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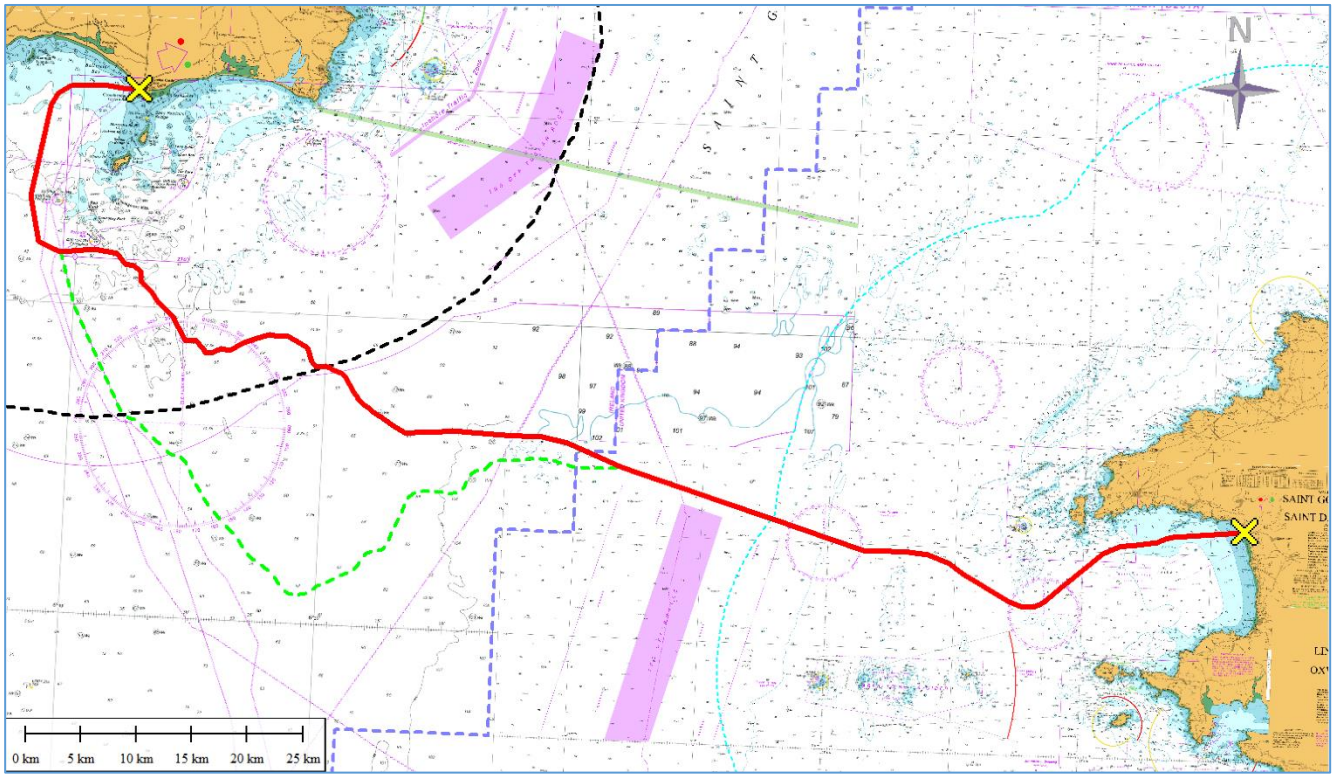
Marine & Environmental Consultancy

Natura Impact Statement – Information for a Stage 2 (Natura Impact Statement) AA for marine survey and site investigation works at Kilmore Quay, Co. Wexford.



23rd November 2023

Prepared by: [redacted] (MCIEEM) of Altemar Ltd.
On behalf of: McMahon Design and Management Ltd.

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Document Control Sheet			
Project	Natura Impact Statement - Information for a Stage 2 (Natura Impact Statement) AA for marine survey and site investigation works at Kilmore Quay, Co. Wexford.		
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1. Introduction

The following Natura Impact Statement (NIS) has been prepared by **Altemar Ltd.** for marine survey and site investigation works for an Ireland/UK marine fibre optic cable.

An Appropriate Assessment is an assessment of the potential effects of a proposed project or plan, on its own, or in combination with other plans or projects, on one or more European sites. European sites are those sites designated as Special Areas of Conservation (SAC) or Special Protection Areas (SPA). An AA Screening was carried out for the proposed survey project and concluded that '*The project is limited in scale and extent and the potential zone of influence is restricted to the immediate vicinity of the survey route, with the exception of underwater noise that may extend beyond the survey corridor. The proposed intertidal survey is within Ballyteige Burrow SAC. Further, it should be noted that the Saltee Islands SAC has been screened IN due to the potential movements of grey seals (qualifying interest of this SAC). The distribution of these species may bring them within the proximity of the subtidal survey works. Standard marine mammal mitigation measures will be in place (in compliance with NPWS guidance) and as a result it is required to go to NIS for this SAC.*

Acting on a strictly precautionary basis, NIS is required in respect of the effects of the project on the Ballyteige Burrow SAC, Saltee Islands SAC, Ballyteige Burrow SPA, and Saltee Islands SPA (potential habitat and disturbance effects in the absence of mitigation) because it cannot be excluded on the basis of best objective scientific information following screening, in the absence of control or mitigation measures that the plan or project, individually and/or in combination with other plans or projects, will have a significant effect on the named European Site/s.' In addition, there is potential for effects on marine mammals from underwater noise and mitigation measures are required to prevent significant effects on marine mammals that are species outlined in Annex IV

This Natura Impact Statement (NIS) examines whether the plan or project, either alone, or in combination with other plans and projects, in the view of best scientific knowledge and in view of the sites' conservation objectives, will adversely affect the integrity of the European sites or species populations for which the site/s were designated.

Altemar Ltd.

Since its inception in 2001, Altemar has been delivering ecological and environmental services to a broad range of clients. Operational areas include residential, infrastructural, renewable, oil & gas, private industry, local authorities, EC projects and State/semi-State Departments. [redacted] is the managing director of Altemar. [redacted] is an environmental scientist and marine biologist with 28 years' experience working in Irish terrestrial and aquatic environments, providing services to the State, Semi-State and industry. [redacted] (MCIEEM) holds a MSc in Environmental Science, BSc (Hons.) in Applied Marine Biology, NCEA National Diploma in Applied Aquatic Science and a NCEA National Certificate in Science (Aquaculture). Bryan Deegan carried out all elements of this Appropriate Assessment Screening.

Background to the Appropriate Assessment

The Habitats Directive 92/43/EEC (together with the Birds Directive (2009/1477/EC)) forms the cornerstone of Europe's nature conservation policy. The Directive protects over 1000 animals and plant species and over 200 "habitat types" which are of European importance. In the Habitats Directive, Articles 3 to 9 provide the legislative means to protect habitats and species of European Community interest through the establishment and conservation of an EU-wide network of conservation sites (Natura, 2000). These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive), Article 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect European sites. Article 6(3) establishes the requirement for Appropriate Assessment:

"Any plan or project not directly connected with or necessary to the management of the [EUROPEAN] site but likely to have a significant effect thereon, either individually or in combination with other plans and projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implication for the site and subject to the provisions of paragraph 4, the component national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."

As outlined in "Managing European sites, The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC" (European Commission, 21 November 2018) *"The purpose of the appropriate assessment is to assess the implications of the plan or project in respect of the site's conservation objectives, either individually or in combination with other plans or projects. The conclusions should enable the competent authorities to ascertain whether the plan or project will adversely affect the integrity of the site concerned. The focus of the appropriate assessment is therefore specifically on the species and/or the habitats for which the European site is designated."*

As outlined in the EC guidance document on Article 6(4) (January 2007)[1]:

"Appropriate assessments of the implications of the plan or project for the site concerned must precede its approval and take into account the cumulative effects which result from the combination of that plan or project with other plans or projects in view of the site's conservation objectives. This implies that all aspects of the plan or project which can, either individually or in combination with other plans or projects, affect those objectives must be identified in the light of the best scientific knowledge in the field.

Assessment procedures of plans or projects likely to affect European sites should guarantee full consideration of all elements contributing to the site integrity and to the overall coherence of the network, both in the definition of the baseline conditions and in the stages leading to identification of potential impacts, mitigation measures and residual impacts. These determine what has to be compensated, both in quality and quantity. Regardless of whether the provisions of Article 6(3) are delivered following existing environmental impact assessment procedures or other specific methods, it must be ensured that:

- *Article 6(3) assessment results allow full traceability of the decisions eventually made, including the selection of alternatives and any imperative reasons of overriding public interest.*
- *The assessment should include all elements contributing to the site's integrity and to the overall coherence of the network as defined in the site's conservation objectives and Standard Data Form, and be based on best available scientific knowledge in the field. The information required should be updated and could include the following issues:*
    - *Structure and function, and the respective role of the site's ecological assets;*
    - *Area, representativity and conservation status of the priority and nonpriority habitats in the site;*
    - *Population size, degree of isolation, ecotype, genetic pool, age class structure, and conservation status of species under Annex II of the Habitats Directive or Annex I of the Birds Directive present in the site;*
    - *Role of the site within the biographical region and in the coherence of the European network; and,*
    - *Any other ecological assets and functions identified in the site.*
- *It should include a comprehensive identification of all the potential impacts of the plan or project likely to be significant on the site, taking into account cumulative impacts and other impacts likely to arise as a result of the combined action of the plan or project under assessment and other plans or projects.*

[1] European Commission. (2007).Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission;

- *The assessment under Article 6(3) applies the best available techniques and methods, to estimate the extent of the effects of the plan or project on the biological integrity of the site(s) likely to be damaged.*
- *The assessment provides for the incorporation of the most effective mitigation measures into the plan or project concerned, in order to avoid, reduce or even cancel the negative impacts on the site.*
- *The characterisation of the biological integrity and the impact assessment should be based on the best possible indicators specific to the European assets which must also be useful to monitor the plan or project implementation."*

Stages of the Appropriate Assessment

This Appropriate Assessment screening was undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001), Part XAB of the Planning and Development Act 2000, as amended, in addition to the December 2009 publication from the Department of Environment, Heritage and Local Government; 'Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities' and the European Communities (Birds and Natural Habitats) Regulations 2011. In order to comply with the above Guidelines and legislation, the Appropriate Assessment process must be structured as follows:

1) Screening stage:
    - Description of plan or project, and local site or plan area characteristics;
    - Identification of relevant European sites, and compilation of information on their qualifying interests and conservation objectives
    - Identification and description of individual in combination effects likely to result from the proposed project;
    - Assessment of the likely significance of the effects identified above. Exclusion of sites where it can be objectively concluded that there will be no likely significant effects; and,

      Conclusions
2) Appropriate Assessment (Natura Impact Statement):
    - Description of the European sites that will be considered further;
    - Identification and description of potential adverse impacts on the conservation objectives of these sites likely to occur from the project or plan; and,
    - Mitigation Measures that will be implemented to avoid, reduce or remedy any such potential adverse impacts
    - Assessment as to whether, following the implementation of the proposed mitigation measures, it can be concluded, beyond all reasonable scientific doubt, that there will be no adverse impact on the integrity of the relevant European Site in light of its conservation objectives"
    - Conclusions.

If it can be demonstrated during the AA screening phase (Stage 1), that the proposed project will not have a significant effect, whether alone or in combination with other plans or projects, on the conservation objectives of a European site, then no further AA (Stage 2) will be required. It is important to note that there is a requirement to apply a precautionary approach to AA screening. Therefore, where effects are possible, certain or unknown at the screening stage, AA will be required.

In addition, it should be noted that Article 6(3) of the Habitats Directive must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an AA of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site.

2. Stage 1 Screening Assessment

Management of the Site

The plan or project is not directly connected with, or necessary to the management of NATURA 2000 sites.

Description of the Proposed Project

The applicant plans to investigate the feasibility of constructing a new subsea telecoms cable system, TUSKAR, linking Ireland to the United Kingdom, from a landfall at Kilmore Quay to a landfall at Newgale on the South west coast of Wales as shown in Figure 1 below. This Works Methodology is produced in support of an application for a marine survey and site investigations licence under the Maritime Area Planning Act 2021, and should not be used for any other purpose apart from that expressly stated in this document. The applicant intends to undertake the survey campaign across the Licence Application Area within the IRL Exclusive Economic Zone (EEZ) in order to inform the location and design of the cable route and landfall.

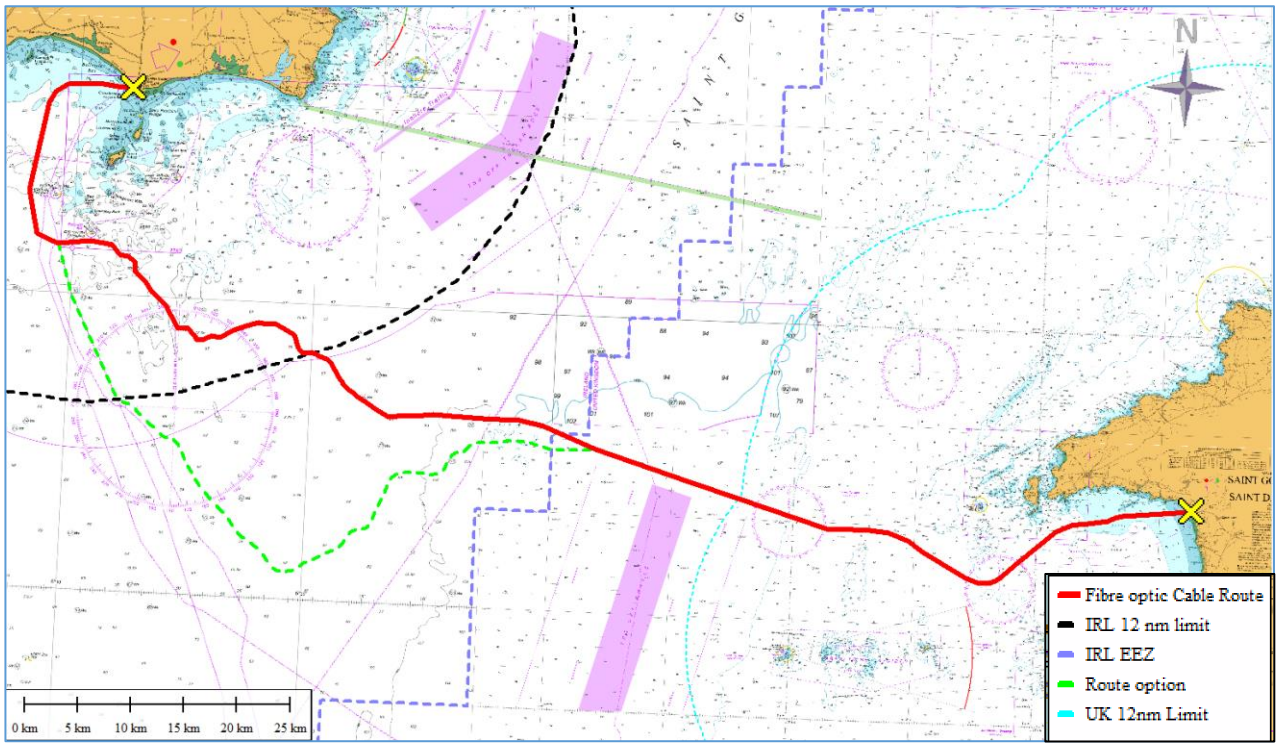

Figure 1. Proposed Telecoms Cable System

This Works Methodology has been prepared by McMahon Design and Management Ltd on behalf of the applicant and forms part of an application for a Licence for Marine Survey and Site Investigations for route and landfall options traversing the Celtic Sea and St Georges Channel. The works will be carried out predominantly by remote sensing seabed mapping techniques (geophysical survey) with some selective sampling of the upper layers of the seabed (geotechnical survey). Once the results of the survey are obtained and analysed a preferred route corridor will be determined, design and method statements will be developed and a final Route Position List (RPL) will be defined as part of further submissions for a Maritime Area Consent and Planning consent for the installation works.

PROPOSED SURVEY ROUTE AND SURVEY LICENCE APPLICATION AREA IN IRISH TERRITORIAL WATERS

Licence Application Area

The License Application Area is situated off the coast of Wexford (Figure 2). The survey corridor has total length of approx. 154 km and a total area of 10,191 hectares within EEZ limits. A cable route corridor of between 400m to 1500m in width will be surveyed within the licence application area.

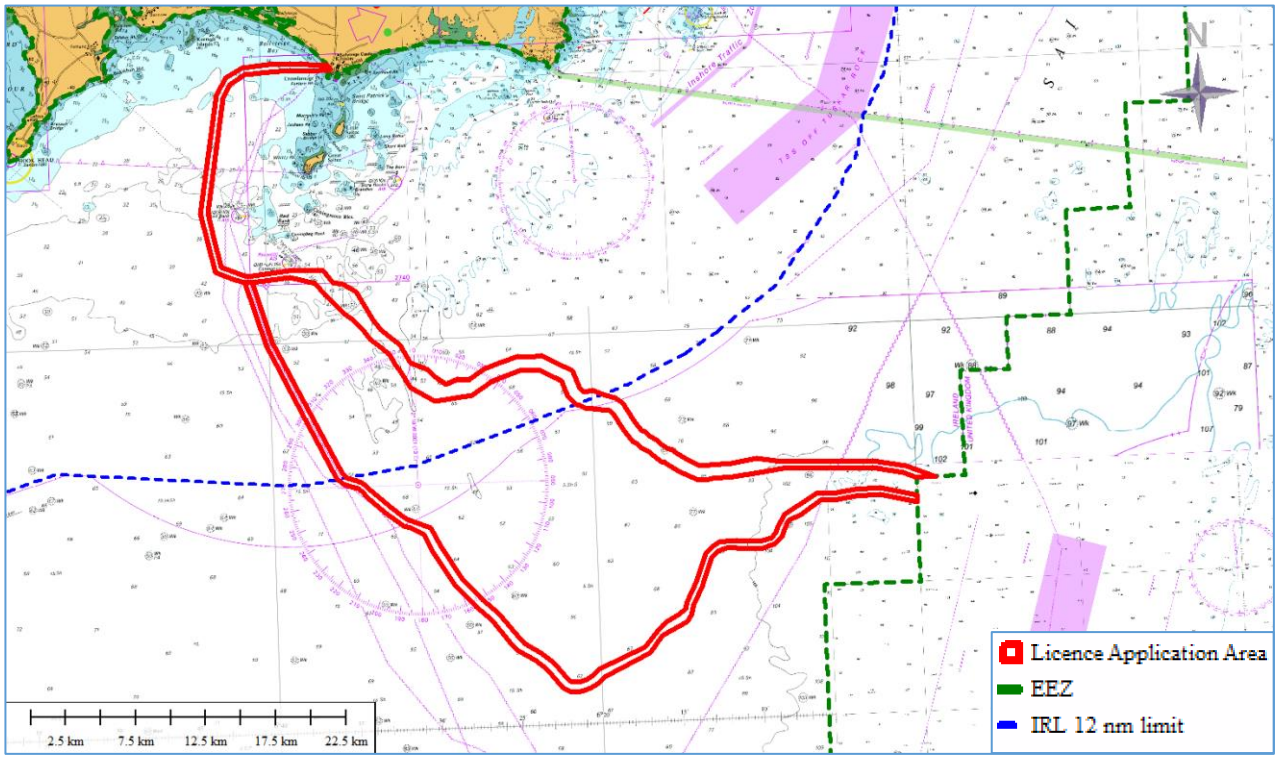

Figure 2. Proposed Survey Licence Application Area.

Figure 3. Landfall Location

Landfall & Inshore Survey Corridors

The licence application area covers the landfall at Kilmore Quay, with a survey corridor traversing the Celtic Sea and St Georges Channel to the East. The general location is shown in Figure 3.

Kilmore Quay

The licence application area covers a landfall at Kilmore Quay, Wexford. The landfall location is adjacent to the car park at Ballyteige Burrow / Crossfarnoge Beach. Any requirement for beach access for survey will be via the existing established tracks and paths from the car park. The Route Position List for the Licence Application Area is presented in Table 1a+2b below.

Idx	Latitude	Longitude	Idx	Latitude	Longitude
1	52° 02' 23.3446" N	6° 40' 57.8793" W	40	51° 54' 53.7596" N	6° 15' 30.6628" W
2	52° 02' 32.8829" N	6° 38' 35.6753" W	41	51° 54' 35.1228" N	6° 14' 43.3844" W
3	52° 02' 17.1398" N	6° 37' 00.7264" W	42	51° 54' 15.0215" N	6° 13' 44.0368" W
4	52° 01' 49.5663" N	6° 36' 25.1314" W	43	51° 54' 12.4897" N	6° 13' 06.7906" W
5	52° 01' 04.1131" N	6° 35' 11.3274" W	44	51° 54' 15.3307" N	6° 12' 42.8291" W
6	52° 00' 53.1912" N	6° 34' 50.1960" W	45	51° 54' 17.4672" N	6° 11' 23.2457" W
7	52° 00' 30.6172" N	6° 34' 13.9019" W	46	51° 54' 25.9228" N	6° 09' 46.9736" W
8	52° 00' 02.9839" N	6° 33' 41.5270" W	47	51° 54' 32.2832" N	6° 08' 20.3505" W
9	51° 59' 45.1542" N	6° 33' 05.1372" W	48	51° 54' 27.3403" N	6° 04' 51.2287" W
10	51° 59' 26.7036" N	6° 32' 31.8770" W	49	51° 54' 26.7803" N	6° 04' 24.0261" W
11	51° 59' 05.5327" N	6° 32' 13.6099" W	50	51° 54' 25.6371" N	6° 03' 38.1885" W
12	51° 58' 49.0776" N	6° 31' 57.0497" W	51	51° 54' 26.7474" N	6° 02' 44.5335" W
13	51° 58' 10.9375" N	6° 31' 17.8851" W	52	51° 54' 12.8490" N	6° 00' 48.2875" W
14	51° 57' 37.7383" N	6° 29' 46.6925" W	53	51° 53' 58.7080" N	5° 59' 59.9999" W
15	51° 57' 42.7364" N	6° 28' 47.8886" W	54	51° 54' 00.0000" N	5° 59' 59.9999" W
16	51° 57' 48.5467" N	6° 27' 29.7327" W	55	51° 54' 00.0048" N	5° 59' 33.7673" W
17	51° 58' 16.8343" N	6° 26' 16.1776" W	56	51° 54' 00.0091" N	5° 58' 49.6394" W
18	51° 58' 29.9473" N	6° 25' 19.1314" W	57	51° 54' 28.3451" N	6° 00' 40.0876" W
19	51° 58' 40.2175" N	6° 24' 26.2516" W	58	51° 54' 42.9766" N	6° 02' 42.4644" W
20	51° 58' 38.6061" N	6° 23' 43.3432" W	59	51° 54' 41.8255" N	6° 03' 38.0990" W
21	51° 58' 40.6220" N	6° 23' 14.8845" W	60	51° 54' 42.9470" N	6° 04' 23.0645" W
22	51° 58' 28.1103" N	6° 22' 39.5392" W	61	51° 54' 43.5074" N	6° 04' 50.2897" W
23	51° 58' 12.6828" N	6° 21' 51.9863" W	62	51° 54' 48.4521" N	6° 08' 19.4876" W
24	51° 57' 35.8701" N	6° 21' 29.1111" W	63	51° 54' 57.9573" N	6° 09' 54.3197" W
25	51° 57' 18.0120" N	6° 20' 58.0344" W	64	51° 54' 49.7234" N	6° 11' 28.0699" W
26	51° 57' 16.0585" N	6° 20' 45.7902" W	65	51° 54' 47.5522" N	6° 12' 48.9229" W
27	51° 57' 14.1587" N	6° 20' 41.4375" W	66	51° 54' 45.1834" N	6° 13' 08.9037" W

Idx	Latitude	Longitude	Idx	Latitude	Longitude
28	51° 57' 09.2239" N	6° 20' 27.2006" W	67	51° 54' 46.4821" N	6° 13' 28.0074" W
29	51° 57' 01.7540" N	6° 18' 58.7972" W	68	51° 55' 02.9843" N	6° 14' 16.7287" W
30	51° 56' 56.0106" N	6° 18' 45.3006" W	69	51° 55' 18.6315" N	6° 14' 56.4193" W
31	51° 56' 16.7561" N	6° 18' 08.1852" W	70	51° 55' 25.2915" N	6° 15' 06.0126" W
32	51° 55' 58.6513" N	6° 17' 46.6051" W	71	51° 55' 29.0134" N	6° 15' 26.4163" W
33	51° 55' 48.9250" N	6° 17' 36.0767" W	72	51° 55' 38.0212" N	6° 15' 45.3501" W
34	51° 55' 43.8438" N	6° 17' 21.4653" W	73	51° 55' 50.1538" N	6° 16' 07.2699" W
35	51° 55' 31.1703" N	6° 16' 59.9768" W	74	51° 55' 57.4789" N	6° 16' 28.7641" W
36	51° 55' 23.5941" N	6° 16' 37.7429" W	75	51° 56' 10.0534" N	6° 16' 50.0833" W
37	51° 55' 13.1119" N	6° 16' 18.8033" W	76	51° 56' 13.3364" N	6° 16' 59.5222" W
38	51° 54' 59.6885" N	6° 15' 50.5865" W	77	51° 56' 17.2511" N	6° 17' 03.7590" W
39	51° 54' 56.8728" N	6° 15' 35.1475" W	78	51° 56' 34.5614" N	6° 17' 24.3873" W

Table 1a. Licence Application Area RPL.

