement of people and vehicles to and from as well as within the sites.

Conclusion 4: The current levels of licenced aquaculture (existing) are considered non-disturbing to Harbour Seal conservation features in all areas of the SAC. One exception is that at site No 2 (see Figure 8), oyster trestles should not be positioned to impede seal movement between the

resting/breeding location and the main drainage channel. In addition, operators should note sensitive times of years for seals and continue to tailor their activities to minimise potential disturbance.

Conclusion 5: In relation to new licence applications, given the potential broad range of Harbour Seal within the SAC, the risk of disturbance to Harbour Seals posed by an expansion of aquaculture is not considered significant given the locations of areas for which applications have been received (tend to be more confined to Cummeen Strand or adjacent to existing aquaculture activities) and thus away from identified seal haul-out sites (sheltered areas). Notwithstanding, operators should note sensitive times of years for seals and adapt their activities to minimise any potential disturbance at all locations within the SAC.

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