Idx	Latitude	Longitude	Idx	Latitude	Longitude
79	51° 57' 18.5634" N	6° 18' 05.9815" W	107	52° 02' 47.5993" N	6° 36' 32.9877" W
80	51° 57' 31.2462" N	6° 18' 35.7828" W	108	52° 02' 48.9378" N	6° 38' 38.8948" W
81	51° 57' 37.2614" N	6° 19' 07.7753" W	109	52° 02' 37.1365" N	6° 41' 13.3002" W
82	51° 57' 38.8675" N	6° 19' 19.1471" W	110	52° 02' 44.1627" N	6° 41' 42.9624" W
83	51° 57' 49.7688" N	6° 19' 56.6267" W	111	52° 02' 56.5277" N	6° 42' 31.0937" W
84	51° 57' 47.1873" N	6° 20' 29.9312" W	112	52° 03' 02.1040" N	6° 42' 50.8457" W
85	51° 57' 55.1307" N	6° 20' 44.9762" W	113	52° 04' 10.3813" N	6° 43' 15.4195" W
86	51° 58' 35.6542" N	6° 21' 10.1483" W	114	52° 05' 07.4447" N	6° 43' 35.3533" W
87	51° 58' 56.4762" N	6° 22' 14.3191" W	115	52° 09' 32.0507" N	6° 42' 23.3707" W
88	51° 59' 13.9760" N	6° 23' 03.7575" W	116	52° 10' 01.4739" N	6° 41' 56.5749" W
89	51° 59' 11.0735" N	6° 23' 44.7487" W	117	52° 10' 24.8532" N	6° 40' 59.9568" W
90	51° 59' 12.8748" N	6° 24' 32.7352" W	118	52° 10' 28.9533" N	6° 39' 29.7306" W
91	51° 59' 00.5607" N	6° 25' 36.1412" W	119	52° 10' 30.7484" N	6° 38' 09.2758" W
92	51° 58' 46.0204" N	6° 26' 39.3935" W	120	52° 10' 26.6462" N	6° 37' 01.2518" W
93	51° 58' 22.3917" N	6° 27' 40.8375" W	121	52° 10' 29.7494" N	6° 35' 38.2031" W
94	51° 58' 26.2128" N	6° 28' 19.9131" W	122	52° 10' 33.0429" N	6° 35' 40.5498" W
95	51° 58' 16.0810" N	6° 29' 04.6255" W	123	52° 10' 38.6148" N	6° 35' 46.5405" W
96	51° 58' 31.0430" N	6° 29' 41.3541" W	124	52° 10' 42.7960" N	6° 36' 59.5164" W
97	51° 58' 48.6985" N	6° 30' 08.0418" W	125	52° 10' 46.9537" N	6° 38' 08.4646" W
98	51° 59' 06.2787" N	6° 31' 12.6693" W	126	52° 10' 45.1084" N	6° 39' 31.1779" W

99	51° 59' 21.6927" N	6° 31' 28.1774" W	127	52° 10' 40.6911" N	6° 41' 08.3686" W
100	51° 59' 46.9511" N	6° 31' 49.9651" W	128	52° 10' 18.1722" N	6° 42' 11.5188" W
101	52° 00' 09.8793" N	6° 32' 31.2906" W	129	52° 09' 37.4989" N	6° 42' 48.5561" W
102	52° 00' 25.5525" N	6° 33' 03.2748" W	130	52° 05' 07.0628" N	6° 44' 02.0810" W
103	52° 00' 51.6142" N	6° 33' 33.8029" W	131	52° 04' 06.9265" N	6° 43' 41.0637" W
104	52° 01' 54.3087" N	6° 34' 30.0739" W	132	52° 02' 50.7445" N	6° 43' 13.6342" W
105	52° 02' 13.6137" N	6° 35' 18.2440" W	133	52° 02' 32.8980" N	6° 42' 08.5716" W
106	52° 02' 18.6973" N	6° 35' 55.6791" W	134	52° 02' 24.1218" N	6° 41' 25.7202" W

Table 2a. Licence Application Area RPL continued

Idx	Latitude	Longitude	Idx	Latitude	Longitude
1	52° 02' 24.1218" N	6° 41' 25.7202" W	40	51° 49' 01.9780" N	6° 14' 21.7401" W
2	51° 59' 56.9991" N	6° 40' 12.1957" W	41	51° 49' 11.3787" N	6° 14' 17.5127" W
3	51° 54' 49.8688" N	6° 36' 06.2746" W	42	51° 49' 28.0241" N	6° 14' 09.1037" W
4	51° 54' 42.9589" N	6° 35' 56.6458" W	43	51° 50' 11.5829" N	6° 13' 33.8675" W
5	51° 54' 40.7952" N	6° 35' 53.6052" W	44	51° 50' 14.8938" N	6° 13' 31.2745" W
6	51° 54' 33.8268" N	6° 35' 37.8633" W	45	51° 51' 12.8411" N	6° 12' 56.4795" W
7	51° 54' 28.5409" N	6° 35' 20.9124" W	46	51° 51' 28.4106" N	6° 12' 33.4783" W
8	51° 54' 24.8505" N	6° 34' 58.4741" W	47	51° 51' 34.6405" N	6° 12' 00.3037" W
9	51° 54' 21.5447" N	6° 34' 45.3233" W	48	51° 51' 34.4528" N	6° 11' 21.1545" W
10	51° 54' 17.1743" N	6° 34' 33.7429" W	49	51° 51' 30.0317" N	6° 09' 51.6052" W
11	51° 54' 12.0528" N	6° 34' 25.6317" W	50	51° 51' 39.2065" N	6° 08' 57.4074" W
12	51° 54' 04.6157" N	6° 34' 18.5426" W	51	51° 51' 55.5461" N	6° 08' 32.0898" W
13	51° 53' 22.8932" N	6° 33' 02.0452" W	52	51° 52' 12.2321" N	6° 08' 22.3574" W
14	51° 53' 02.3461" N	6° 32' 19.8370" W	53	51° 52' 32.6269" N	6° 08' 03.6885" W
15	51° 52' 52.1750" N	6° 31' 58.2450" W	54	51° 52' 45.7012" N	6° 07' 17.1342" W
16	51° 52' 46.4913" N	6° 31' 36.3291" W	55	51° 53' 15.3890" N	6° 06' 01.9427" W
17	51° 52' 43.5726" N	6° 31' 21.4643" W	56	51° 53' 16.7010" N	6° 04' 57.3153" W
18	51° 52' 30.5905" N	6° 30' 45.6709" W	57	51° 53' 22.3949" N	6° 03' 50.3577" W
19	51° 51' 51.4260" N	6° 30' 15.3993" W	58	51° 53' 24.3358" N	6° 02' 21.0594" W
20	51° 50' 34.2636" N	6° 29' 00.4505" W	59	51° 53' 02.5665" N	5° 59' 59.9986" W
21	51° 49' 39.8765" N	6° 27' 40.3549" W	60	51° 53' 19.3666" N	5° 59' 59.9989" W
22	51° 49' 07.4827" N	6° 26' 44.8038" W	61	51° 53' 40.5826" N	6° 02' 18.3155" W
23	51° 48' 17.1623" N	6° 25' 40.4491" W	62	51° 53' 38.5335" N	6° 03' 52.6022" W
24	51° 47' 54.9053" N	6° 25' 08.8330" W	63	51° 53' 32.7331" N	6° 05' 00.8150" W
25	51° 47' 31.4479" N	6° 24' 07.2856" W	64	51° 53' 31.2621" N	6° 06' 16.1896" W
26	51° 47' 08.8799" N	6° 23' 23.8852" W	65	51° 53' 21.4063" N	6° 06' 46.2596" W

27	51° 46' 26.9225" N	6° 22' 29.9130" W	66	51° 52' 46.2080" N	6° 08' 20.7885" W
28	51° 46' 20.5673" N	6° 22' 14.4117" W	67	51° 52' 18.2039" N	6° 08' 46.7545" W
29	51° 46' 16.1467" N	6° 21' 55.5449" W	68	51° 52' 06.3974" N	6° 08' 52.7038" W
30	51° 46' 15.1360" N	6° 21' 34.3271" W	69	51° 51' 53.3181" N	6° 09' 10.7172" W
31	51° 46' 18.7142" N	6° 21' 08.8681" W	70	51° 51' 46.4519" N	6° 09' 55.4660" W
32	51° 46' 23.1163" N	6° 20' 46.0589" W	71	51° 51' 50.7441" N	6° 11' 22.4241" W
33	51° 46' 31.7200" N	6° 20' 20.6643" W	72	51° 51' 50.8895" N	6° 12' 01.0802" W
34	51° 46' 48.3972" N	6° 19' 48.1403" W	73	51° 51' 48.3757" N	6° 12' 25.6075" W
35	51° 47' 39.9953" N	6° 16' 59.7287" W	74	51° 51' 42.3840" N	6° 12' 47.0439" W
36	51° 48' 16.6697" N	6° 16' 11.9729" W	75	51° 51' 22.5660" N	6° 13' 18.5118" W
37	51° 48' 21.7457" N	6° 16' 03.9973" W	76	51° 50' 20.5314" N	6° 13' 55.7528" W
38	51° 48' 37.6989" N	6° 15' 11.7672" W	77	51° 49' 34.1034" N	6° 14' 33.3896" W
39	51° 48' 47.7614" N	6° 14' 37.7216" W	78	51° 49' 17.6377" N	6° 14' 41.7055" W

Table 3b. Route option Area RPL.

vIdx	Latitude	Longitude	Idx	Latitude	Longitude
79	51° 49' 03.6720" N	6° 15' 09.2278" W	107	51° 50' 47.4368" N	6° 28' 31.7774" W
80	51° 48' 50.9943" N	6° 15' 49.5941" W	108	51° 52' 01.8728" N	6° 29' 44.0789" W
81	51° 48' 42.7322" N	6° 16' 07.4524" W	109	51° 52' 46.1669" N	6° 30' 18.3059" W
82	51° 48' 27.4182" N	6° 16' 31.5146" W	110	51° 52' 58.4453" N	6° 31' 10.7718" W
83	51° 47' 52.9261" N	6° 17' 16.4257" W	111	51° 53' 01.6921" N	6° 31' 27.3066" W
84	51° 47' 07.0055" N	6° 20' 07.5497" W	112	51° 53' 06.2977" N	6° 31' 45.0652" W
85	51° 46' 50.0270" N	6° 20' 40.6509" W	113	51° 53' 15.1401" N	6° 32' 03.8359" W
86	51° 46' 43.4841" N	6° 20' 59.9572" W	114	51° 53' 35.3272" N	6° 32' 45.3027" W
87	51° 46' 39.9773" N	6° 21' 18.0698" W	115	51° 54' 15.0497" N	6° 33' 58.1278" W
88	51° 46' 37.3238" N	6° 21' 36.9437" W	116	51° 54' 21.9661" N	6° 34' 04.7198" W
89	51° 46' 37.8320" N	6° 21' 47.7436" W	117	51° 54' 29.9343" N	6° 34' 17.3387" W
90	51° 46' 40.2813" N	6° 21' 58.1647" W	118	51° 54' 36.0376" N	6° 34' 33.5101" W
91	51° 46' 43.3741" N	6° 22' 05.6832" W	119	51° 54' 40.2221" N	6° 34' 50.1556" W
92	51° 47' 24.3295" N	6° 22' 58.3976" W	120	51° 54' 43.7431" N	6° 35' 11.5635" W
93	51° 47' 49.3615" N	6° 23' 46.4943" W	121	51° 54' 45.9283" N	6° 35' 24.3351" W
94	51° 48' 11.9208" N	6° 24' 45.7225" W	122	51° 54' 54.4209" N	6° 35' 36.3610" W
95	51° 48' 31.2687" N	6° 25' 13.2054" W	123	51° 54' 59.5153" N	6° 35' 44.8030" W
96	51° 49' 22.4130" N	6° 26' 18.5759" W	124	52° 00' 03.0094" N	6° 39' 47.7708" W
97	51° 49' 55.2545" N	6° 27' 14.9097" W	125	52° 02' 23.3446" N	6° 40' 57.8793" W

Table 4b. Route option Area RPL continued.

Figure 4. Landfall at Kilmore Quay

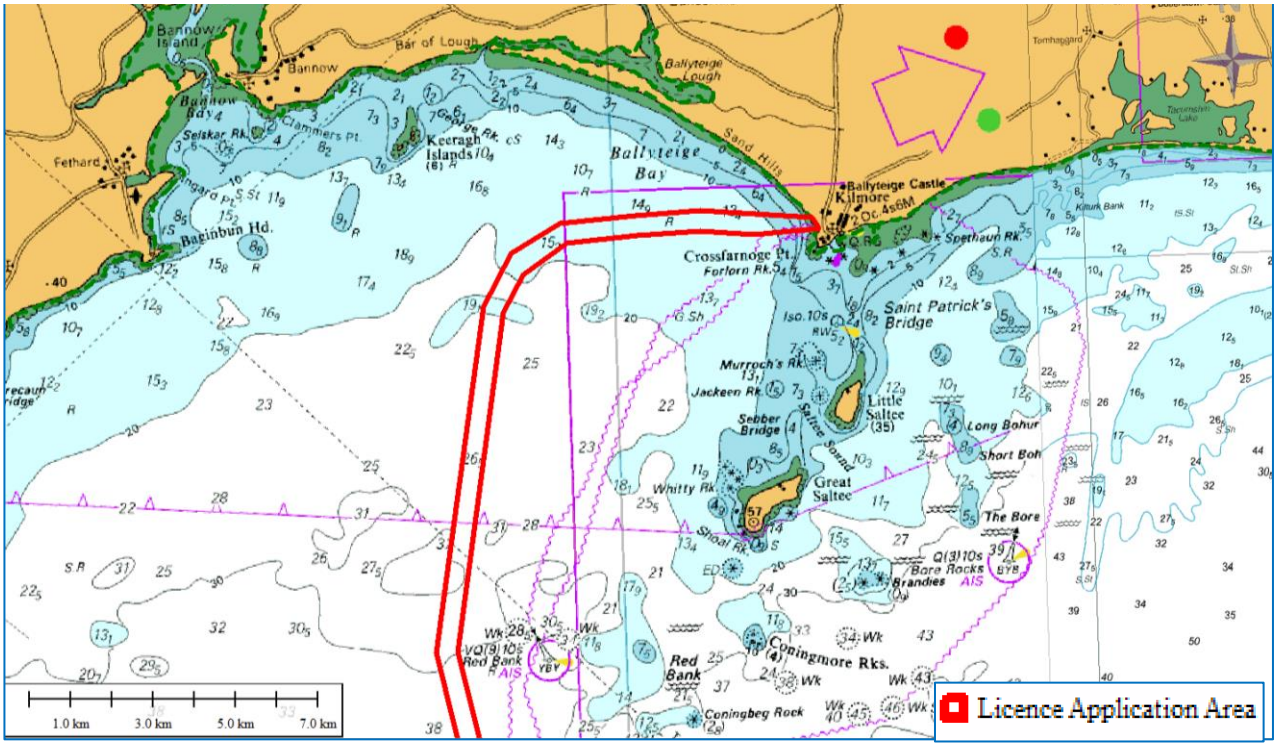

Figure 6. Inshore Survey Sections and Landfalls.

The general line of the inshore section of the survey route is shown on an Admiralty Chart base in Figure 6. The route heads west from the landfall, parallel to existing cables, before turning South and then easterly towards Wales, staying south of the Saltee Islands. Offshore, route options are explored to investigate the optimum route for cable installation.

The landfall location shown on Ordnance Survey Maps are provided in Drawing 1359-001 and included with the Licence Application.

MARINE SURVEY & SITE INVESTIGATIONS SCHEDULE OF WORKS

The principal objective of the Marine Survey & Site Investigations is to ascertain a feasible and safe route for cable system design, deployment, survivability and subsequent maintenance with due regard for environmental and ecological considerations. The survey will also enable decisions to be made on cable armouring and burial. The survey will identify the necessary water depths, route features, seabed obstructions, seabed geomorphology and cable hazards and will also provide detailed information on the seabed sediment, subsurface stratigraphy and upper sediment layers to support cable route and installation engineering. The site investigations will provide "ground-truthing" of the geophysical data along the route.

The objectives of the marine geophysical survey shall be:

- To collect up to date high-resolution bathymetry along a 400 – 1500m wide cable corridor within the License Application Area;
- To obtain information on the seabed surface (type, texture, variability, etc.) and in particular, to identify any seabed features that may be of interest.
- Identify any shallow geohazards and man-made hazards (including but not limited to outcropping, boulders, shallow gas, wrecks, debris etc.);
- Determine the stratigraphy of the upper layers of the seabed along the cable route and quantify the variability in the lateral and vertical extents to depths of 2-5m
- Identify any magnetic anomalies;
- Identify sensitive marine habitats which will need to be avoided during site investigations and sampling.

The survey operations will be broken down into separate but overlapping areas, with boundaries defined by water depth as specified in the technical requirements outlined below.

These water depth boundaries may be adjusted due to suitability of the survey vessel(s) and survey spread. The survey and survey line spacing will be designed to ensure adequate coverage and overlap of geophysical measurements.

- Landfall Survey – Intertidal Zone
- Inshore Survey – from 3m Chart Datum to 15m Chart Datum
- Offshore Survey – Water depths greater than 15m Chart Datum

In order to ensure data continuity, coverage between the survey areas is required with indicated overlap below;

- Landfall Survey to Inshore Survey – 50m overlap
- Inshore Survey to Offshore Survey – 500m overlap

Landfall Survey & Site Investigations

A non-intrusive topographic survey along the line of the cable route at the landfall is required to the low water mark. Intertidal and beach surveys (walkover survey) will be carried out on the beach by the project ecologist and the project archaeologist.

The topographical survey would typically be carried out by GPS Rover, Total Station or UAV Aerial Drone using photogrammetry or LiDAR techniques. The terrestrial geophysical survey will comprise remote sensing techniques such as Ground Penetrating Radar or Electrical Resistivity Tomography (ERT) to establish subsurface features and depth to bedrock and magnetometer or handheld marine metal detector to locate buried ferrous objects.

Landfall Site Investigations will be undertaken to establish the depth and nature of the sediment. The focus of the site investigations will be on the upper layers of sediment to assess the feasibility of cable burial and installation techniques. The following may be undertaken at the landfall:

- Bar probes on the intertidal at 10m spacing (approx. 8 to 10 at the landfall).
- Bar probes from the Low Water Line to the 3m water depth contour at 30m spacing. (approx. 8 to 10 at the landfall)
- 3 Trial Pits on the beach (target depth 2.5m).

The bar probes on the intertidal are manually driven to a depth of 2 metres simply to prove the depth of upper layers of sand, gravel or soft material.

The Trial Pits will be positioned at approximately 30 to 50m centres starting seaward of the High Water Mark. The Trial Pits will be excavated, logged, photographed and backfilled in a single tidal cycle. The trial pits will be backfilled with the original excavated materials in the sequence in which they are excavated.

A summary Method Statement for excavation of the Trial Pits is as follows;

- Excavate sand and place to one side.
- Excavate substrate and place separate from sand.
- Measure, log and photograph each Trial Pit.
- Backfill in sequence compacting with bucket of back-hoe as the backfilling proceeds.

Inshore Marine Survey

The area extending seaward from the low water mark at the landfall and inshore of the safe working draft limits of the primary survey vessel will be accurately surveyed with a small craft or Unmanned Survey Vessel (USV) using Multibeam Echosounder (MBES), sidescan sonar, marine magnetometer and sub-bottom profile equipment. Sub-bottom profile equipment will be able to discern the nature and density of the upper 3 metres of seabed and will be used on a non-interfering basis with other sounding systems. A minimum of seven survey lines, based upon the Survey RPL, is required.

Features such as shallow reefs, surge channels, debris fields, archaeological features or anything that could be a hazard to the cable or installation team will be noted. General reconnaissance of the survey corridor beyond the planned survey lines and tie-lines may be necessary to describe the seabed as accurately as possible. A line plan showing number of survey lines as a function of depth will be determined prior to start of survey operations.

Survey Area	Depth Range	Survey Corridor Width	Min. # of Lines	Min. Overlap	Typical Survey Speed
Inshore	3m to 15m	400 - 500m	9	SSS: 100% MBES Bathy: 20%	4 knots

Table 5 Inshore Survey.

Offshore Marine Survey

The area extending seaward from the outer limits of the inshore survey to the EEZ limits will be surveyed by the primary survey vessel using Multibeam Echosounder (MBES), sidescan sonar, marine magnetometer and sub-bottom profiler equipment. A continuous bathymetric swathe along with side scan sonar imagery and sub-bottom traces will be obtained, centred on the preliminary route and along all wing lines needed to complete the route corridor coverage. A minimum of seven survey lines, based upon the Survey RPL, is required.

Sub-bottom profile equipment will be able to discern the nature and density of the upper 3 metres of seabed and will be used on a non-interfering basis with other sounding systems.

Survey Area	Depth Range	Survey Corridor Width	Min. # of Lines	Min. Overlap	Typical Survey Speed
Offshore	> 15m	500m - 1500	7	SSS: 100% MBES Bathy: 20%	4 knots

Table 6. Offshore Survey.

Marine Site Investigations and Seabed Sampling

The purpose of the marine site investigations and seabed sampling is to evaluate the physical properties of the superficial seabed sediments along the cable route. These methodologies will ensure that a full understanding of the subsurface is achieved, focussing on the upper 3 metres of sediment to subsequently develop a cable burial assessment, installation and burial plan.

The scheduled site investigations and seabed sampling within EEZ limits will comprise of the following techniques:

- Up to 26 CPTs (2m to 3m)
- Up to 19 Gravity Cores / Vibrocores (3m)
- Up to 17 Grab Samples

Indicative locations for the relevant site investigation activities (Gravity or Vibrocore and CPT's) are shown in Figure 7. Typically, individual sampling positions will be determined following initial interpretation of the geophysical survey data. The positioning of individual site investigation locations will also take into consideration environmental constraints such as the position of sensitive habitats or archaeological features.

Two or more attempts may be made at each location to acquire a suitable sample. If an acceptable sample is achieved on the first attempt, there is no need to perform a second attempt.

An acceptable sample is defined as;

- Grab Sample – recovery of approximately a full bucket of sediment. Recovery of large size granular material may be taken as indication of a hard seabed.
- Gravity Core / Vibrocore – recovery of < 3m core of soil. If stiff or hard soils are encountered and are clearly indicated in the sample, it sample may be deemed acceptable. Any sample site yielding less than 1m of recovery must be investigated a second or third time unless there is obvious damage to the coring equipment indicating a hard or rocky substrate.
- CPT – Penetration to the 2m target depth or refusal. Any push resulting in less than 2m penetration will warrant a second attempt.

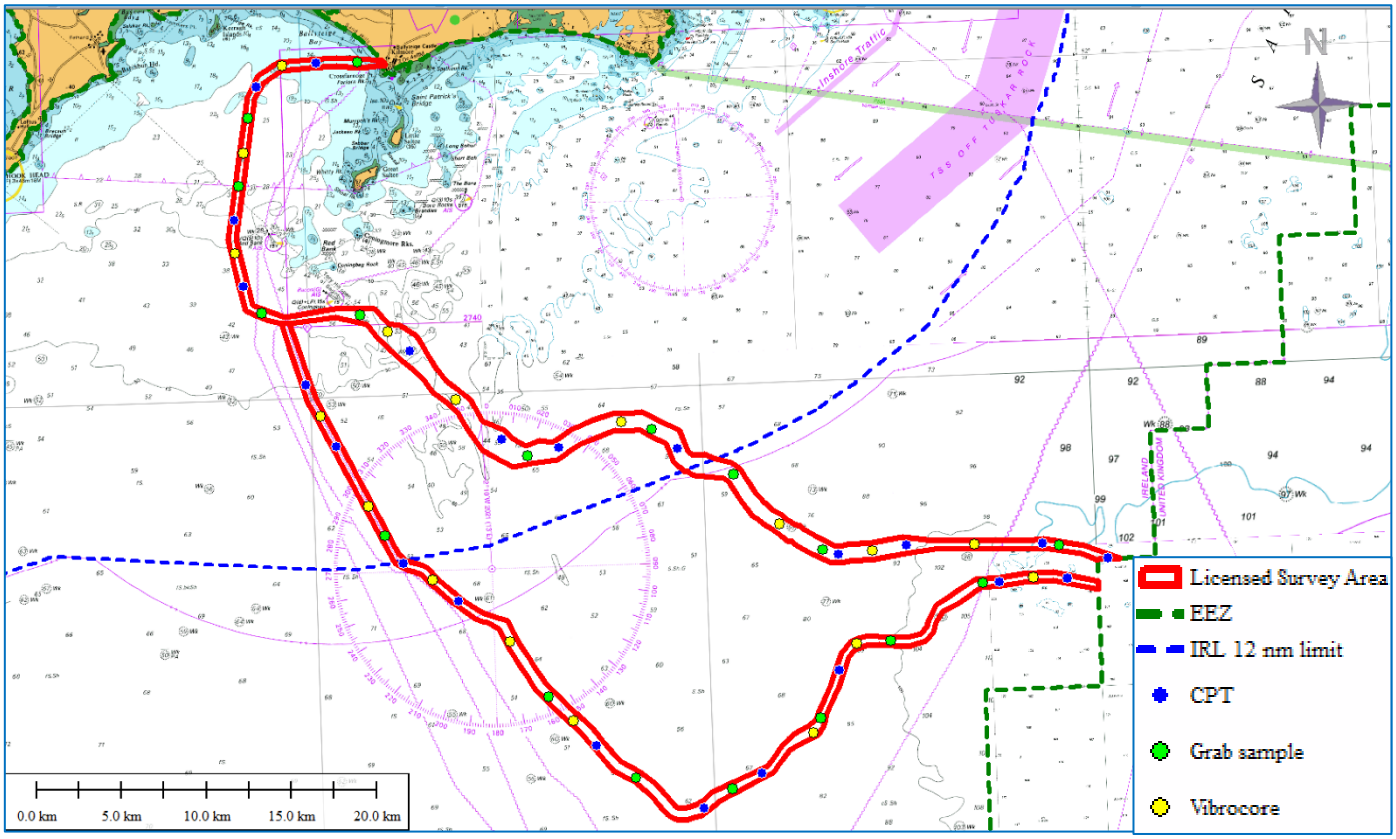

Figure 7. Indicative CPT and Vibrocore Locations.

Seabed Sampling

The total overall scope of the Site Investigations is as follows:

- Bar Probes — 10 No. on the intertidal
- Trial Pits — 3 No. on the beach
- Bar Probes — 10 No. from Low Water to 3m contour.
- Grab Samples — 17 No. along the route corridor.
- Gravity Cores / Vibrocores — 19 No. along the route corridor.
- Cone Penetration Tests — 26 No. along the route corridor.

Underwater Video Survey

Underwater video camera system may be used for inspections of the seabed to investigate seabed obstructions, marine archaeology or benthic habitats. An underwater drop-down camera system or similar may be used in a series of video transects which would be georeferenced and later mapped in GIS.

Archaeological Survey

The survey specification takes into account archaeological data acquisition to enable professional archaeological interpretation and analysis of data. The survey equipment deployed and data acquisition and processing shall comply with the requirements of the National Monuments Service, Underwater Archaeology Unit.

All archaeological assessments will be carried out under by a suitably qualified and experienced marine archaeologist to determine the location of all known archaeological features in advance of the intrusive site investigations and seabed sampling. The data collected will be used to support the archaeological assessments.

SURVEY EQUIPMENT PARAMETERS

Multibeam Echosounder (MBES)

Echo-sounders are a diverse group of acoustic sources used to collect information on bathymetry, seabed features and objects in the water column (e.g. Multi beam echosounder, scientific echo-sounders/ fish-finders). They measure water depth by emitting rapid pulses of sound towards the seabed and measuring the sound reflected back.

Multibeam Echosounder (MBES) will be used during the marine survey to provide detailed 3 dimensional bathymetric mapping of the cable route corridor using multiple beams elongated in the across-track direction to cover a fan-shaped sector (or swath) (Figure 8). Measurements of the across-track beam from MBES showed 3 dB beam widths of 150-160°; in the along-track orientation beam width is narrow, typically ~1.5-3.0° (Crocker & Fratantonio 2016).

MBES is non-intrusive and does not interact with the seabed. The MBES system will be used will be confirmed following the appointment of a survey contractor but typical systems which can be taken as examples would be the R2 Sonic 2024, Kongsberg EM2040 or Teledyne Seabat T50 which would be hull mounted on the survey vessel.

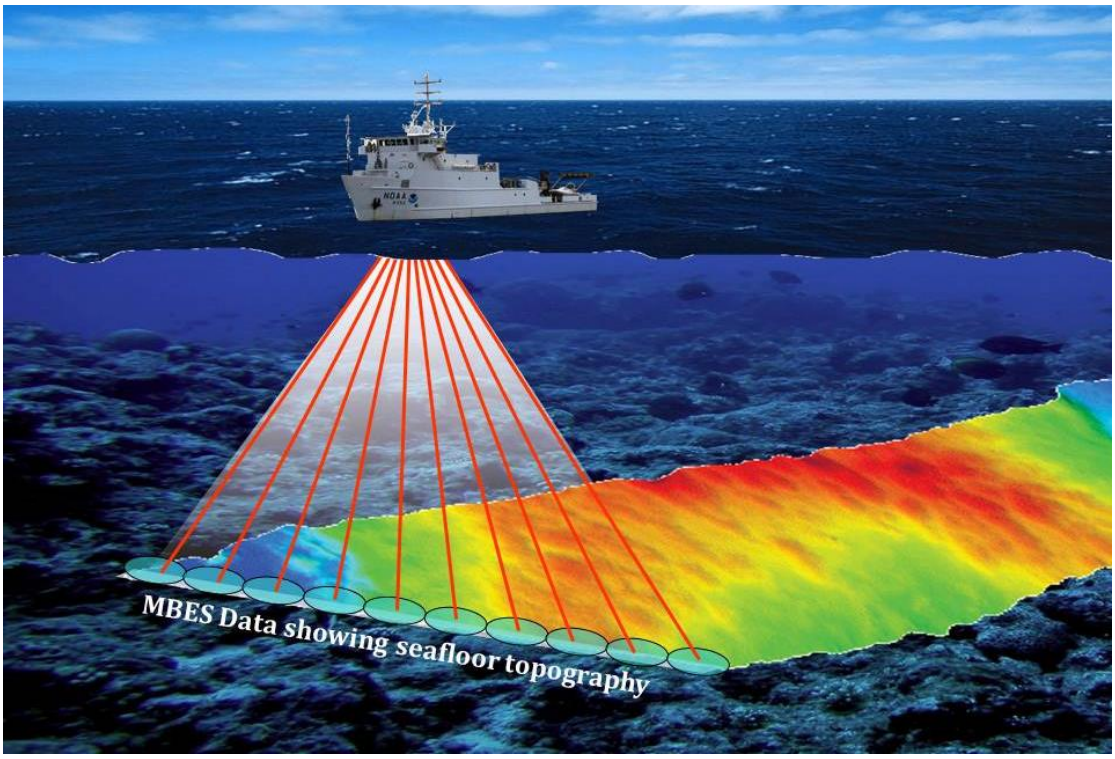

Figure 8. Graphic of MBES survey in operation

The acoustic signal emitted by MBES systems is short duration, typically of a few milliseconds or less, and can be configured to within the range 0.05-10 ms for certain systems. Repetition rates are highly customisable, varying with signal frequency and water depth. Ping rates of up to 10-20 pings per second may be used in very high frequency systems, whereas there may be several seconds between pings in low-frequency deep-water applications.

For collecting information on the seabed, emitted sound frequencies are typically between 12 – 400 kHz depending on water depth, with surveys in continental shelf applications operating at between 70 to 150 kHz, and in shallower waters of less than 200 m using multi-beam echosounders operating at between 200 and 500 kHz The typical operating frequencies for the cable route survey within the licence application area will be in the range of 200kHz to 500kHz. (Danson 2005, Hopkins 2007, Lurton and DeReutier 2011)

Maximum sound source pressure levels of MBES have been reported as ranging from 210-245 dB re 1µPa at 1m with the highest levels corresponding to the lowest frequency systems (DECC 2011, Lurton and DeReutier 2011, Lurton 2016, BEIS 2020). The highest measured source levels among three MBES systems when operated at maximum power for central operating frequencies of ≥100 kHz was between Lp,pk 225-228 dB re 1µPa at 1m (LE,p 181-197 dB re 1µPa^2 s at 1m (Crocker & Fratantonio 2016).

Side-scan Sonar

Side-scan sonar (SSS) is a seabed imaging technique used to provide high-resolution and detailed 2 dimensional imagery of the seabed for a variety of purposes. SSS involves the use of an acoustic beam to obtain an accurate image over a narrow area of seabed to either side of the instrument.

Piezoelectric transducers in the SSS generate high-frequency acoustic pulses which are directed either side of the tow fish. The transducers are oriented such that the acoustic signal covers a wide angle perpendicular to the path of the tow fish through the water, providing information on a strip either side of the device (port and starboard). The intensity of the acoustic reflections from the seafloor is recorded in a series of cross-track images. When stitched together along the direction of motion, these images form a waterfall view of the sea floor within the swath of the beam. The range (swath width) is dependent upon the frequency, power and other source configurations, but is typically between 50-300 m on both sides.

Analysis of SSS data can aid identification of seafloor sediment, surficial bedrock outcrops and geomorphology mapping. Obstacles rising proud of the seafloor, such as shipwrecks, boulders, pipelines, outfalls, exposed cables, fishing gear etc. can cast shadows on the resulting seafloor image where no acoustic signal is returned. The size of the shadow can be used to determine the size of the feature casting it (Figure 9).

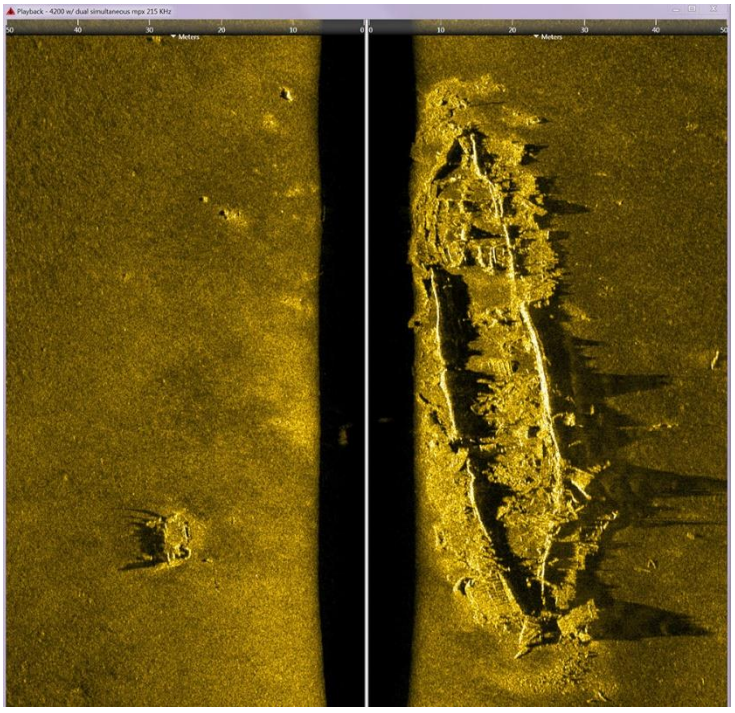

Figure 9. SSS image of shipwreck on seabed and nadir gap.

SSS is non-intrusive and does not interact with the seabed. The SSS system will be used will be confirmed following the appointment of a survey contractor but typical systems which can be taken as examples would be the Klein 3000 or Edgetech 4200 (Figure 10). The SSS may be hull mounted but is typically towed at depth behind the survey vessel on an armoured tow cable.

Figure 10. Deployment of Edgetech 4200 Tow fish.

Acoustic signal durations of SSS systems are short (0.4ms – 1.0ms), but vary between models and configurations with longer signal durations are required to survey greater ranges. Repetition rates are highly customisable with ping rates of up to several tens of pings per second (Crocker & Fratantonio 2016).

The frequencies used by side-scan sonar are relatively very high, typically between 100 and 900 kHz. Most SSS systems offer real-time dual frequency operation which allows acquisition of both frequencies across a swath independently and simultaneously. The higher frequency produces higher resolution data and sharper images but with a narrow swath width while the lower frequency results in wider seabed coverage at lower resolutions.

SSS typically offer a selection of two operational frequencies in the range of 100-500 kHz, or may operate both simultaneously. Some models may offer an upper frequency of up to 900 kHz for applications requiring the highest resolution data. Across-track resolutions vary between 1-8 cm with finer resolution at higher operating frequencies. The typical operating frequencies for the cable route survey within the licence application area will be between 200 to 700 kHz.

The line spacing for the survey will be determined after consideration of all factors including water depth and prevailing conditions at time of survey. Generally for SSS, full coverage requires two passes with 100% overlap over a given area of sea-floor, with the two passes each insonifying the sea-floor from opposite directions to ensure targets are adequately imaged. This also ensures that the 'nadir gap' or the centre of the image directly under the path of the towfish is fully covered (Figure 9).

Sound source pressure levels of SSS systems have been reported typically in the range Lp,pk 200-240 dB re 1µPa at 1m. (BOEM 2016, BEIS 2020, DAHG 2014). Maximum calibrated source levels, (sound pressure) measured by Crocker & Fratantonio (2016) were Lp, pk 227 dB re 1µPa at 1m for a 0.1 ms pulse, whereas the highest energy source level of LE, p 205 dB re 1µPa^2 s at 1m corresponded to a longer pulse of 1.1 ms at lower maximum pressure (Lp, pk 210 dB re 1µPa at 1m).

Marine Magnetometer

A marine magnetometer is a passive towed sensor used to measure magnetic field strength and to detect variations in the total magnetic field of the underlying seafloor. The magnetometer does not transmit any signals into the marine environment.

Usually, the increased magnetization is caused by the presence of ferrous (unoxidized) iron on the seafloor or buried below the surface, whether from a shipwrecked vessel made of steel or from natural rock formations containing grains of magnetite. After corrections are made to measurements of the total magnetic field, magnetic data is used to locate existing infrastructure such as buried pipelines, undersea cables and to identify shipwrecks and potential unexploded ordnance.

Marine magnetometers are non-intrusive and do not interact with the seabed. They are towed at depth at least two and a half ship-lengths behind the survey vessel, so that the ship's magnetic field does not interfere with magnetic measurements. The marine magnetometer may be integrated and towed in tandem with the SSS. The marine magnetometer will be of the Caesium Vapour type and capable of recording variations in magnetic field strength during survey to an accuracy of ±0.5nT.

The marine magnetometer system to be used will be confirmed following the appointment of a survey contractor but typical systems which can be taken as examples would be the Geometrics G-882 or Marine Magnetics SeaSpy (Figure 11). The line spacing and coverage will generally match the SSS as they are towed in tandem and the parameters of the survey may be determined by the requirements of the Underwater Archaeology Unit of the National Monuments Service.

Figure 11. Marine Magnetics SeaSpy towfish.

Sub-bottom profiler

Sub-bottom profilers (SBPs) encompass a range of acoustic systems which are designed to collect information on the characteristics of strata below the seabed, establish changes in sediments and detect and image structures buried within the sediments (Figure 12). Shallow Sub-bottom profiling can penetrate the seabed to a range of depths, from a few metres to tens of metres depending on the geological conditions encountered, and with vertical resolutions from a few centimetres to a few metres. Most are towed behind a survey vessel, either at/near the surface or at depth, whereas some smaller devices may be hull-mounted or lowered over the side of a vessel on a pole mount.

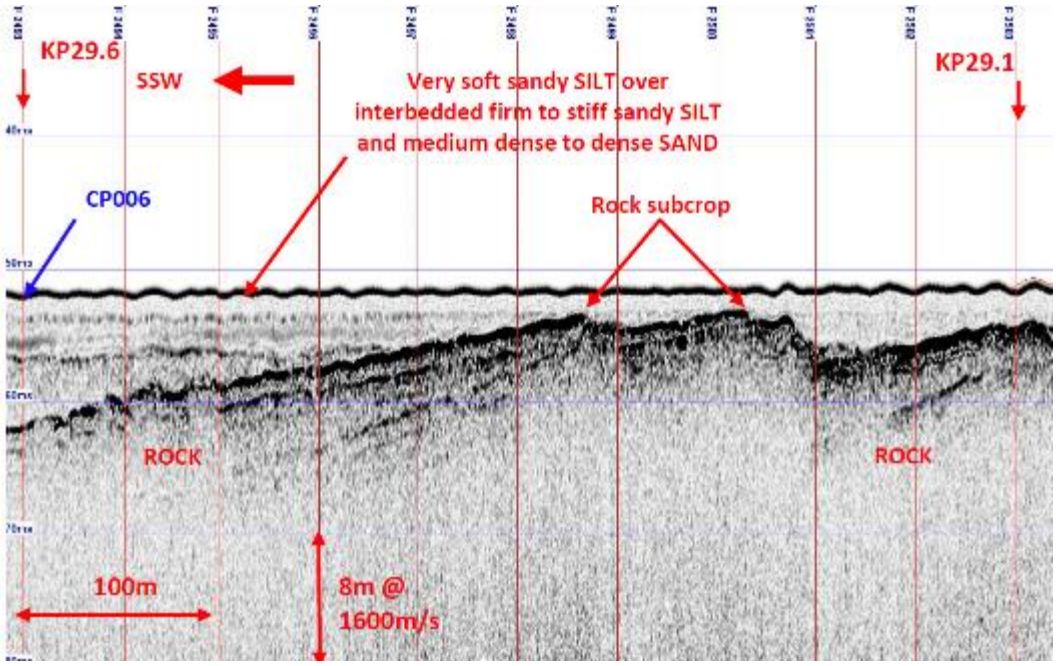

Figure 12. Interpreted SBP seabed profile

Pulsed waveform SBPs generate an acoustic signal either through the impulsive physical processes of electrostatic discharge, as in sparkers, or electromechanically via accelerated water mass, as in boomers. All periodic waveform SBPs i.e. pingers, chirpers and parametric SBPs are electromechanical sources which employ piezoelectric transducers to generate an acoustic waveform by converting electrical energy into mechanical movement i.e. vibrations. Through the reverse of this process, the transducers can also detect sound. As such, these sources are highly customisable; in many cases, the signal is modulated in frequency and/or amplitude to improve its detectability and performance.

The systems most commonly used for high-resolution surveying are the boomer (such as the Applied Acoustics S-Boom), pinger (such as the Kongsberg GeoPulse), chirp (such as the Edgetech SB-424, Figure 13) and parametric chirp systems (such as the Innomar SES-2000). Whereas the boomer system provides best results for coarser sediments, the pinger and chirp systems deliver detail for finer sediments.

The objective of the SBP cable route survey is to investigate the upper layers of the seabed sediments for cable burial potential and installation risk from seabed obstructions such as subcropping rock formations and is not focussed on deep seabed conditions such as required for investigation of offshore wind farm foundations or deepwater seismic surveys carried out by Oil and Gas Exploration. The SBP system used for the survey will be confirmed following the appointment of a survey contractor and the most appropriate system chosen depending on the seabed, anticipated geological environment and the survey vessel capabilities.

Sound source pressure levels of various SBP systems have been reported typically in the range Lp,pk 185-247 dB re 1µPa at 1m. (Hartley Anderson 2020, Crocker & Fratantonio 2016). A summary of the Maximum Sound Pressure Levels for SBP systems is described in Table 4 below. The SBP survey is non-intrusive therefore does not interact with the seabed.

Figure 13. Edgetech SB-424 tow body.

Equipment Type	Frequency Range	Duration	*Maximum* Source Pressure Level (re 1µPa at 1 m)	Reference
Sub-bottom Profiler (SBP) - Pinger	2 kHz to 15 kHz	0.5 - 30 ms	214 dB.	Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Chirper	2 kHz to 13 kHz	5 - 40 ms	185 - 215 dB.	Crocker & Fratantonio 2016, Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Boomer	500 Hz to 15 kHz	0.5 - 1.0 ms	205 - 215 dB.	Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Parametric	4 to 15 kHz, 85 to 115 kHz	0.2 - 30 ms	238 - 247 dB. 200 - 206 dB.	Hartley Anderson 2020

Table 7. Typical SBP specifications.

Ultra-Short Baseline (USBL) Subsea Positioning

An Ultra-Short Baseline (USBL) is a subsea positioning system widely used by the offshore marine industry and scientific research vessels to accurately track the position of towed equipment and sensors. The USBL system consists of a transceiver mounted to the survey vessel, and transponders on the towed equipment.

To calculate a subsea position, the USBL calculates both a range and an angle from the transceiver to the subsea beacon. Angles are measured by the transceiver, which contains an array of transducers. The transceiver emits an acoustic signal at predetermined periods (often 0.5 seconds) which is returned by the transponder and allows for the bearing and distance to be calculated.

USBL systems are designed for close range transmission and thus typically emit pulses of medium frequency sound (20 to 50 kHz). Manufacturers report SPL values of 194 to 207dB re 1µPa at 1m depending on the model used, taking as an example the higher range of USBL source (Kongsberg HiPAP) with a SPL of 207dB re 1µPa at 1m.

Cone Penetration Test (CPT)

The survey vessel will position itself over the target position to carry out the CPT. The seabed CPT rig (such as a Neptune 3000, Figure 14) is deployed to the seabed from the vessel crane, A-frame or dedicated Launch and Recovery System (LARS). Once on the seabed, in a stable position, a steel rod with a conical tip (typically an apex angle of 60° and a diameter of 35.7 mm) is pushed at a steady rate into the seabed until it reaches target penetration depth of 3 to 6m or refusal. The penetration resistance at the tip and along a section of the shaft (friction sleeve) is measured and recorded for later analysis.

Refusal is indicated by peak system thrust, excessive load on the tip or excessive inclination of the cone. If target penetration depth is not met, the CPT rig may be moved to a nearby position on the seabed and the test repeated. The time taken to complete a shallow CPT is typically less than 10 minutes but the total time in the water from deployment to recovery may be 1 to 2 hours at each position, depending on water depth and sea state.

There is very little published information on the sound pressure levels generated from CPT equipment, collected either from field experimentation or from manufactures specifications. Data from a similar device, deep boring, indicates that sound pressure source levels are typically within the range 118 - 145 decibels (dB) (BOEM 2012, EIRGRID 2014).

Figure 14 Neptune 3000 CPT rig.

Gravity Core

Gravity corers (Figure 15) provide a rapid means of obtaining a continuous core sample in water depths from a few metres down to several thousand metres. A gravity corer consists of a steel tube in which is inserted a plastic liner to hold the core sample. Gravity corers are commonly used for cable route investigations.

A set of heavy weights, up to 750 kg, is attached at the top end of the tube above which is a fin arrangement to keep the corer stable and vertical during its fall to the seabed. The sampler penetrates the seabed under its own weight. Normal practice is to lower the device to within 10 m of the seabed before releasing. The penetration depth is between 1 m and 3 m. Penetration in stiffer clays or sands is usually limited.

The penetrating end of the tube is fitted with a cutter and a concave spring-steel core-catcher to retain the sample when the corer is retracted from the soil. The suction caused when withdrawing a core barrel from a soft soil such as clay, can pull the sample from the barrel, or in other ways disturb its homogeneity. By fitting a piston above the sample, the partial vacuum caused above the piston, when the barrel is withdrawn, keeps the sample from being pulled out of the tube.

Upon refusal or at target depth of 3m, the sampler is recovered on deck where the sample is split, typically into 1m lengths, logged, sealed and stored for later laboratory analysis. The typical diameter of the liner is in the region of 90mm with a typical maximum diameter of 120mm.

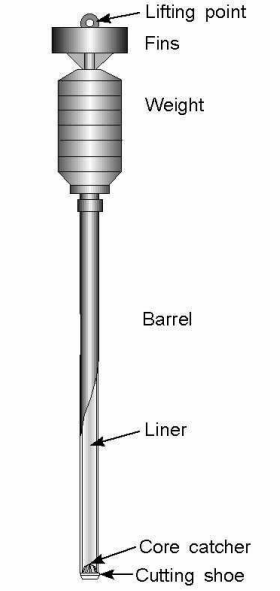

Figure 15. Gravity Corer schematic

Vibrocorer

Vibrocorers are used wherever soil conditions are unsuited to gravity corers or where greater penetration of the seabed is necessary. Vibrocore is best suited to non-cohesive soils (e.g. gravel or sand) as samples recovered are considered disturbed. Vibrocorers are commonly used for cable route investigations.

To penetrate soils such as dense sands and gravels, or to reach deeper into stiff clays, rather than depending on a gravity free-fall, the corer's barrel is vibrated, thus facilitating its penetration into the soil. This vibration energy allows the core barrel to penetrate the sediments under self-weight. In other respects, the barrel and sample retention systems are similar to gravity corers.

The typical vibrocorer consists of a tall steel frame and tripod support. Within the frame is a standard 102 mm steel coring barrel in which is inserted a PVC liner to contain the sample. The typical diameter of the PVC liner is in the region of 90mm with a typical maximum diameter of 120mm. A spring steel core catcher is fitted to the cutting shoe, as with the gravity corer. Two linear electric motors enclosed in a pressure housing provide the vibratory motion; the core barrel is attached directly to the motor housing. Power is fed to the motors via an electrical control line from the survey vessel.

Once in motion, the heavy motor housing provides the mass to drive the core barrel into the seabed. The penetration depth can be from 2m to 8m depending on seabed conditions. A typical 6 m vibrocorer will weigh nearly two tonnes and requires a crane for A-Frame or deployment and recovery. Vibrocorers come with barrel lengths of 3m, 6m and 8m. A normal coring operation in 100 m water depth will take about one hour.

Once coring is started, the core barrel will penetrate to the target depth. Upon refusal or at target depth of 3m, the vibrocore is recovered on deck where the sample in the liner is removed from the barrel, the sample is split, typically into 1m lengths, logged, sealed and stored for later laboratory analysis.

The sounds produced by the operation of a vibrocorer on the seabed consist of a series of impulses corresponding to the movement and impacts of the mechanics of the vibrating motion from the oscillating motors on the core barrel. Expected sound pressure levels generated by vibrocore equipment would be approximately 187.4 dB re 1µPa at 1m (LGL, 2010),

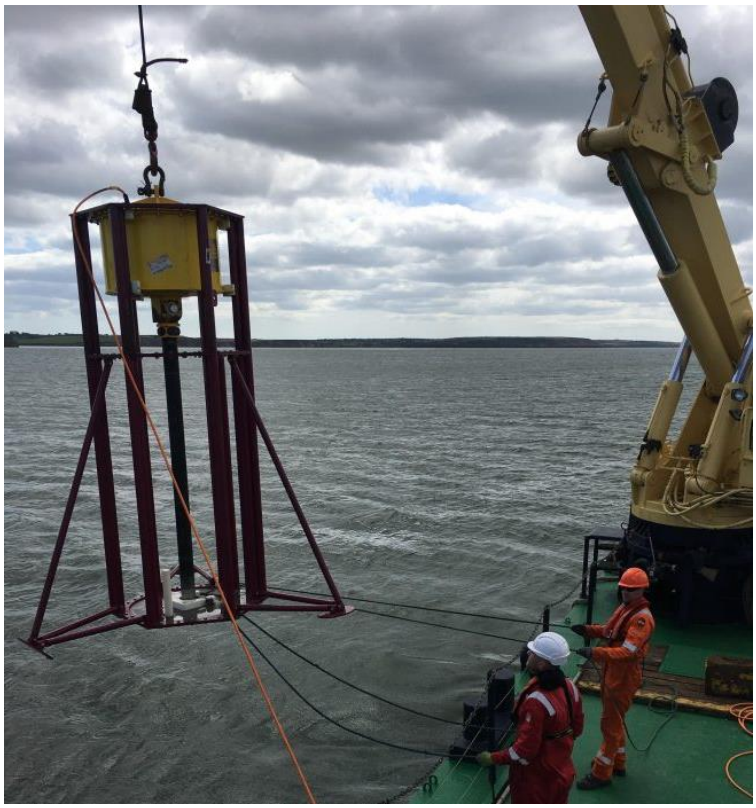

Figure 16. Deployment of Vibrocorer from Survey Vessel

Grab Samplers

Grab samplers are one of the most common methods of retrieving soil samples from the seabed surface. The grab sampler is a device that simply grabs a sample of the topmost layers of the seabed by bringing two steel clamshells together and cutting a bite from the seabed surface to a depth of 0.1 to 0.5m. The information they provide can be applied in a number of applications such as seabed classification, environmental sampling, chemical and biological analysis and ground truthing for morphological mapping and geophysical survey. Grab samplers can be used to recover samples of most seabed soils, although care is needed in selecting the right size unit for the task.

There are various grab sampler types to include but not limited to Van Veen (single or double, Figure 17), Hamon, Shipek and Day Grab samplers. Generally, some variants may come both as single or double, and in a variety of different sizes. The grab sampler comprises two steel clamshells acting on a single or double pivot. The shells are brought together either by a powerful spring (Shipek type) or powered hydraulic rams operated from the survey vessel.

In operation, the grab is lowered from the survey vessel to the seabed with the clamshells in the open position and which trigger shut when the sampler is in contact with the seafloor. The shells swivel together in a cutting action and retains a sample of seabed. The sampler is then recovered to the survey vessel for visual inspection, processing, logging and transfer to suitable sample containers for storage and later laboratory analysis. Typical performance rates are between three and four samples per hour.

The smaller Shipek type grab sampler is useful for ground truthing geophysical surveys for the surface layer, and samples are taken to about 0.1 m below the seabed. Larger hydraulic grabs are capable of recovering relatively intact samples of consolidated soils to a depth of about 0.5 m. In areas of large cobbles or boulders, grabs can become jammed open and their contents washed away during recovery to the surface. However, the hydraulic grab is more likely to recover cobbles and small boulders than any other system, and in this respect is invaluable. Various grabs will be available for the survey to ensure adequate sampling equipment for various sediment types.

Figure 17. Single and Double Van Veen Grab

SURVEY VESSELS

Offshore survey vessels are typically between 15m and 75m in length with potential for smaller vessels to be used in nearshore / shallow water areas. Offshore survey vessel typically have an endurance of approximately 14 to 28 days. A vessel with a shallow water draft will be utilised for the inshore survey area. An unmanned surface vehicle (USV) and/or autonomous surface vehicle (ASV) may also be used for the geophysical survey. The survey vessels may use a local port for personnel / equipment mobilisation, bunkering and provisioning.

The marine survey works will consist of a dedicated marine spread which will be suitable for the scope of work required, the water depth and the anticipated seabed conditions of the survey area. The exact equipment to be used will be confirmed following a tender process to procure the marine survey contractor.

All survey vessels will be fit for purpose, will possess all relevant classification certificates and capable of safely undertaking the survey work required. Health, safety, environment and welfare considerations will be a priority and will be actively managed during the course of the survey scopes of work. Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work. Prior to survey works taking place under Licence, both Project Supervisor for Design Process (PSDP) and Project Supervisor for Construction Stage (PSCS) will be appointed under the relevant legislation and project / survey specific HSE plans will be put in place which will form part of the survey project execution plans.

The vessels will conform to the following minimum requirements as appropriate:

- Compliance with Safety of Life at Sea (SOLAS), International Maritime Organization (IMO) and national requirements for operating within Irish territorial waters.
- Station-keeping and sea keeping capabilities required to carry out the survey operations safely;
- Calibrated equipment and spares with necessary tools for all specified works;
- Endurance (e.g. fuel, water, stores, etc.) to undertake the required survey works;
- Sufficient qualified staff to allow the survey operations to be carried out efficiently, (typically 24 hour continuous for offshore survey, 12 hour for nearshore survey); and
- Appropriate accommodation and crew welfare facilities.

Survey vessels will generate some subsea noise in the marine environment from engine noise and dynamic positioning thrusters. Shipping noise is typically within the 50-300 Hz frequency band and is the dominant noise source in deeper water (DECC, 2011). Propellers on vessels all have the potential to produce cavitation noise. This sound is caused by vacuum bubbles that were generated by the collapse of bubbles created by the spinning of the propellers.

Acoustic broadband source pressure levels typically increase with increasing vessel size, with smaller vessels (<50 m) having source pressure levels 160-175 dB (re 1µPa at 1m), medium size vessel (50-100 m) 165-180 dB (re 1µPa at 1m) and large vessels (>100 m) 180-190 dB (re 1µPa at 1m) (DECC, 2011). Every vessel has a unique noise signature and for each vessel this can change in response to a number of factors, including; ship speed, operational status, vessel load, the condition of the vessel and even the properties of the water that the vessel is operating in.

MARINE SURVEY AND SITE INVESTIGATIONS SOUND PRESSURE LEVEL SUMMARY

All survey works that involve the use of acoustic instrumentation will follow the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters, 2014.

The ranges of noise frequency and sound pressure levels associated with all the surveys outlined in previous sections is summarised in Tables 5. and 6 below. It can be noted that as the focus of the cable route surveys within the licence application area is the seabed surface and upper layers of seabed sediments and generally obtaining higher resolution data, the geophysical equipment such as MBES and SSS is generally operated more towards the higher end of the frequency range where possible.

TIMELINE AND DURATION OF SURVEY ACTIVITIES

The intention is to commence the survey as soon as feasible following license award, taking into account survey vessel availability, the overall cable route survey programme, seasonality and suitable weather windows. The exact mobilisation dates will not be known until the process of procuring a contractor and issue of the marine licence is complete. It is anticipated that the marine geophysical survey and site investigations activities within the marine licence area will take less than 6 weeks in total and will be completed over a 6 month period.

The estimated time required to complete the cable route survey campaign activities is described in Table 10 below.

Equipment Type	Purpose	Frequency Range	Duration	*Maximum* Source Pressure Level (re 1µPa at 1 m)	Reference
Multibeam Echo Sounder (MBES)	Measure detailed bathymetry by transmitting sound pulses (active sonar).	200 kHz to 500 kHz	0.05 - 10 ms	210 - 245 dB.	Danson 2005, Hopkins 2007, DECC 2011, Lurton and DeReutier 2011, Lurton 2016, BEIS 2020, Crocker & Fratantonio 2016
Side Scan Sonar (SSS)	Determine surficial nature of the seabed and detect objects by transmitting sound pulse.	200 kHz to 700 kHz	0.4 - 1.0 ms	200 - 240 dB.	BOEM 2016, BEIS 2020, DAHG 2014, Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Pinger	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 15 kHz	0.5 - 30 ms	214 dB.	Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Chirper	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 13 kHz	5 - 40 ms	185 - 215 dB.	Crocker & Fratantonio 2016, Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Boomer	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	500 Hz to 15 kHz	0.5 - 1.0 ms	205 - 215 dB.	Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Parametric	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	4 to 15 kHz, 85 to 115 kHz	0.2 - 30 ms	238 - 247 dB. 200 - 206 dB.	Hartley Anderson 2020
Ultra-Short Base Line (USBL)	Subsea positioning.	20 kHz to 50 kHz	5 - 10 ms	194 - 207 dB.	Kongsberg
Magnetometer	Identify ferrous anomalies for metal obstructions, shipwrecks, etc. on and under the seabed.	Passive	N/A	Passive	N/A
Survey Vessels	Carry out the survey and deploy the equipment.	50 Hz to 300 Hz	N/A	160 - 190 dB.	DECC 2011

Table 8. Marine Survey Activities.

Equipment Type	Purpose	Number of locations within Licence Application Area (up to)	Frequency Range	*Maximum* Source Pressure Level (re 1µPa at 1 m)	Reference
Cone Penetration Test (CPT)	Determine geotechnical engineering properties of seabed sediments.	26	28 Hz	118 - 145 dB.	BOEM 2012, EIRGRID 2014
Gravity Corer	Retrieve a seabed sediment sample by penetrating seabed with a steel core barrel under self-weight	19	N/A	N/A	N/A
Vibrocorer	Retrieve a seabed sediment sample by penetrating seabed with a vibrating steel core barrel	19	30 Hz	187.4 dB.	LGL 2010
Grab Samples	Collect small sediment samples from seabed surface with clamshell mechanism	17	N/A	N/A	N/A

Table 9. Marine Site Investigation Activities.

Activity	Typical Time Period Required for Activity	Total Number of SI Locations	Total Time for SI	Foot Print Affected per SI	Foot Print Affected per SI (ha)	Total Foot Print (ha)	Area Directly Affected as % of Licence Application Area
Inshore Geophysical Survey	3 to 4 days (weather and sea state dependent)	400 - 500 m cable route corridor	3 to 4 days (weather and sea state dependent)	N/A	N/A	376 ha	3.68953%
Offshore Geophysical Survey	8 to 10 days (weather and sea state dependent)	500 - 1500 m cable route corridor	8 to 10 days (weather and sea state dependent)	N/A	N/A	9815 ha	96.31047%
CPT	30 minutes - 2 hours in any one location	26	52 hours within total 10 days of Site Investigations campaign (weather and sea state dependent)	8m²	0.0008 ha	0.0208 ha	0.00020%
Gravity Corer	30 minutes - 2 hours in any one location	19	38 hours within total 10 days of Site Investigations campaign (weather and sea state dependent)	1m²	0.0001 ha	0.0019 ha	0.00002%
Vibro Corer	30 minutes - 2 hours in any one location	19	38 hours within total 10 days of Site Investigations campaign (weather and sea state dependent)	8m²	0.0008 ha	0.0152 ha	0.00015%
Grab Samples	20 minutes - 45 minutes in any one location	17	13 hours within total 10 days of Site Investigations campaign (weather and sea state dependent)	0.5m²	0.00005 ha	0.00085 ha	0.00001%

Table 10. Estimated Time and Duration of Survey Activities.

Spatial Scope and Zone of Influence

The proposed Cable Route, Licence Application Area, and Works is demonstrated in Figures 18-20. SACs and Waterbodies proximate to the proposed Cable Route and Licence Application Area within Ballyteige Beach are demonstrated in Figure 21. SACs and SPAs within 10km of the proposed Cable Route Licence Application Area are demonstrated in Figures 22 & 23. SACs and SPAs within 15 km of the proposed Licence Application Area are seen in Figures 24 & 25. The proposed fibre optic survey route in relation to the 12 nm limit, Designated Irish Continental shelf and Offshore SAC's (no offshore SAC's in the area) is demonstrated in Figure 26.

All Natura 2000 sites within 15km of the survey route, and beyond 15km with the potential for significant effects on Natura 2000 sites (none), are listed in Table 11. European sites screened in for NIS are seen in Table 12.

Table 11. Proximity to designated sites of conservation importance

Designation	European Site	Distance
SAC	Ballyteige Burrow SAC	**Within**
SAC	Saltee Islands SAC	350m
SAC	Hook Head SAC	3.6 km
SAC	Tacumshin Lake SAC	5.6 km
SAC	Bannow Bay SAC	7.6 km
SAC	Carnsore Point SAC	10.3 km
SAC	Lady's Island Lake SAC	11.5 km
SAC	River Barrow and River Nore SAC	13.5 km
SPA	Ballyteige Burrow SPA	700m
SPA	Saltee Islands SPA	3 km
SPA	Keeragh Islands SPA	3.3 km
SPA	Tacumshin Lake SPA	6.7 km
SPA	Bannow Bay SPA	7.3 km
SPA	Lady's Island Lake SPA	11.9 km
SPA	Wexford Harbour and Slobs SPA	14.8 km

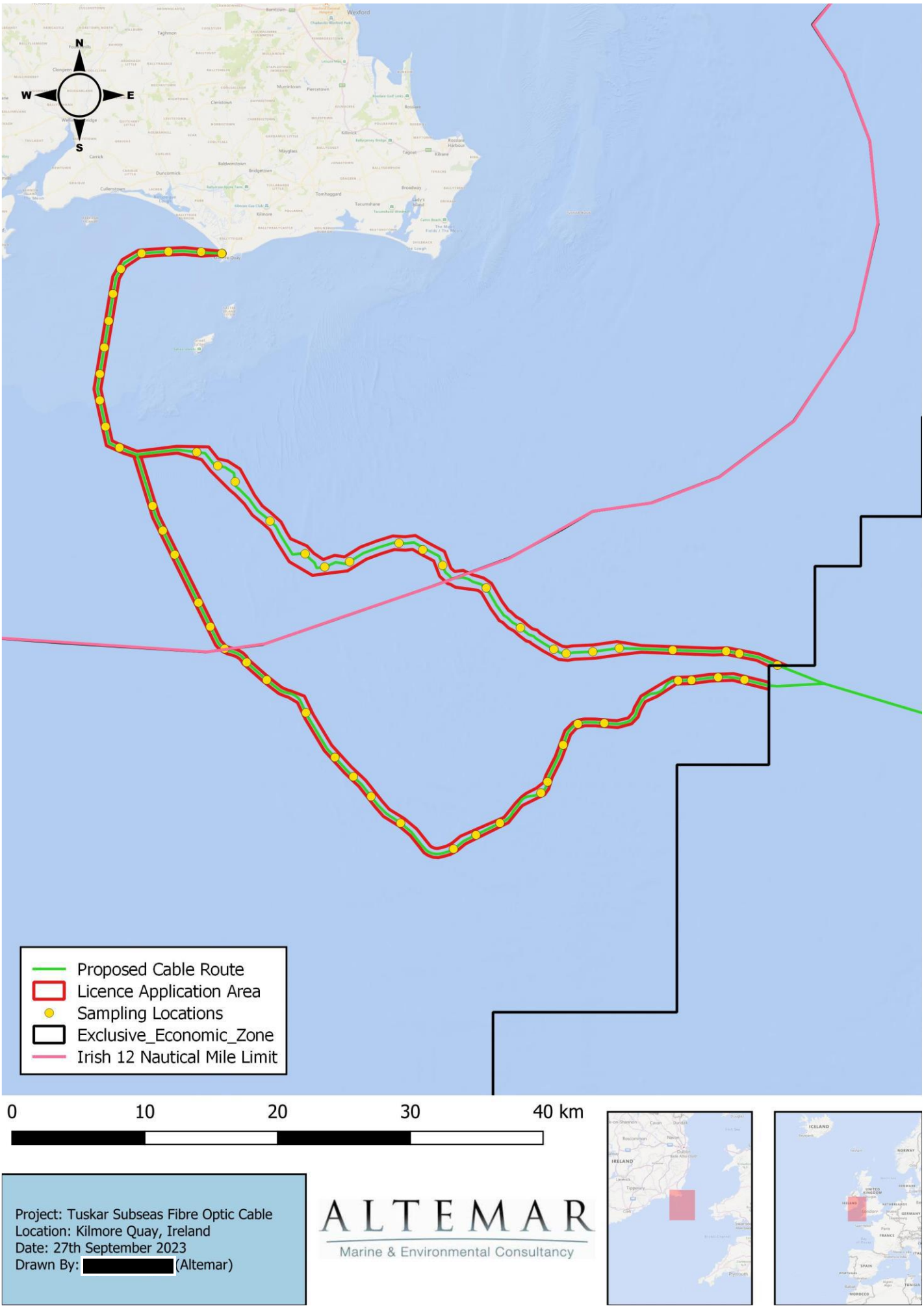

Figure 18: Proposed Cable Route, Licence Application Area, and Works (to Irish Exclusive Economic Zone).

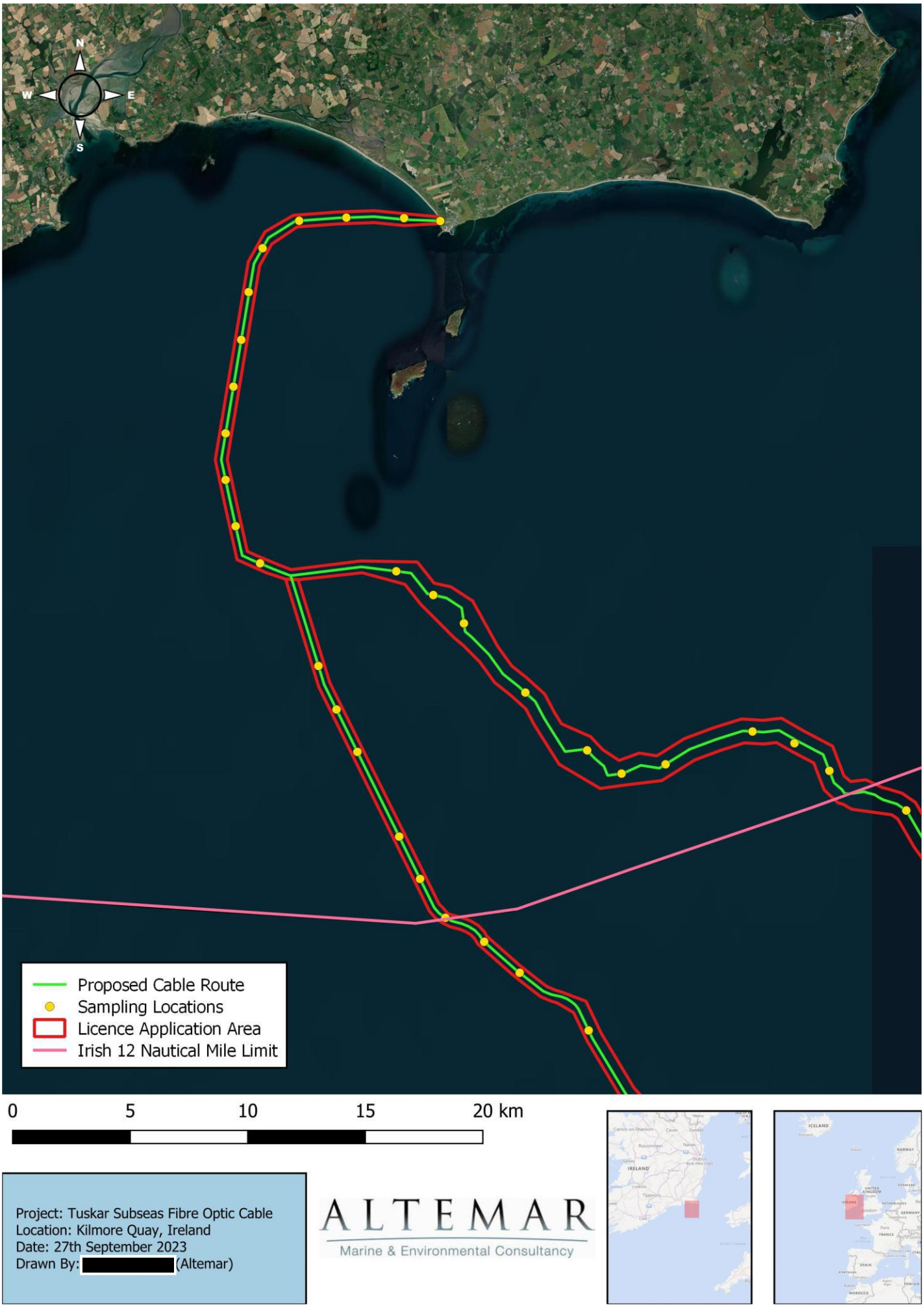

Figure 19: Proposed Cable Route, Licence Application Area, and Works (to Irish 12 Nautical Mile Limit).

Figure 20. Proposed Cable Route and Licence Application Area at proposed landfall location

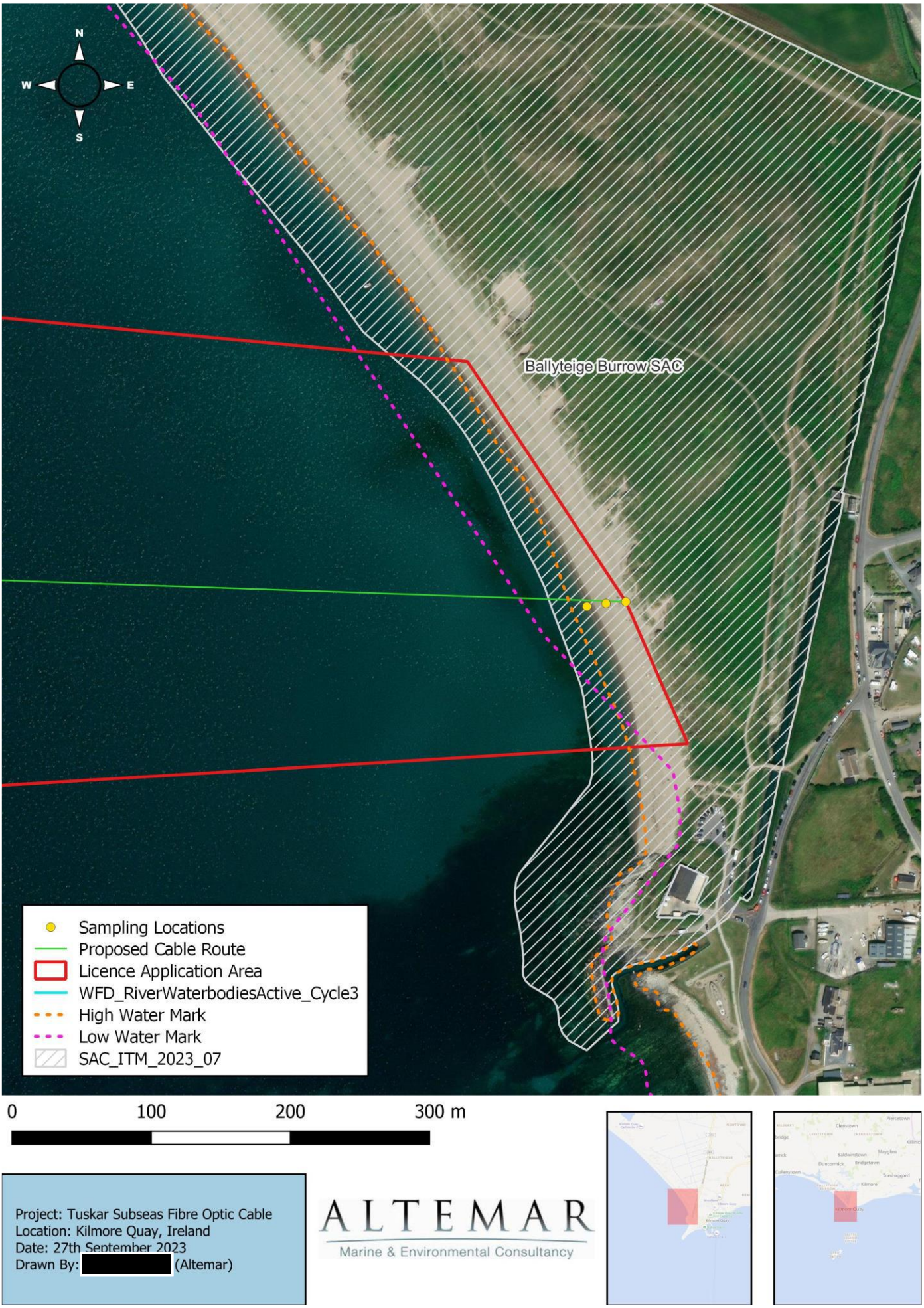

Figure 21: Special Areas of Conservation within the proposed Cable Route and Licence Application Area at landfall location.

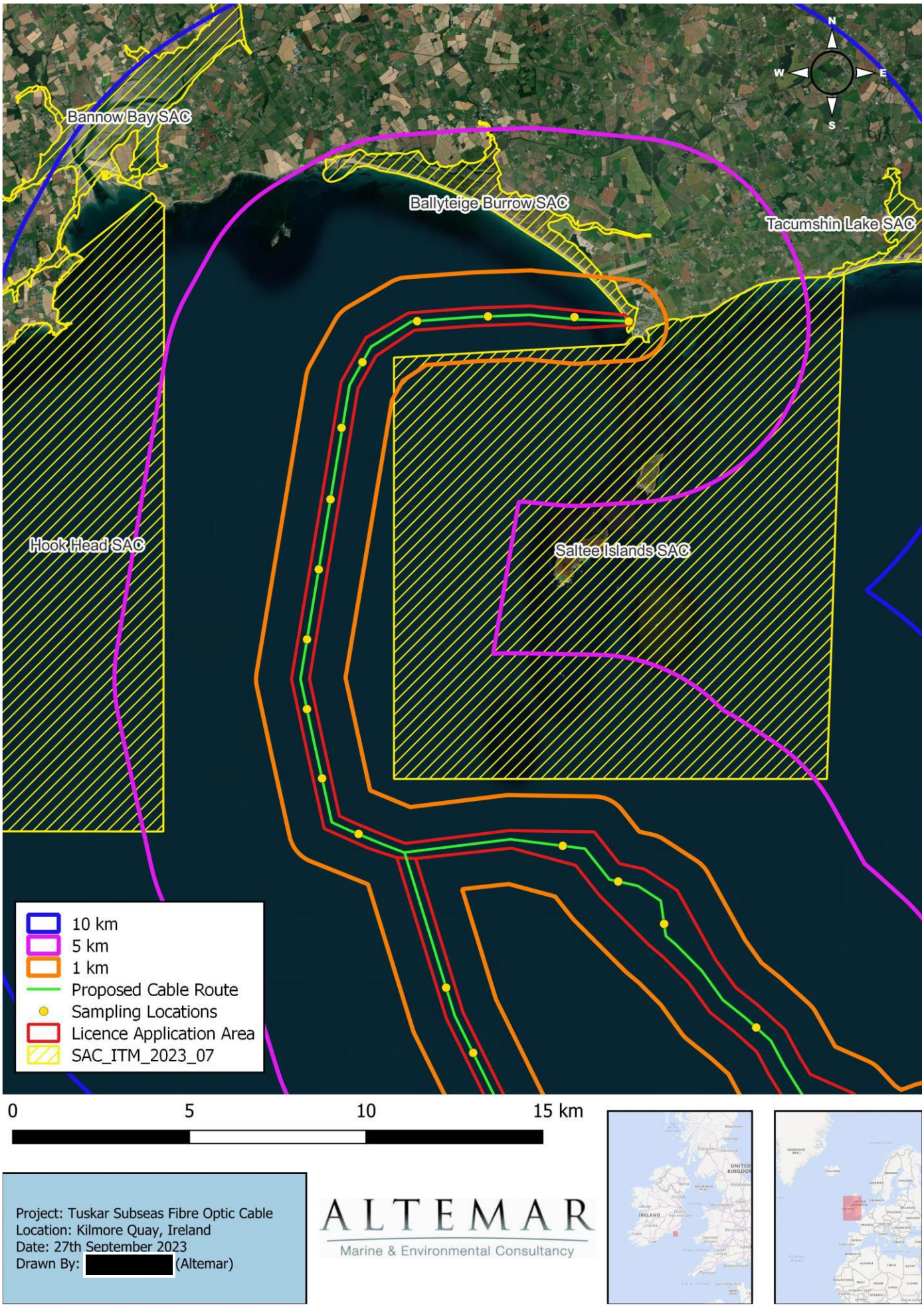

Figure 22: Special Areas of Conservation within 10km of the proposed Cable Route and Licence Application Area within Kilmore Quay

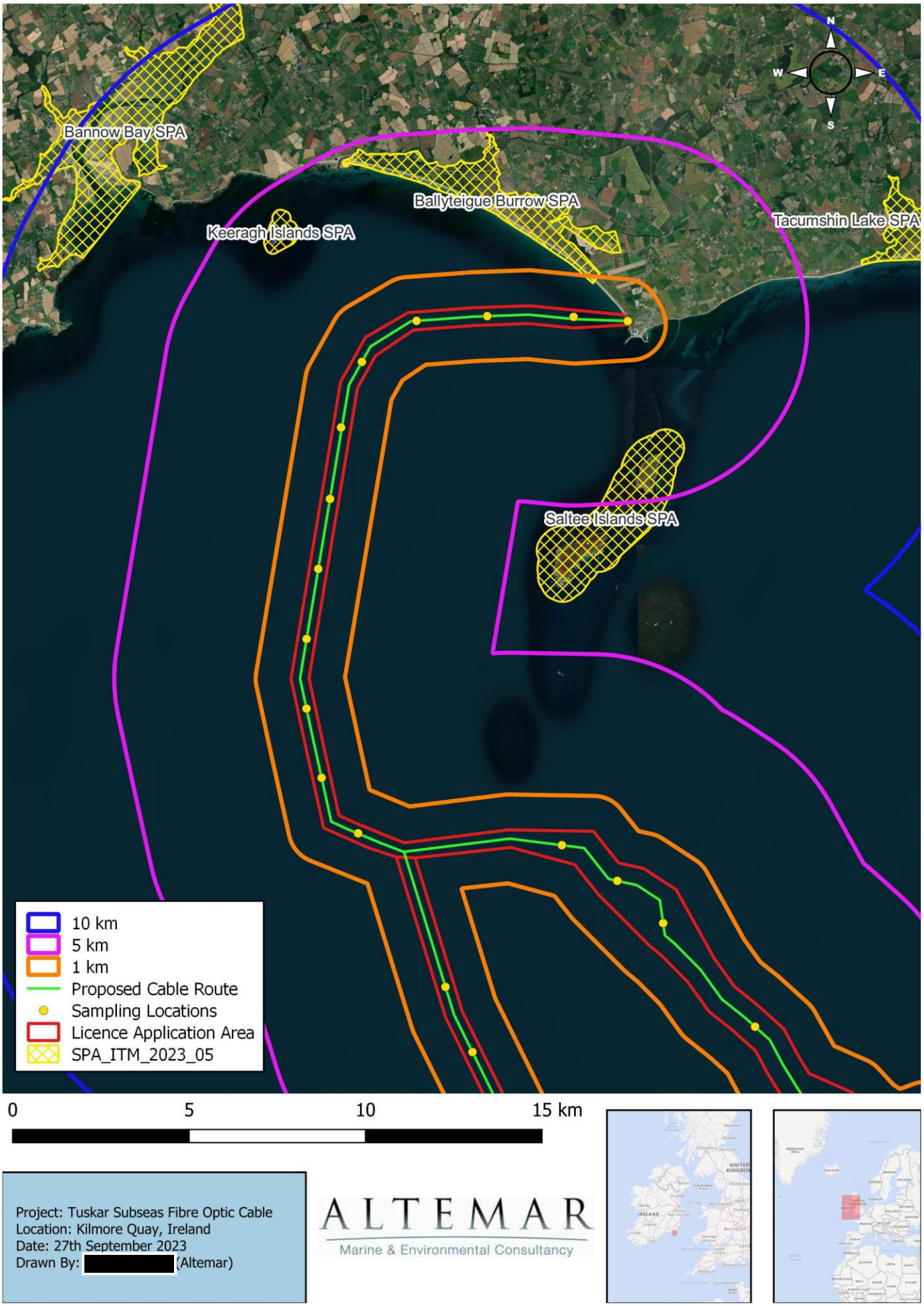

Figure 23: Special Protection Areas within 10km of the proposed Cable Route and Licence Application Area within Kilmore Quay

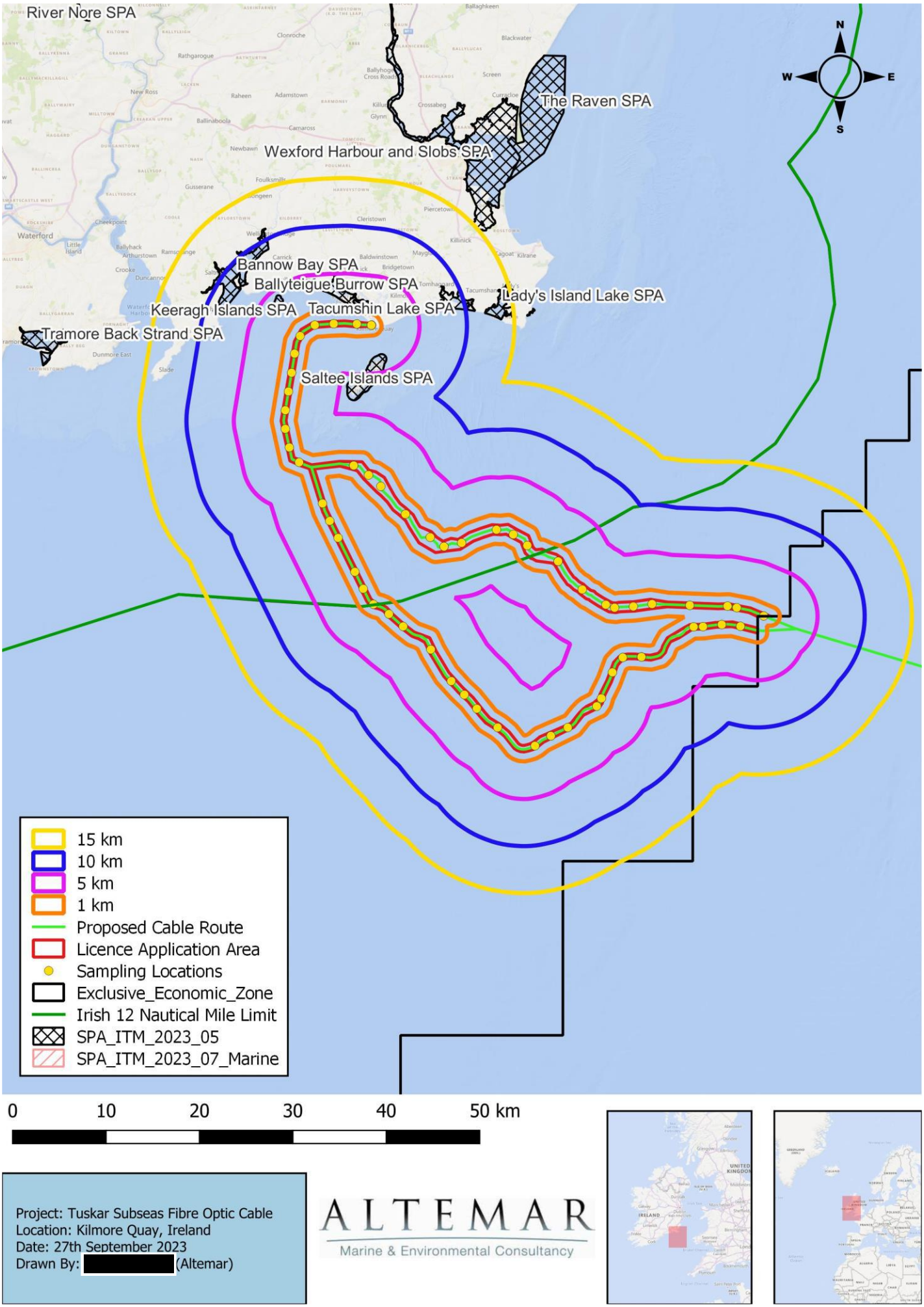

Figure 24: Special Protection Areas within 15 km of the proposed Cable Route and Licence Application Area.

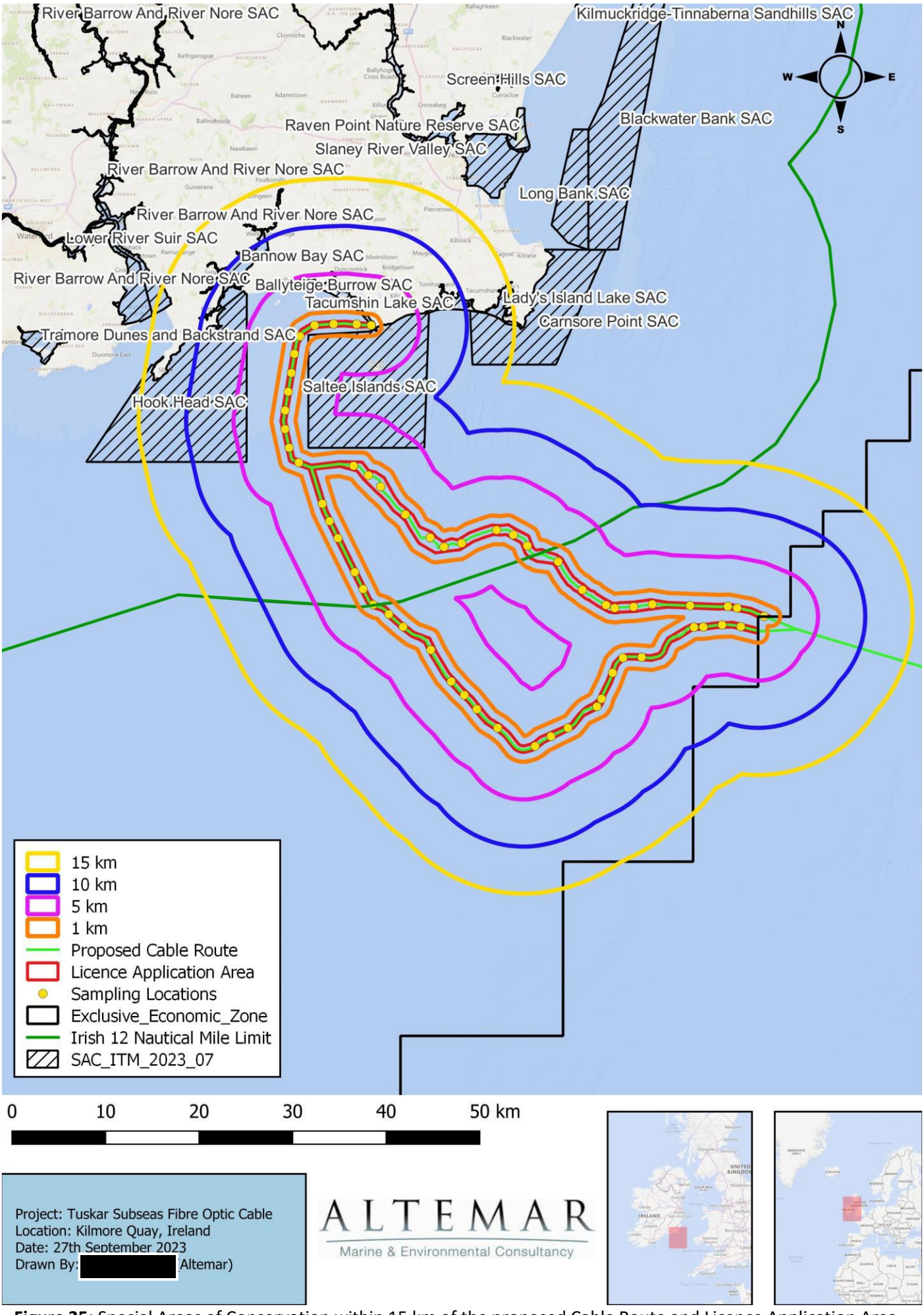

Figure 25: Special Areas of Conservation within 15 km of the proposed Cable Route and Licence Application Area.

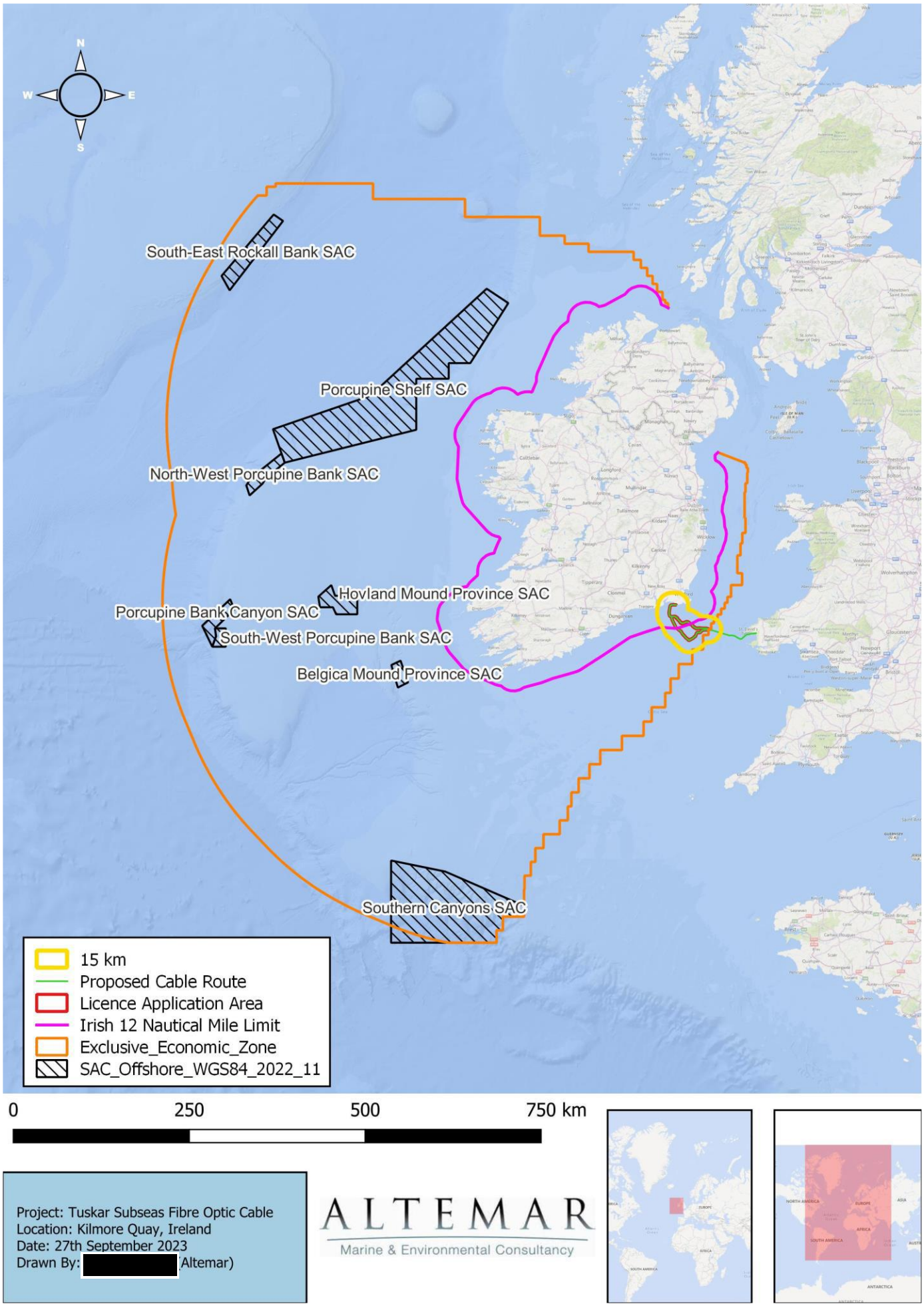

Figure 26: Fibre optic survey route in relation to the 12 nm limit, Designated Irish Continental shelf and Offshore SAC's (no offshore SAC's in the area).

Table 12. Initial screening of NATURA 2000 sites within 15km and NATURA 2000 sites with potential of hydrological connection to the proposed development – Screened IN (NIS Required)

NATURA Code	Name	Screened IN/OUT	Details/Reason
Special Areas of Conservation			
IE000696	Ballyteige Burrow SAC	**In**	**Conservation Objectives** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Qualifying Interests** Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) [1420] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Humid dune slacks [2190] **Potential Impact** The proposed cable survey route passes through this SAC. The proposed survey works will be in the terrestrial and in the marine elements of the SAC. The intertidal element will involve personnel, machinery and excavations on a popular beach proximate to Kilmore Quay with an existing car park and human and dog walking activity. However, initial assessment identifies that in the absence of mitigation measures there may be potential for impact on the qualifying interests of this SAC through disturbance and the physical impact on the intertidal sediments and terrestrial habitats. There is also potential for pollution from personnel on site within the SAC. Given that survey works are proposed within the SAC, mitigation measures are required to prevent significant impacts on its qualifying interests. Further information is required to determine the potential for adverse effects on this SAC. **NIS is Required.**
IE000707	Saltee Islands SAC	**In**	**Conservation Objective** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall

NATURA Code	Name	Screened IN/OUT	Details/Reason
			maintenance of favourable conservation status of those habitats and species at a national level. **Qualifying Interests** Mudflats and sandflats not covered by seawater at low tide [1140] Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Submerged or partially submerged sea caves [8330] *Halichoerus grypus* (Grey Seal) [1364] **Potential Impact** This SAC is located 350m from the proposed cable survey area. No works are proposed in this SAC. Due to the scale of the proposed survey works, and the distance from the proposed survey area to this SAC, in the absence of mitigation, there will be no significant effects on the terrestrial features of interest from the proposed works associated with this survey license application. However, initial assessment identifies that, in the absence of mitigation measures, there may be potential for impact on the marine features of interest of this SAC through underwater noise and physical disturbance which could impact Grey Seal, which is a Feature of Interest of this SAC. Mitigation measures are required to protect the SAC from significant effects. **Natura Impact Statement Required**
Special Protection Areas			
IE004020	Ballyteige Burrow SPA	In	**Conservation Objective** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Qualifying Interests** Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Wetland and Waterbirds [A999] **Potential Impact** The proposed survey works area is located a minimum of 700m from the SPA. The cable survey route is in the marine subtidal and in the terrestrial/intertidal elements of Ballyteige Bay and offshore. The proposed survey works will be within an area of existing vessel traffic in Kilmore Quay and the intertidal element is on a popular beach with a car park and existing human and dog walking activity.

NATURA Code	Name	Screened IN/OUT	Details/Reason
			The majority of species are overwintering birds and are likely not be present during the works. However, out of an abundance of caution, should the qualifying interests be present during survey works, mitigation measures will be required in the way of ecological supervision. It is considered that, although the works are proposed in a popular beach and disturbed area, there may be potential for effect on the qualifying interests of this SPA through disturbance, if species from this SPA are roosting on site during the works. Mitigation measures will be present on site in relation to bird species and it is possible, although unlikely that wintering birds may be present during the works. Further information is required to determine the potential for adverse effects on this SPA. **NIS is Required.**
IE004002	Saltee Islands SPA	In	**Conservation Objectives** The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. **Qualifying Interests** Fulmar (*Fulmarus glacialis*) [A009] Gannet (*Morus bassanus*) [A016] Cormorant (*Phalacrocorax carbo*) [A017] Shag (*Phalacrocorax aristotelis*) [A018] Lesser Black-backed Gull (*Larus fuscus*) [A183] Herring Gull (*Larus argentatus*) [A184] Kittiwake (*Rissa tridactyla*) [A188] Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200] Puffin (*Fratercula arctica*) [A204] **Potential Impact** The proposed survey route is located 3km from this SPA. The survey works will be in the marine subtidal and in the terrestrial/intertidal elements of Ballyteige Bay and offshore. The survey works will be within an area of existing vessel traffic in Kilmore Quay and the intertidal element is on a popular beach with a car park and existing human and dog walking activity. The majority of species listed as qualifying interests would not be expected in the terrestrial/intertidal landfall area. However, species would be present offshore. Out of an abundance of caution, in the absence of mitigation measures, it is considered that there may be potential for impact on the qualifying interests of this SPA through disturbance particularly for species that may be present in the landfall area. Mitigation measures are required. Further information is required to determine the potential for adverse effects on this SPA. **NIS is Required.**

In combination effects

As outlined by (OSPAR, 2012) "*Cumulative effects, the combined effect of more than one activity, may reinforce the impacts of a single activity due to temporal and/or spatial overlaps*". The potential for in-combination effects within the ZoI that may occur as a result of the proposed project, during and post works were assessed. The proposed landfall cable survey works are in a populated area and is a popular destination for the local community. It is a location with a regular stream of dog walkers and pedestrians on the shore. The proposed survey works would not be seen to have an impact on water quality of the area including impacting the water quality status. The intertidal section of this project will involve trial pits (in SAC/SPA/pNHA & Ramsar site) and machinery that will enter the upper shore (within the conservation sites).

The following is a list of planning applications as identified on the Department of Housing, Local Government and Heritage's 'National Planning Application Database' portal:

Table 13. In combination effects evaluated.

Ref. No.	Address	Proposal
20210079	Ballask (ED Kilmore), Kilmore.	Permission for the construction of 1) an All Weather Outdoor Training facility and associated lighting, 2) an All weather walking track and associated lighting and 3) all associated site works at Kilmore GAA grounds.
20191633	Crossfarnogue, Nemestown, Beak, Ballyteigue and Libgate, Kilmore.	Ten year planning permission to construct a new wastewater treatment plant in Kilmore Quay in two phases. Phase 1 (A) Wastewater treatment plant (WwTP) with a capacity of 850 population equivalent (PE) at Nemestown; (B) 2 No. wastewater pumping stations (WwPS) at Crossfarnogue; (C) 8.5 kms of pipeline Irish Water intends to deliver this phase within 5 years. Phase 2 construction of modular expansion to the WwTP to provide a treatment capacity up to 1,900 PE. A Natura Impact Statement accompanies this planning application.
20170534	Crossfarnogue, Kilmore.	Permission for extension to front of existing factory comprising the erection of single storey loading bay.

These potential future offshore developments are discussed with regard to the planned survey in the following sections. These have been detailed previously in the report.

Table 14. Foreshore licence applications in vicinity of survey works

Reference	Title	Year	Location	Activity	Status
FS007445	Blackwater Offshore Wind – Marine Surveys	2022	Wexford	Marine Surveys	Applied
FS007472	Mac Lir Offshore Wind Limited Site Investigations for proposed Offshore Wind Farm	2022	Wicklow, Wexford, Dublin	Site Investigations	Applied
FS007488	Celtic Offshore Renewable Energy Site Investigations for proposed Offshore Wind Farm	2022	Wexford and Waterford	Site Investigations	Applied
FS007436	Voyage Offshore Array Limited Site Investigations for proposed Wind Farm	2022	Waterford and Wexford	Site Investigations	Applied
FS007464	Bore Array Offshore Wind Farm	2022	Wexford	Site Investigations	Applied

FS007509	Rosslare Europort Offshore Wind Hub Site Investigations	2022	Wexford	Site Investigations	Determination
FS007361	Beaufort Subsea Fibre Optic Cable	2022	Off Wexford Coast	Installation of Subsea Fibre Optic Cable	Consultation
FS007232	DP Energy – Latitude 52 Offshore Windfarm Ltd. Site Investigations	2022	Wicklow and Wexford	Site Investigations	Applied
FS007135	ESB Wind Development Ltd. Site Investigations at Loch Garman Offshore Wind	2022	Wexford	Site Investigations	Consultation
FS007318	RWE Renewables Ireland East Celtic Ltd. Site Investigations for proposed East Celtic Offshore Wind Park	2022	Wexford and Waterford	Site Investigations	Applied
FS007384	Celtic Horizon Offshore Wind Farm Limited Site Investigations for proposed Offshore Wind Farm	2022	Wexford and Waterford	Site Investigations	Applied
FS007224	Rosslare Europort Berth 3 Extension	2022	Wexford	Extension of Existing Berth 3	Consultation
FS007219	Rosslare Europort Maintenance Dredging	2022	Wexford	Maintenance Dredging	Determination
FS007374	Mainstream Renewable Power Ltd.	2022	Waterford & Wexford	Site Investigations	Consultation
FS007038	Lady's Island Pipeline	2022	Wexford	Installation of 2 no. pipes and a flow control structure	Consultation
FS007351	GDG Ltd. Deployment of 3 ADCP off the coast of Wicklow and Deployment of 1 ADCP off the coast of Wexford	2021	Wexford & Wicklow	Four Acoustic Doppler Current Profiler (ADCP) Trawl Resistant Bottom Mount (TRBM) units to be deployed on the seabed in the Irish Sea for a duration of 35 days to collect data on current speed and direction at each location.	Determination
FS007222	Rosslare Europort Site Investigation	2021	Wexford	Site Investigation	Determination
FS007274	UCD Soil and Vegetation Sampling - Ballyteige	2021	Wexford	Soil and vegetation sampling	Consultation
FS007050	Greenlink Interconnector Wexford	2019	Wexford	Subsea and underground electricity interconnector cable	Determination
FS006982	Energia - Application for Site Investigation Licence for Windfarm off Helvick Head	2019	Waterford	Site investigations for Offshore Wind Farm	Consultation
FS006983	SSE Renewables Celtic Sea	2019	Waterford	Site investigations for Offshore Wind Farm	Consultation
FS007038	Lady's Island Pipeline	2021	Wexford	Installation of 2 no. pipes and a flow control structure	Consultation

Application **20191633** relates to a proposed wastewater treatment plant located to the east of the proposed survey area that was granted permission. An Appropriate Assessment Screening Report and a Natura Impact Statement was prepared by AECOM Infrastructure and Environment UK Ltd., on behalf of Irish Water, to accompany this application. The Stage 2 Appropriate Assessment concludes that:

'*provided the mitigation measures and the guidelines outlined in this Stage 2 Appropriate Assessment, along with monitoring procedures outlined are implemented, it is considered that the proposed development will not result in significant impacts on the qualifying species or habitats, and the conservation status of the Saltee Islands SAC or Ballyteige Burrow SAC, either directly, indirectly, or cumulative.*'

Further, following the implementation of mitigation measures:

'*it is envisioned that there shall be no significant adverse effects on the integrity of the European sites in view of the site's conservation objectives and that the conservation status of the Annex I habitats and Annex II species will not be compromised by this proposed project either directly, indirectly, or cumulatively*.'

The UK element of the project will be covered under UK licencing. Given this, it is considered that in combination effects with other existing and proposed developments in proximity to the application area would be unlikely, neutral, not significant and localised. It is concluded that no likely significant effects on Natura 2000 sites will be seen as a result of the proposed survey works alone or combination with other projects.

The potential impacts of the proposed cable route survey are Temporary (i.e. Effects lasting less than a year) and primarily to occur during the brief survey period (with the presence of boats, machinery and personnel in the vicinity of the works). Impacts on infauna would be deemed to be temporary (i.e. Effects lasting less than a year). The projects outlined above are either completed or, are currently going through planning stages and are not expected to be carried out concurrently or are not at a scale or location where in combination effects are foresee with the proposed project. This report pertains to survey works for the proposed route for a marine fibre optic cable in subtidal and intertidal habitats. As can be seen from using the Best Available Techniques and mitigation measures during survey works, considerable effort has gone into minimising the potential environmental impact of the project. "*Generally all mitigation measures applied for individual cables also contribute to reduction of cumulative impacts*" (OSPAR, 2012).

No in combination effects are foreseen from the project in conjunction with other projects.

Further Information on European Sites Screened in for NIS

Ballyteige Burrow SAC (Site code: 000696)

As outlined in the Ballyteige Burrow SAC Site Synopsis[2] (NPWS 2020):

'*This coastal site extends eastwards and northwards from the village of Kilmore Quay in Co. Wexford. A long, narrow spit of coarse sand and gravel with an impressive sand dune system (Ballyteige Burrow) forms most of the seaward boundary of this site. Behind the spit lies a shallow, tidal sea inlet and estuary of the Duncormick River (The Cull). The eastern portion of this intertidal system was reclaimed in the 19th century by construction of the Cull Bank and is now polderland, most of which is intensively farmed grassland and arable land. The western portion of The Cull retains semi-natural habitat, including mudflats which are exposed at low tide and saltmarsh. Most of the site is designated a Nature Reserve.*

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

[1130] Estuaries; [1140] Tidal Mudflats and Sandflats; [1150] Coastal Lagoons; [1210] Annual Vegetation of Drift Lines; [1220] Perennial Vegetation of Stony Banks; [1310] Salicornia Mud; [1330] Atlantic Salt Meadows; [1410] Mediterranean Salt Meadows; [1420] Halophilous Scrub; [2110] Embryonic Shifting Dunes; [2120] Marram Dunes (White Dunes); [2130] Fixed Dunes (Grey Dunes)*; [2150] Decalcified Dune Heath*; [2190] Humid Dune Slacks.*

A significant proportion of this site comprises intertidal mud- and sandflats which form part of the estuary of the Duncormick River, and the site includes most of the tidal section of this river. The estuary also receives the flow from a network of canals which drain the polders to the east of the site, plus from some minor streams. The estuary is interesting because it is almost entirely enclosed by the extensive sandshingle spit which makes up Ballyteige Burrow, with only a narrow inlet/outlet at the western end. The estuary empties almost entirely on most tides, apart from the main central channel.

A dominating feature of this site is its large dune system, many of the dunes reaching over 20 m in height. Embryonic shifting dunes and Marram (Ammophila arenaria) dunes occur along the seaward side, with more stable fixed dunes and dune heath inland, though blow-outs occur throughout. Typically, plants such as Marram, Portland Spurge (Euphorbia portlandica), Sea-holly (Eryngium maritimum), Sea Stork'sbill (Erodium cicutarium) and Carline Thistle (Carlina vulgaris) are common on the seaward dunes.

The fixed dunes occupy the central ridge of the Burrow. These are well developed and species-rich. The vegetation is predominantly low-growing and contains species such as Common Restharrow (Ononis repens), Wild Pansy (Viola tricolor subsp. curtisii), Sea Stork's-bill, Common Centaury (Centaurium erythraea), Wild Thyme (Thymus praecox) and Red Fescue (Festuca rubra).. Cattle have not grazed the eastern end of the site since 1987 and, as a result, there is an increase in dune scrub encroachment and a decrease in species diversity. The dominant species here are Red Fescue and Burnet Rose (Rosa pimpinellifolia), while Bracken (Pteridium aquilinum) is common.

One of the most notable features at Ballyteige is the presence of developing acid heath within the (calcareous) fixed grey dune area. This is very unusual in Irish dune systems. The vegetation here is dominated by Bracken, with some Gorse (Ulex europaeus) and low-growing herbs. In addition, dune slacks occur as part of the dune complex. These are eroded down in places to the shingle base on which the dunes rest. The free draining nature of these slacks has resulted in an unusual vegetation community distinguished from the adjacent fixed dunes in the abundance of the lichen and bryophyte flora and the shorter stature of the vegetation.

Saltmarsh vegetation fringes The Cull, featuring Sea Aster (Aster tripolium), Sea Arrowgrass (Triglochin maritima), Lax-flowered Sea-lavender (Limonium humile) and Hard-grass (Parapholis strigosa), with well developed mats of glasswort (Salicornia sp.) and patches of cord-grass (Spartina sp.). Salt meadows with Sea Rush (Juncus maritimus) have formed behind the dyke at the eastern end of the site. Part of the saltmarsh complex contains halophilous scrub vegetation. This is a very rare habitat in Ireland, with only two known extant locations - Ballyteige and Bannow Bay. This habitat is characterised by the rare Perennial Glasswort (Arthrocnemum perenne).

A series of drainage channels and a small pond, which are largely artificial in origin, now have a flora and fauna characteristic of lagoons. The channels have a maximum depth of 3 m. Seawater enters mainly by percolation through the dunes along the southern shore and apparently by leakage of the sluice on The Cull at high tide. While the aquatic

[2] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000696.pdf

vegetation in much of the site is poor, two lagoonal specialists, Tassel-weed (Ruppia maritima) and the green alga Chaetomorpha linum occur. An additional lagoonal specialist, the Red Data Book stonewort Chara canescens, was recorded here in 1991. The fauna of the lagoonal habitat is rich, diverse and typically lagoonal. A total of 60 taxa were recorded in a survey in 1998, in addition to several further taxa recorded previously. Eleven of these are considered as lagoonal specialists in Britain or Ireland (Lekanesphaera hookeri (Order Isopoda), Palaemonetes varians (Order Decapoda), Sigara stagnalis (Order Hemiptera), S. concinna (Order Hemiptera), Agabus conspersus (Order Coleoptera), Enochrus bicolor (Order Coleoptera), Hydrobia ventrosa (Class Gastropoda, Order Neotaenioglossa), Conopeum seurati (a bryozoan), Neomysis integer (Order Mysida), Notonecta viridis (Order Hemiptera) and Plea leachi (Order Heteroptera)). While the habitat is particularly degraded, restoration is considered feasible and long-term prospects are good.

Ballyteige is recognised as one of the most impressive shingle-based dune systems in the country. There are 'cobble valley's' in between the some of the dunes, an unusual feature. Species associated with shingle recorded from the site include Sea Sandwort (Honkenya peploides), Sea-holly (Eryngium maritimum), Sea Bindweed (Calystegia soldanella) and Yellow Horned-poppy (Glaucium flavum). Species typical of the habitat 'annual vegetation of drift lines' which occur at the site include Spear-leaved Orache (Atriplex prostrata), Sea-holly, Sea Rocket (Cakile maritima) and Yellow Horned-poppy.

This site is host to a range of rare plant species. Wild Asparagus (Asparagus officinalis subsp. prostratus) is frequent among dune vegetation, while Lesser Centaury (Centaurium pulchellum) is associated with damp dune slacks. Borrer's Saltmarshgrass (Puccinellia fasciculata) and Perennial Glasswort occur on the saltmarsh. There is also a recent record for Sea Pea (Lathyrus japonicus subsp. maritimus), a species typically associated with shingle. All five species are protected under the Flora (Protection) Order, 2015. Henbane (Hyoscyamus niger), a species which is considered as threatened in Ireland, also occurs at Ballyteige. The dunes also have an interesting lichen flora: the scarce species Usnea articulata occurs here, and this is the only known site in Ireland for the species Fulgensia fulgens.

The Cull and adjacent reclaimed land provide important habitat for wintering waterfowl, and Brent Goose occur here in internationally important numbers (average maximum count of 219 individuals over the winters 1994/95 - 1997-98). Nationally important numbers of Lapwing (2,737) and Black-tailed Godwit (161) occur. Two species listed on Annex I of the E.U. Birds Directive occur regularly in winter, Golden Plover (2,441) and Bar-tailed Godwit (79), while another species, Little Tern, breeds at Callenstown strand.

The invertebrate fauna of the site includes a number of scarce species, examples being the bumble bees Bombus distinguendus and B. sylvarum, the jewel wasp Hedychridium ardens and the ant Tetramorium caespitum, as well as those listed above.

The dune system is used for cattle grazing. An appropriate grazing level is a critical factor in maintaining the diversity of dune systems. Coastal systems in general are threatened by disturbance of the substrate, such as removal of sand/shingle.

This coastal site is of major ecological value for its range of good quality coastal habitats, including three habitats given priority status on Annex I of the E.U. Habitats Directive - fixed dune, dune heath and lagoon. The dune system is of excellent quality, physically well developed and with a rich flora which includes five protected species. The importance of the site for wintering waterfowl further enhances its value.'

As outlined in the Conservation objectives supporting document – coastal habitats (NPWS, 2014)[3] habitats in the vicinity of the proposed works and could be potentially impacted by the proposed works include:

A) 'Perennial vegetation of stony banks

Perennial vegetation of stony banks is vegetation that is found at or above the mean high water spring tide mark on shingle beaches (i.e., beaches comprised of cobbles and pebbles). It is dominated by perennial species (i.e. plants that continue to grow from year to year). The first species to colonise are annuals or short-lived perennials that are tolerant of periodic displacement or overtopping by high tides and storms. Level, or gently-sloping, high-level mobile beaches, with limited human disturbance, support the best examples of this vegetation. More permanent ridges are formed by storm waves. Several of these storm beaches may be piled against each other to form extensive structures. However, little is known about the distribution and nature of this habitat at this site.

Overall Objective

The overall objective for 'perennial vegetation of stony banks' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'. This objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Range, (b) Area and (c) Structure and Functions.

Area

Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target for favourable condition is 'no decrease in extent from the established baseline'. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

The exact current extent of this habitat in Ballyteige Burrow is unknown. The National Shingle Beach Survey (Moore & Wilson, 1999) surveyed the site, but did not map the area. The CMP recorded and mapped a narrow band of shingle vegetation extending approximately 630m along the strand at Ballyteige Burrow (0.506ha) (Ryle et al., 2009). The habitat was not recorded suring the Sand Dunes Monitoring Project (Delaney et al., 2013), however it appears that the differences in the records may be down to the interpretation of the habitat.

The target is that the area should be stable or increasing, subject to natural processes, including erosion and succession.

Range

Habitat distribution

Current distribution unknown. Shingle was noted to occur as a narrow band along the strand at Ballyteige by Ryle et al. (2009). The NSBS also noted a number of shingle based flat grasslands between the dunes (Moore & Wilson, 1999). Some of the vegetation within the areas assigned as 'humid dune slacks' by Delaney et al. (2013) could possibly be assigned to this habitat.

The target is that there should be no decline or change in the distribution of this habitat, unless it is the result of natural processes, including erosion and succession.

Structure and Functions

A fundamental aim of shingle conservation is to facilitate natural mobility. Shingle beaches are naturally dynamic systems, making them of geomorphological interest as well as ecological interest. They are constantly changing and shingle features are rarely stable in the long term.

Functionality and sediment supply

The health and on-going development of this habitat relies on a continuing supply of shingle sediment. This may occur sporadically as a response to storm events rather than continuously. Interference with the natural coastal processes, through offshore (or onshore) extraction or coastal defence structures in particular, can interrupt the supply of sediment and lead to beach starvation.

[3] https://www.npws.ie/sites/default/files/publications/pdf/Ballyteige%20Burrow%20SAC%20(000696)%20Conservation%20objectives%20supporting%20document%20-%20coastal%20habitats%20[Version%201].pdf

The target is to maintain the natural circulation of sediment and organic matter, without any physical obstructions.

Vegetation structure: zonation

Ecological variation in this habitat type depends on stability; the amount of fine material accumulating between the pebbles; climatic conditions; width of the foreshore and past management of the site. The ridges and lows also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle. In the frontal less stable areas of shingle, the vegetation tends to be dominated by annuals and short-lived salt-tolerant perennials. Where the shingle is more stable the vegetation becomes more perennial in nature and may include grassland, heathland and scrub, depending on the exact nature of the site. The presence of lichens at Ballyteige Burrow indicates long term stability of the shingle structure. Transitions to intertidal, saltmarsh and sand dune habitats occur at this site (Moore & Wilson, 1999). The rare lichen, Fulgensia semibracteata has its only known station in Ireland in the dry slacks of Ballyteige Burrow, where there is an absence of winter flooding, primarily due to the underlying shingle substrate.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes including erosion and succession.

Vegetation composition: typical species & sub-communities

The degree of exposure, as well as the coarseness and stability of the substrate determines species diversity. There is little information concerning the vegetation growing on the shingle at Ballyteige Burrow but it is assumed to support a typical flora for this habitat. Typical species include sea sandwort (Honckenya peploides), sea-holly (Eryngium maritimum), sea bind weed (Calystegia soldanella) and yellow horned-poppy (Glaucium flavum). The target for this attribute is to ensure that the typical flora of vegetated shingle is maintained, as are the range of sub-communities within the different zones.

Vegetation composition: negative indicator species

Where shingle becomes more stabilised negative indicator species can become an issue. Negative indicator species can include non-native species (e.g. Centranthus ruber, Lupinus arboreus); species indicative of changes in nutrient status (e.g. Urtica dioica) and species not considered to be typical of the habitat (e.g. Pteridium aquilinum).

The target for this attribute is that negative indicator species (including non-native species) should represent less than 5% of the vegetation cover."

B) Sand dune habitats

Sand dunes are hills of wind-blown sand that have become progressively more stabilised by a cover of vegetation. In general, most sites display a progression through strandline, foredunes, mobile dunes and fixed dunes. Where the sandy substrate is decalcified, fixed dunes may give way to dune heath. Wet hollows, or dune slacks, occur where the dunes have been eroded down to the level of the water-table. Machair is a specialised form of dune system that is only found on the northwest coasts of Ireland and Scotland. Transitional communities can occur between dune habitats and they may also form mosaics with each other. Dune systems are in a constant state of change and maintaining this natural dynamism is essential to ensure that all of the habitats present at a site achieve favourable conservation condition.

In Ireland, there are 9 sand dune habitats (including annual vegetation of drift lines) listed under Annex I of the EU Habitats Directive (92/43/EEC) (denotes a priority habitat):*

- *Annual vegetation of drift lines (1210)*
- *Embryonic shifting dunes (2110)*
- *Shifting dunes along the shoreline with Ammophila arenaria (2120)*
- *Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) **
- *Decalcified dunes with Empetrum nigrum (2140) **
- *Atlantic decalcified fixed dunes (2150) **
- *Dunes with Salix repens (2170)*
- *Humid dune slacks (2190)*
- *Machair (21AO) **

Six dune habitats were recorded by Ryle et al. (2009) but only the five habitats indicated in bold above are listed as Qualifying Interests for Ballyteige Burrow SAC. These habitats include mobile areas at the front, as well as more stabilised parts of dune systems. Humid dune slacks were also recorded at the Ballyteige Burrow sub-site by the CMP.

However, these areas need to be assessed further to investigate whether they are better placed within the habitat 'perennial vegetation of stony banks'.

Annual vegetation of drift lines is found on beaches along the high tide mark, where tidal litter accumulates. It is dominated by a small number of annual species (i.e. plants that complete their life-cycle within a single season). Tidal litter contains the remains of marine algal and faunal material, as well as a quantity of seeds. Decaying detritus in the tidal litter releases nutrients into what would otherwise be a nutrient-poor environment. The habitat is often represented as patchy, fragmented stands of vegetation that are short-lived and subject to frequent re-working of the sediment. The vegetation is limited to a small number of highly specialised species that are capable of coping with salinity, wind exposure, an unstable substrate and lack of soil moisture. Typical species include spear-leaved orache (Atriplex prostrata), frosted orache (A. laciniata), sea rocket (Cakile maritima), sea sandwort (Honckenya peploides) and prickly saltwort (Salsola kali).

Embryonic dunes are low accumulations of sand that form above the strandline. They are sometimes referred to as foredunes, pioneer dunes or embryo dunes, as they can represent the primary stage of dune formation. They are characterised by the presence of the salt-tolerant dune grasses sand couch (Elytrigia juncea) and lyme grass (Leymus arenarius), which act as an impediment to airborne sand. Strandline species can remain a persistent element of the vegetation.

Where sand accumulation is more rapid, marram grass (Ammophila arenaria) invades, initiating the transition to mobile dunes (Shifting dunes along the shoreline with Ammophila arenaria). Marram growth is actively stimulated by sand accumulation. These unstable and mobile areas are sometimes referred to as 'yellow dunes' (or white dunes in some European countries), owing to the areas of bare sand visible between the tussocks of marram.

Fixed dunes refers to the more stabilised area of dune systems, generally located in the shelter of the mobile dune ridges, where the wind speed is reduced and the vegetation is removed from the influence of tidal inundation and salt spray. This leads to the development of a more or less closed or 'fixed' carpet of vegetation dominated by a range of sand-binding species (Gaynor, 2008).

At the older landward edge of the fixed dunes, leaching of basic minerals and nutrients can lower the pH over time and create conditions suitable for colonisation by heath species. As these decalcified or acidic conditions can only form on the older, landward extremes of dune systems, they are often vulnerable to housing or other developments. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as Calluna vulgaris (heather), and Erica spp., that are generally regarded as characterising the habitat, are not well represented in Ireland.

All of the dune habitats indicated above occur as a complex mosaic of constantly changing and evolving vegetation communities. They are inextricably linked in terms of their ecological functioning and should be regarded as single geomorphological units. As such, no dune habitat should be considered in isolation from the other dune habitats present at a site, or the adjoining semi-natural habitats with which they often form important transitional communities.

The CMP surveyed one sub-site within Ballyteige Burrow SAC:

1. *Ballyteige Burrow (Appendix V)*

Ballyteige Burrow is a long sand/shingle spit extending approximately 8.5km in a westerly direction from Forlorn Point at Kilmore Quay. The distribution of sand dune habitats as mapped by the SDM is presented in Appendix II. A total of 253.53ha of sand dune habitat was mapped within the Ballyteige Burrow SAC, of which 17.68ha represents 'humid dune slacks' which need to be reviewed. The remaining area represents habitats of qualifying interest for this particular site.

Overall objectives

The overall objective for 'Annual vegetation of drift lines' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Embryonic shifting dunes' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with Ammophila arenaria' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Ballyteige Burrow SAC is to 'restore the favourable conservation condition'.

While acknowledging that the habitat may be poorly developed at this site, the overall objective for 'Atlantic decalcified fixed dunes (Calluno-Ulicetea)' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

These objectives are based on an assessment of the recorded condition of each habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

Area

Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats at each sub-site in Ballyteige Burrow SAC during the Coastal Monitoring Project (CMP) (Ryle et al., 2009). During the SDM, these baseline maps were checked and revised to account for changes in habitat interpretation and ommissions. Updated maps were then produced to reflect the current situation on the ground. The revised baseline habitat maps and updated habitat maps from the SDM are included with the individual site reports in the Appendix V.

Ballyteige Burrow is an important site for the range and extent of its coastal habitats. In general, the habitats at the front of the system are limited in their development and extent in view of the tidal exposure. The fixed dunes are significant in extent and species diversity.

Dune heath habitat occurs in transition with the fixed dune habitat. Neither the CMP nor the SDM separated dune heath from fixed dune as the dune heath habitat was recognised based in the presence of gorse (Ulex europaeus) which is concentrated on the leeward side of the dunes. The difficulty in delineating the habitat at Ballyteige Burrows and most Irish sites that are designated for dune heath is the absence of other ericoid species typical of dune heath. The status of this habitat requires further review.

The total areas of each sand dune habitat within the SAC as estimated by Delaney et al. (2013) are presented in the following table.

Habitat	Total area (ha) of habitat within SAC boundary following SDM
Annual vegetation of driftlines	0.66
Embryonic shifting dunes	0.43
Shifting dunes along the shoreline with *Ammophila arenaria*	8.11
Fixed coastal dunes with herbaceous vegetation	225.65
Atlantic decalcified fixed dunes	-
Total	**234.85**

In the case of 'embryonic dunes' and 'shifting dunes along the shoreline with Ammophila arenaria', losses were reported during the baseline survey (Ryle et al., 2009). However, the extent of these habitats is naturally limited by the tidal conditions at the site. Therefore, the general target for this attribute in the case of each habitat is that the area should be stable, or increasing. Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is always assessed subject to natural processes, including erosion and succession.

Range

Habitat distribution

Ballyteige Burrow is a long sand/shingle spit and supports a good range of dune habitats (Ryle et al., 2009; Delaney et al., 2013).

The distribution of sand dune habitats as mapped by Delaney et al. (2013) is presented in Appendix II.

Of particular interest at the site is the possible existence of small areas of decalcified dune heath, a priority Annex I habitat. This is normally characterised by the presence of ericoid or heath species in association with dune species. The status of this habitat in Ireland is currently under review.

There should be no decline or change in the distribution of these sand dune habitats, unless it is the result of natural processes, including erosion, and succession.

Structure and Functions

The location, character and dynamic behaviour of sand dunes are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. Sand dunes are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered. Maintaining the favourable conservation condition of all of the sand dune habitats in Ballyteige Burrow SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

Physical structure: functionality and sediment supply

Coastlines naturally undergo a constant cycle of erosion and accretion. There are two main causes of erosion: (a) those resulting from natural causes and (b) those resulting from human interference. Natural causes include the continual tendency towards a state of equilibrium between coasts and environmental forces, climatic change (particularly an increase in the frequency of storms or a shift in storm tracks), relative sea level rise and natural changes in the sediment supply. Human interference is usually associated with changes in the sediment budget, either directly, through the removal of beach or inshore sediment, or indirectly, by impeding or altering sediment movement. It is important to recognise that the process of coastal erosion is part of a natural tendency towards equilibrium. Natural shorelines attempt to absorb the energy entering the coastal zone by redistributing sediment.

Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sediment supply is especially important in the embryonic dunes and mobile dunes, as well as the strandline communities where accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

The target for this attribute is to maintain the natural circulation of sediment and organic matter throughout the entire dune system, without any physical obstructions.

Vegetation structure: zonation

The range of vegetation zones on a dune system should be maintained. Gaynor (2008) highlights the highly transitional nature of much of the vegetation; therefore, it is important that the transitional communities are also conserved, including those to the saltmarsh communities.

Ballyteige Burrows represents one of the finest examples of a dune/saltmarsh system with intact transitional communities between the two habitats. This is an extremely rare feature on Irish dune systems.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes, including erosion and succession.

Vegetation structure: bare ground

This target only applies to fixed dunes. It does not apply to the other habitats present where high levels of bare sand are a natural component of the habitat. In the fixed and slack areas some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions including invertebrates, helping to increase biodiversity.

The target is to achieve up to 10% bare sand. This target is assessed subject to natural processes.

Vegetation structure: vegetation height

This attribute applies to the fixed dunes, where a varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. The ecological benefits of moderate levels of grazing on dunes have been well documented (Gaynor, 2008). Moderate grazing regimes lead to the development of a species-rich vegetation cover. The animals increase biodiversity by creating microhabitats through their grazing, dunging and trampling activities. Grazing slows down successional processes and in some cases reverses them,

helping to achieve a diverse and dynamic landscape. The effects of trampling assist the internal movement of sand through the development of small-scale blowouts, while dunging can eutrophicate those dune habitats whose nutrient-poor status is crucial for the survival of certain vegetation types. Many species, from plants to invertebrates, benefit immensely from the open and diverse system created by a sustainable grazing regime. Many dune species are small in size and have relatively low competitive ability. Consequently, the maintenance of high species diversity on a dune system is dependent on the existence of some control to limit the growth of rank coarse vegetation (Gaynor, 2008).

There is limited grazing at Ballyteige Burrow as part of the management regime within the Nature Reserve, in order to maintain the dwarf grassland sward mosaic which is of considerable conservation value at the site. In contrast, in the land under private ownership the dunes are undergrazed and dominated by marram with relatively large patches of bracken and bramble present (Ryle et al., 2009; Delaney et al., 2013).

The target for this attribute is to maintain structural variation within the sward.

Vegetation composition: plant health of dune grasses

This attribute applies to foredunes and mobile dunes, where blowing sand is a natural feature. The health of the dune grasses (particularly Ammophila arenaria and Elytrigia juncea) is assessed by the plant parts above the ground (they should be green) and the presence of flowering heads. This gives a clear indication of the status of the supply of blown sand, which is required for these species to thrive.

The target for this attribute is that more than 95% of the dune grasses should be healthy.

Vegetation composition: typical species & sub-communities

Species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance. In the younger, more mobile dunes, marram (Ammophila arenaria) is common, while groundsel (Senecio vulgaris), sea rocket (Cakile maritima) and dandelion (Taraxacum sp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (Galium verum), common birdsfoot trefoil (Lotus corniculatus), wild thyme (Thymus praecox), kidney vetch (Anthyllis vulneraria), wild pansy (Viola tricolor) and biting stonecrop (Sedum acre).

The Ballyteige sub-site supports a characteristic and species-rich dune flora, details of which can be found in the site report from the SDM (Ryle et al., 2009) which is included in Appendix V. Additional information on the flora of the site can be found in Nooren & Schouten (1976), Gaynor (2008) and Ryle et al. (2009). Rare elements of the site flora include wild asparagus (Asparagus officinalis var. prostratus), a Red Data Book species (Ryle et al., 2009).

The target for this attribute is to maintain a typical flora for the particular sand dune habitat.

Vegetation composition: negative indicator species

Negative indicators include non-native species (e.g. Hippophae rhamnoides), species indicative of changes in nutrient status (e.g. Urtica dioica) and species not considered characteristic of the habitat. Sea-buckthorn (Hippophae rhamnoides) should be absent or effectively controlled.

The main invasive species identified in Gaynor (2008) were bracken (Pteridium aquilinum) and sea buckthorn (Hippophae rhamnoides). The invasion of non-native species compromises the typical plant community structure. Bracken (Pteridium aquilinum) is becoming increasingly dominant, particularly where sites have been abandoned or where grazing levels have been significantly reduced. The vegetation retains many elements of the original vegetation cover, but there is a reduction in biodiversity. As the canopy becomes taller and ranker, many of the low-growing species disappear. In this case, the vegetation is treated as a sub-community of the original community that was invaded. This is always the case unless the original vegetation cover has been completely destroyed, as can happen with H. rhamnoides, which can form dense impenetrable thickets.

Bracken (Pteridium aquilinum) and Bramble (Rubus fruticosus) have been recorded in fixed dunes to the east of the site at Ballyteige (privately owned land) where grazing is absent (Ryle et al., 2009; Delaney et al., 2013).

The target is that negative indicators (including non-native species) should represent less than 5% of the vegetation cover.

Vegetation composition: scrub/trees

This attribute only applies to the fixed dunes and dune heath. Scrub encroachment leads to reduction in dune biodiversity and needs to be controlled. The presence of scrub and trees which have deep roots can also lower the groundwater table which can have significant impacts on any slack communities.

The target for this attribute therefore is that the cover of scrub and tree species should be under control or represent no more than 5% of the vegetation cover.'

As outlined in the Conservation objectives supporting document – marine habitats (NPWS, 2014)[4]:

C) Principal Benthic Communities (Mudflats and Sandflats and Estuaries)

Within Ballyteige Burrow SAC, two community types are recorded. Their occurrence within the Annex I habitats and the SPA are presented in table 1; a description of each community type is given below.

Community Type	SAC Annex I Habitats		SPA
	Estuaries (1130)	Mudflats and sandflats not covered by seawater at low tide (1140)	
Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex	✓	✓	✓
Sand with crustaceans and *Nephtys hombergii* community complex	✓		✓

Table 1 The community types recorded in Ballyteige Burrow SAC and their occurrence in the Annex I habitats and the overlapping SPA.

Estimated areas of each community type within the Annex I habitat, based on interpolation, is given in the objective targets in Section 2.

The development of a community complex target arises when an area possesses similar abiotic features but records a number of biological communities that are not regarded as being sufficiently stable and/or distinct temporally or spatially to become the focus of conservation efforts. In this case, examination of the available data from Ballyteige Burrow identified a number of biological communities whose species composition overlapped significantly. Such biological communities are grouped together into what experts consider are sufficiently stable units (i.e. a complex) for conservation targets.

MIXED SEDIMENT TO SAND WITH NEMATODES AND TUBIFICOIDES BENEDII COMMUNITY COMPLEX

The complex is recorded throughout the intertidal at this site and in the shallow subtidal in the inner reaches of the estuary (Figure 43).

The sediment is variable ranging from sandy mud in the inner reaches of the estuary (fine sand and silt-clay ranging from 8.7% to 61.8% and 10.5% to 52%, respectively) to coarse sediment in the exposed outer shore (gravel ranges from 0.2% to 27.3% and coarse sand from 17.6% to 46.8%).

The distinguishing species of this community complex include unidentified nematodes, the oligochaete Tubificoides benedii and unidentified oligochaetes of the family Enchytraeidae, the polychaetes Pygospio elegans and Eteone longa, and the amphipod Corophium volutator.

[4] https://www.npws.ie/sites/default/files/publications/pdf/Ballyteige%20Burrow%20SAC%20(000696)%20Conservation%20objectives%20supporting%20document%20-%20marine%20habitats%20[Version%201].pdf

These species are not uniformly distributed within the community complex. The exposed mobile sand has low species diversity with only enchytraeids being recorded in moderate abundances in some areas here. T. benedii is recorded in moderate to high abundances in the inner estuary but is absent from the outer estuary and on the exposed beach. P.

Distinguishing species of Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex	
Nematoda indet.	Enchytraeidae indet.
Tubificoides benedii	*Corophium volutator*
Pygospio elegans	*Eteone longa*

Table 2 Distinguishing species of Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex.

elegans is recorded in its highest abundance on the shore at Lacken; elsewhere it occurs in moderate to low abundances. It is absent from all but the western end of the exposed beach where it occurs in low abundances. E. longa occurs in moderate abundances with in the estuary and is only recorded midway along the exposed beach. C. volutator is recorded in moderate to high abundances in the east of the site from Blackstone to the east of Cull Island and it occurs in low abundances in the outer reaches of the estuary. Unidentified nematodes occur in high to moderate abundances in the outer reaches of the estuary and at eastern extreme of the exposed beach; they are not recorded elsewhere within the site.

Other species present here include the gastropod Peringia ulvae and the polychaete Hediste diversicolor and the bivalves Cerastoderma edule and Mya arenaria. Arenicola marina is recorded as abundant on the north shore of the sheltered estuary, near Lough, and in the inner estuary just north of Blackstone. Green filamentous algae (Ulva spp.) and Ulva lactuca are present extensively in these areas. The bivalve Lasaea adansoni occurs in high abundance at the outer reaches of the estuary reflecting the coarse nature of the sediment here.

SAND WITH CRUSTACEANS AND NEPHTYS HOMBERGII COMMUNITY COMPLEX

This subtidal community complex is recorded throughout the site at depths of between 0m and 7m (Figure 44).

The sediment is largely that of fine and very fine sands (ranging from 44.4% to 84.1% and 7.7% to 52.6%, respectively) the exception being at the entrance to the estuary where the

substrate is that of coarse sediment (gravel is 28.9% of the sediment compared to less than 0.2% elsewhere).

The community complex is distinguished by the amphipods Bathyporeia elegans and Pontocrates arcticus and the polychaete Nephtys hombergii. N. hombergii is recorded within the estuary while P. arcticus and B. elegans are only recorded outside it.

Other species present in this community complex include the polychaetes Magelona johnstoni, Spio martinensis, Nephtys cirrosa, and Melita palmata and the amphipods Gammarus locusta, Urothoe brevicornis and Bathyporeia pelagica. Gammarus locusta is recorded in high abundance in the coarse sediment near the mouth of the estuary. The polychaete Melinna palmata and Spio martinensis are recorded within the estuary while Spiophanes bombyx, Paraspio decorata and Sigalion mathildae only occur outside the estuary.

Distinguishing species of the Sand with crustaceans and *Nephtys hombergii* community complex	
Bathyporeia elegans	*Pontocrates arcticus*
Nephtys hombergii	

Table 3 Distinguishing species of the Sand with crustaceans and *Nephtys hombergii* community complex.

Section 2 – Appropriate Assessment Notes

Many operations/activities of a particular nature and/or size require the preparation of an environmental impact statement of the likely effects of their planned development. While smaller operations/activities (i.e. sub threshold developments) are not required to prepare such statements, an appropriate assessment and Natura Impact Statement is required to inform the decision-making process in or adjacent to Natura 2000 sites. The purpose of such an assessment is to record in a transparent and reasoned manner the likely effects on a Natura 2000 site of a proposed development. General guidance on the completion of such assessments has been prepared and is available at www.npws.ie.

Annex I Habitats

It is worth considering at the outset that in relation to Annex I habitat structure and function, the extent and quality of all habitats varies considerably in space and time and marine habitats are particularly prone to such variation. Habitats which are varying naturally, i.e. biotic and/or abiotic variables are changing within an envelope of natural variation, must be considered to have favourable conservation condition. Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. The capacity of the habitat to recover from this change is obviously an important consideration (i.e. habitat resilience) thereafter.

This Department has adopted a prioritized approach to conservation of structure and function in marine Annex I habitats.

1. *Those communities that are key contributors to overall biodiversity at a site by virtue of their structure and/or function (keystone communities) and their low resilience should be afforded the highest degree of protection and any significant anthropogenic disturbance should be avoided.*
2. *In relation to the remaining constituent communities that are structurally important (e.g. broad sedimentary communities) within an Annex I marine habitat, there are two considerations.*

   2.1 Significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g. effluent discharge within a given area). Drawing from the principle outlined in the European Commission's Article 17 reporting framework that disturbance of greater than 25% of the area of an Annex I habitat represents unfavourable conservation status, this Department takes the view that licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%. Thereafter, an increasingly cautious approach is advocated. Prior to any further licensing of this category of activities, an interDepartmental management review (considering inter alia robustness of available scientific knowledge, future site requirements, etc) of the site is recommended.

   2.2 Some activities may cause significant disturbance but may not necessarily represent a continuous or ongoing source of disturbance over time and space. This may arise for intermittent or episodic activities for which the receiving environment would have some resilience and may be expected to recover within a reasonable timeframe relative to the six-year reporting cycle (as required under Article 17 of the Directive). This Department is satisfied that such activities could be assessed in a contextspecific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

The following technical clarification is provided in relation to specific conservation objectives and targets for Annex I habitats to facilitate the appropriate assessment process:

Objective - To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Ballyteige Burrow SAC, which is defined by the following list of attributes and targets.

***Target 1** - The permanent habitat area is stable or increasing, subject to natural processes.*

- *This target refers to activities or operations that propose to permanently remove habitat from a site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.*

- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

***Target 2** - Conserve the following community type in a natural condition: Mixed sediment to sand with nematodes and Tubificoides benedii community complex.*

- *A semi-quantitative description of this community type has been provided in Section 1.*
- *An interpolation of its likely distribution is provided in figure 3.*
- *The estimated area of this community type within the Mudflats and sandflats not covered by seawater at low tide habitat given below is based on spatial interpolation and therefore should be considered indicative: - Mixed sediment to sand with nematodes and Tubificoides benedii community complex – 201ha*
- *Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.*
- *Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*

Objective - To maintain the favourable conservation condition of Estuaries in Ballyteige Burrow SAC, which is defined by the following list of attributes and targets.

***Target 1** - The permanent habitat area is stable or increasing, subject to natural processes.*

- *This habitat also encompasses the Annex I habitat of mudflats and sandflats not covered by seawater at low tide. In such areas, the specific targets for that Annex I habitat will address requirements within the Annex I habitat Estuaries.*
- *This target refers to activities or operations that propose to permanently remove habitat from a site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

***Target 2** - Conserve the following community types a natural condition: Mixed sediment to sand with nematodes and Tubificoides benedii community complex and Sand with crustaceans and Nephtys hombergii community complex.*

- *A semi-quantitative description of these community types has been provided in Section 1.*
- *An interpolation of their likely distribution is provided in figure 3.*
- *The estimated area of these community types within the Estuaries habitat given below is based on spatial interpolation and therefore should be considered indicative:*
  - *Mixed sediment to sand with nematodes and Tubificoides benedii community complex*
  - *164ha - Sand with crustaceans and Nephtys hombergii community complex - 30ha*
- *Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area, at which point an interDepartmental management review is recommended prior to further licensing of such activities.*
- *Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*'

D)Coastal Lagoons

As outlined in the Conservation objectives supporting document – coastal lagoons (NPWS, 2014)[5]:

'*"Coastal lagoons" (habitat code 1150) is a priority habitat in Annex I of the Habitats Directive. A coastal lagoon is a lake or pond that is fully or partially separated from the sea by a permeable barrier that can be entirely natural such as shingle, or can be an artificial embankment. Salinity varies depending on such factors such as freshwater inputs*

[5]https://www.npws.ie/sites/default/files/publications/pdf/Ballyteige%20Burrow%20SAC%20(000696)%20Conservation%20objectives%20supporting%20document%20-%20lagoons%20habitats%20[Version%201].pdf

and barrier permeability. Lagoons support unique assemblages of flora and fauna, particularly invertebrates. In Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution (NPWS, 2013).

A single lagoon, in the form of artificial channels, is listed for this SAC (Oliver, 2007). The table below gives the conservation status assessment of this lagoon as outlined in that report. See the map in Appendix 1 and Appendix 2 for an account of the site (from Oliver, 2007).(Figure 45)

Code[1]	Name	County	Conservation Assessment
IL008	Ballyteige channels	Wexford	Unfavourable- inadequate

[1] Codes are those used in Oliver, 2007.

Conservation objectives

A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

Conservation objectives are defined using attributes and targets that are based on parameters as set out in the Habitats Directive for defining favourable status, namely area, range, and structure and functions.

Provisional reference conditions for Irish lagoons are proposed by Roden and Oliver (2013). Reference conditions aim to define ecological status prior to human impacts (i.e. "natural" conditions). The targets for the water quality attributes given below are based on reference values given by Roden and Oliver (2013).

Attributes and targets may change/become more refined as further information becomes available.

Area

The target for habitat area is: stable or increasing, subject to natural processes. Favourable reference area for the mapped lagoons is 12.5ha (area is calculated from spatial data derived from Oliver (2007)).

Range

The known distribution of lagoon habitat in Ballyteige Burrow SAC is shown in Appendix 1. The target for the habitat distribution attribute is: no decline, subject to natural processes.

Structure and functions

Structure and functions relates to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For lagoons these include attributes such as salinity, hydrology and various water quality attributes.

Salinity regime

Lagoons can vary considerably in salinity both within and between sites depending on the volume and timing of inflowing and outflowing fresh and seawater. Salinity is probably the most important variable in the classification of lagoon types (Roden and Oliver, 2013).

The target for the salinity regime attribute is: median annual salinity and temporal variation within natural range.

Seawater enters these artificial drainage channels by percolation through the dunes along the southern shore and also by leakage of the sluice on the Cull at high tide. It is also possible that seawater enters from the tidal river that runs from Duncormick to Bridgetown. A range of salinities from 34psu near seepage streams to freshwater can be found. See Roden and Oliver (2013) for further information on salinity classes and Appendix 2 for the lagoon report.

Hydrological regime

Fluctuations in water depth are a natural feature of lagoon hydrology. However, if water levels fluctuate beyond their natural values due to issues such as drainage, the condition of the habitat can deteriorate.

The target for hydrological regime is: annual water level fluctuations and minima within natural ranges.

Ballyteige channels is relatively shallow (less than 3m deep), thus even small changes in water depth can cause significant losses in habitat area. Further information is required to investigate historic fluctuations to enable more specific targets to be set. See Appendix 2 for the site report.

Barrier: connectivity between lagoon and sea

The morphology of the barrier between a lagoon and sea determines how it functions ecologically. Changes to the barrier can be due to natural processes such as storms, but they can also be modified through human intervention. Active management is sometimes necessary, particularly if the lagoon is artificial.

The target for the attribute barriers: connectivity between lagoon and sea is: appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management.

The channels are artificial; water is pumped westward into the Cull and south eastwards into the sea west of Kilmore Quay. See also site account in Appendix 2.

Water quality- Chlorophyll a

This attribute indicates the level of phytoplankton in the water column. Roden and Oliver (2013) make the assumption that, for shallow lagoons in "natural" condition, primary productivity is dominated by the benthos rather than the plankton. Phytoplankton tends to increase in density in response to increasing nutrient levels. Excessive shading from phytoplankton can reduce submergent macrophyte colonisation of the littoral zone of lagoons.

The target for the attribute water quality- Chlorophyll a is: annual median chlorophyll a within natural ranges and less than 5µg/L. Target based on Roden and Oliver (2013).

4.5 Water quality- Molybdate reactive phosphorus (MRP)

The target for the attribute water quality- Molybdate Reactive Phosphorus (MRP) is: annual median MRP within natural ranges and less than 0.1mg/L. The target is based on Roden and Oliver (2013).

This limit is required to ensure that excessive shading from phytoplankton does not reduce submergent colonisation of the littoral zone.

Water quality- Dissolved inorganic nitrogen (DIN)

The target for the attribute water quality- Dissolved Inorganic Nitrogen (DIN) is: annual median DIN within natural ranges and less than 0.15mg/L.The target is based on Roden and Oliver (2013).

As for phosphorus, the limit for set nitrogen is to ensure that excessive shading from phytoplankton does not reduce submergent colonisation.

Depth of macrophyte colonisation

Ballyteige channels within the Ballyteige Burrow SAC have been identified as shallow, thus, it is expected that macrophytes extend down to their full depths.

The target for the attribute depth of macrophyte colonisation is: macrophyte colonisation to maximum depth of lagoons.

Typical plant species

As lagoon specialist species do not easily recolonise, their presence is one of the indicators of long term continuity of quality.The target for the attribute typical plant species is: maintain number and extent of listed lagoonal specialists, subject to natural variation.The plant species recorded in this lagoon are summarised in Oliver (2007). Species considered to be lagoonal specialists includeChaetomorphalinumand Ruppiamaritima. See Appendix 2 for the site report.

Typical animal species

Some invertebrate species are regarded as lagoonal specialists and their presence can indicate long term quality. As species found within each lagoon can vary considerably, depending on other attributes such as salinity, the target is based on site-specific species lists.

The target for the attribute typical animal species is: maintain listed lagoon specialists, subject to natural variation The species recorded in this lagoon are summarised in Oliver (2007).

Negative indicator species

Negative indicator species include non-native alien species as well as those that are not typical of the habitat. For example, accelerated encroachment by reedbedscan be caused by low salinity, shallow water and elevated nutrient levels. The target for the attribute negative indicator species is: negative indicator species absent or under control.'

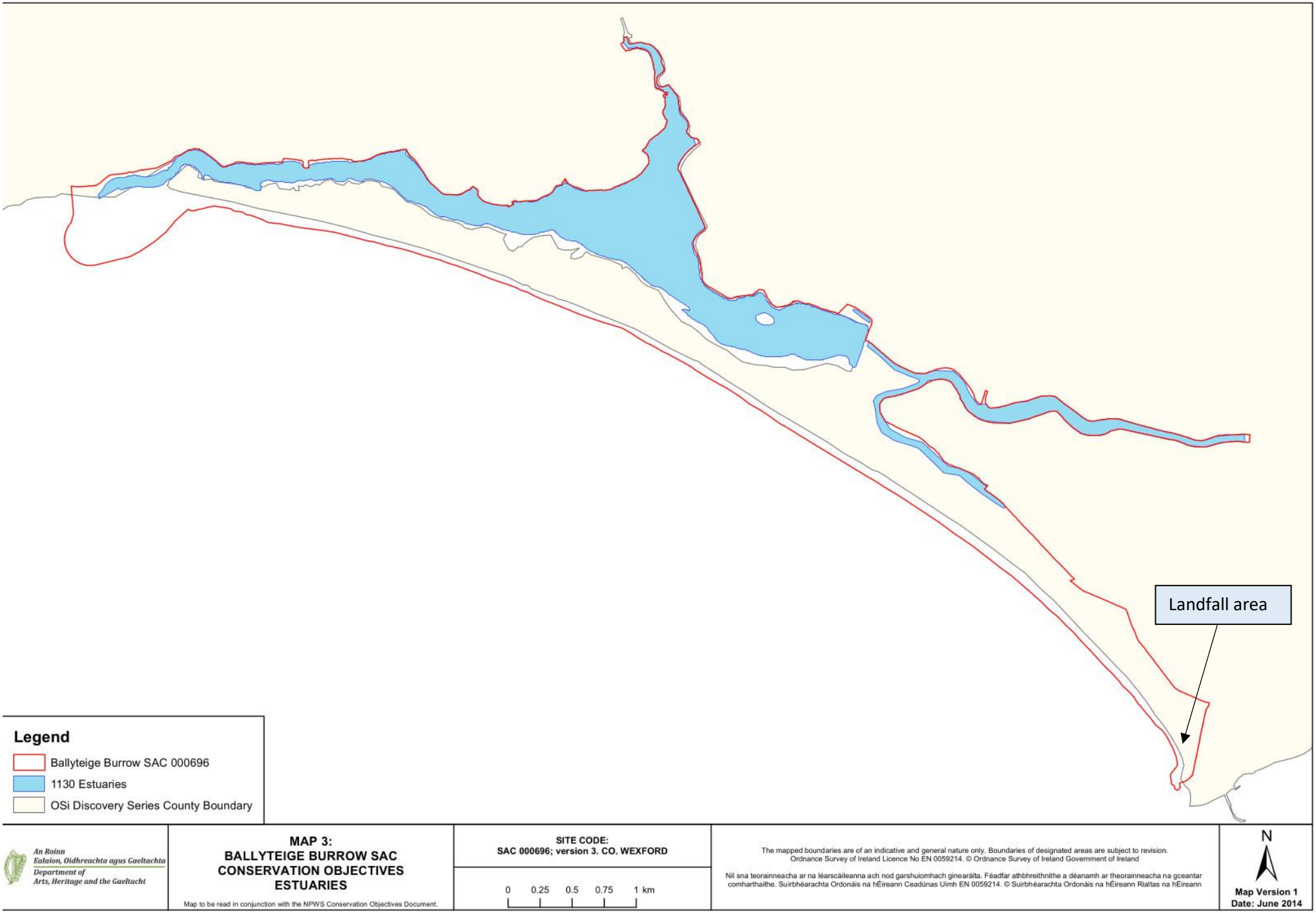

Figure 27. Location of Estuaries in Ballyteige Burrow SAC

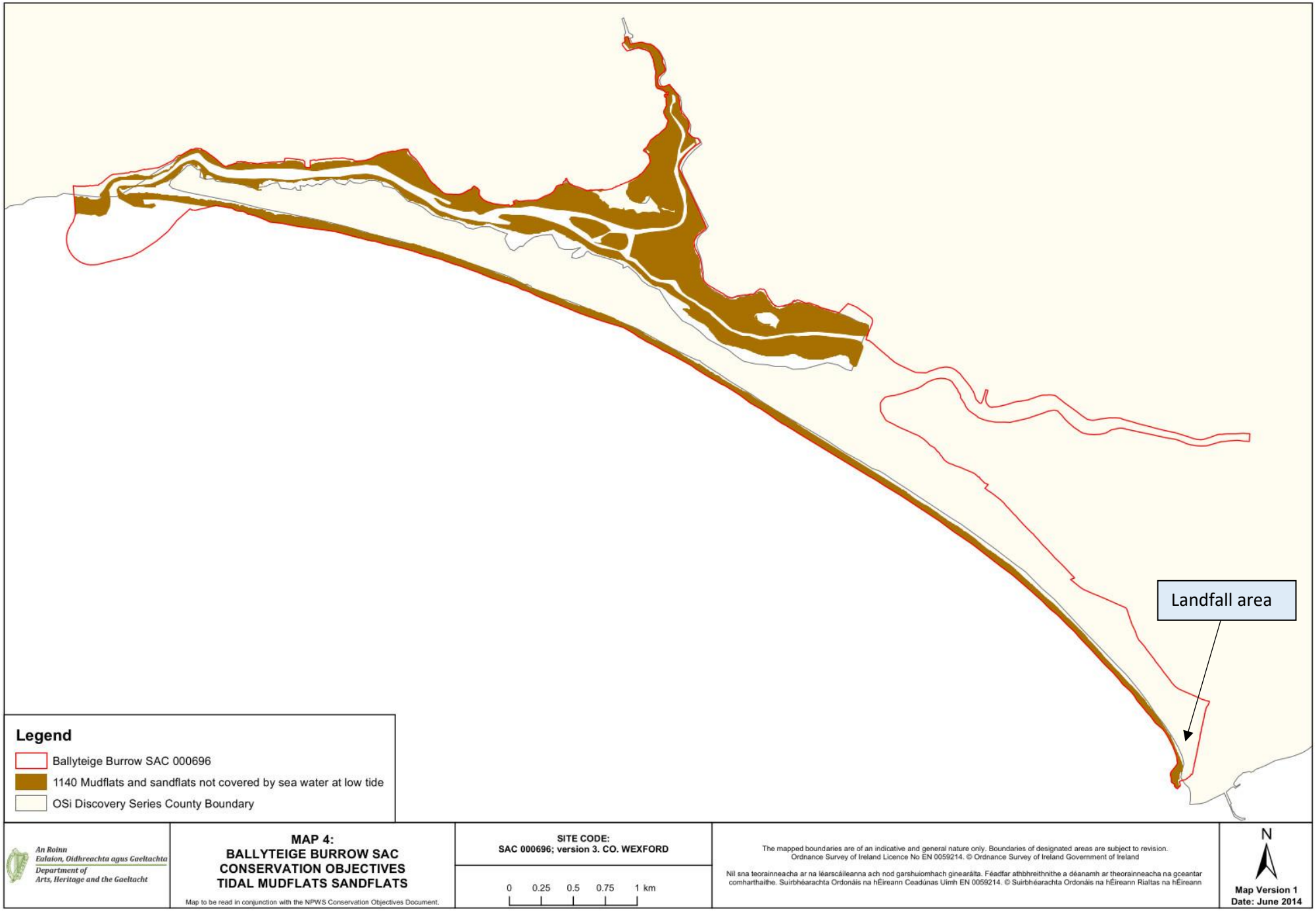

Figure 28. Location of Tidal Mudflats and Sandflats in Ballyteige Burrow SAC

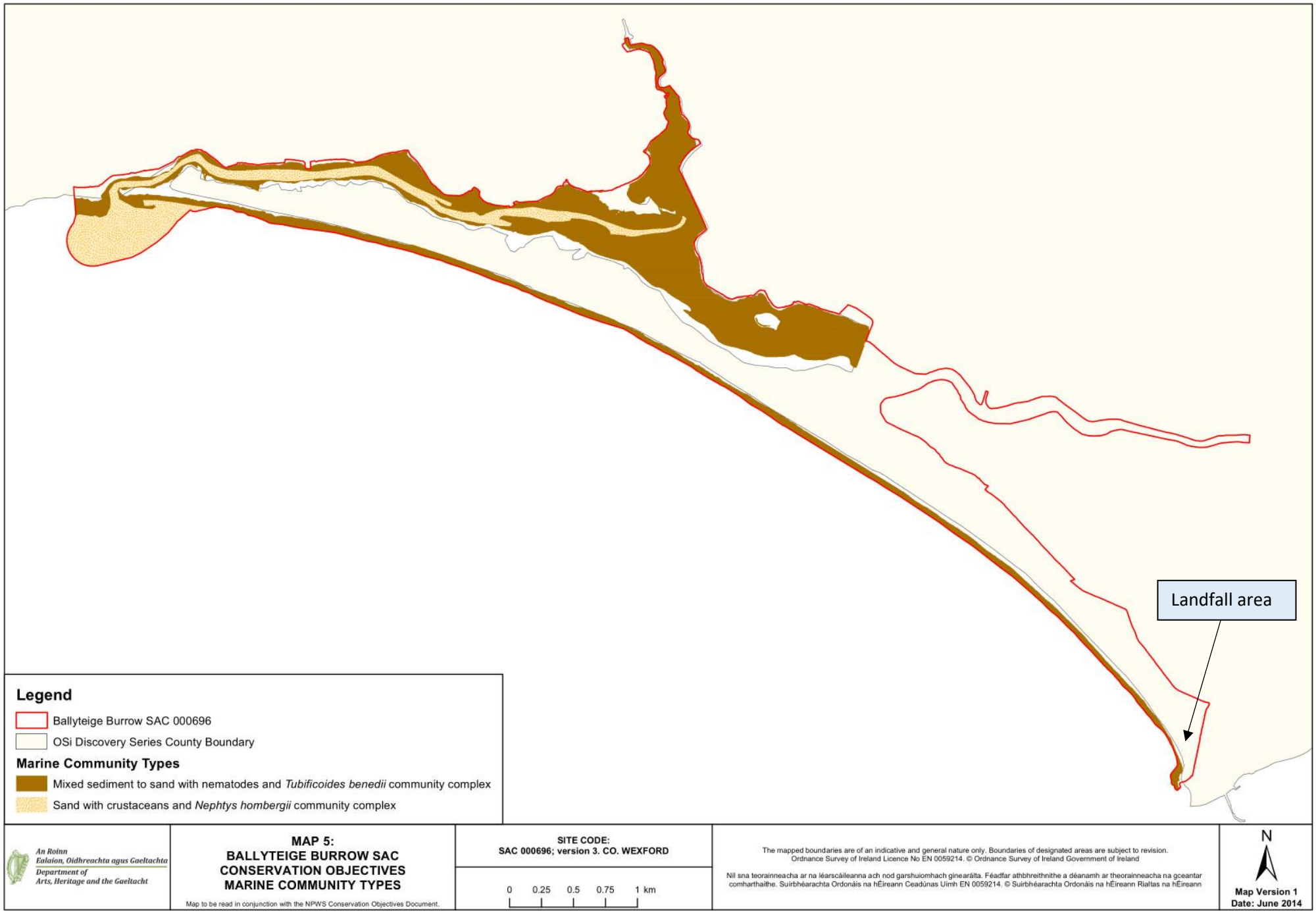

Figure 29. Location of Mixed Community Types in Ballyteige Burrow SAC

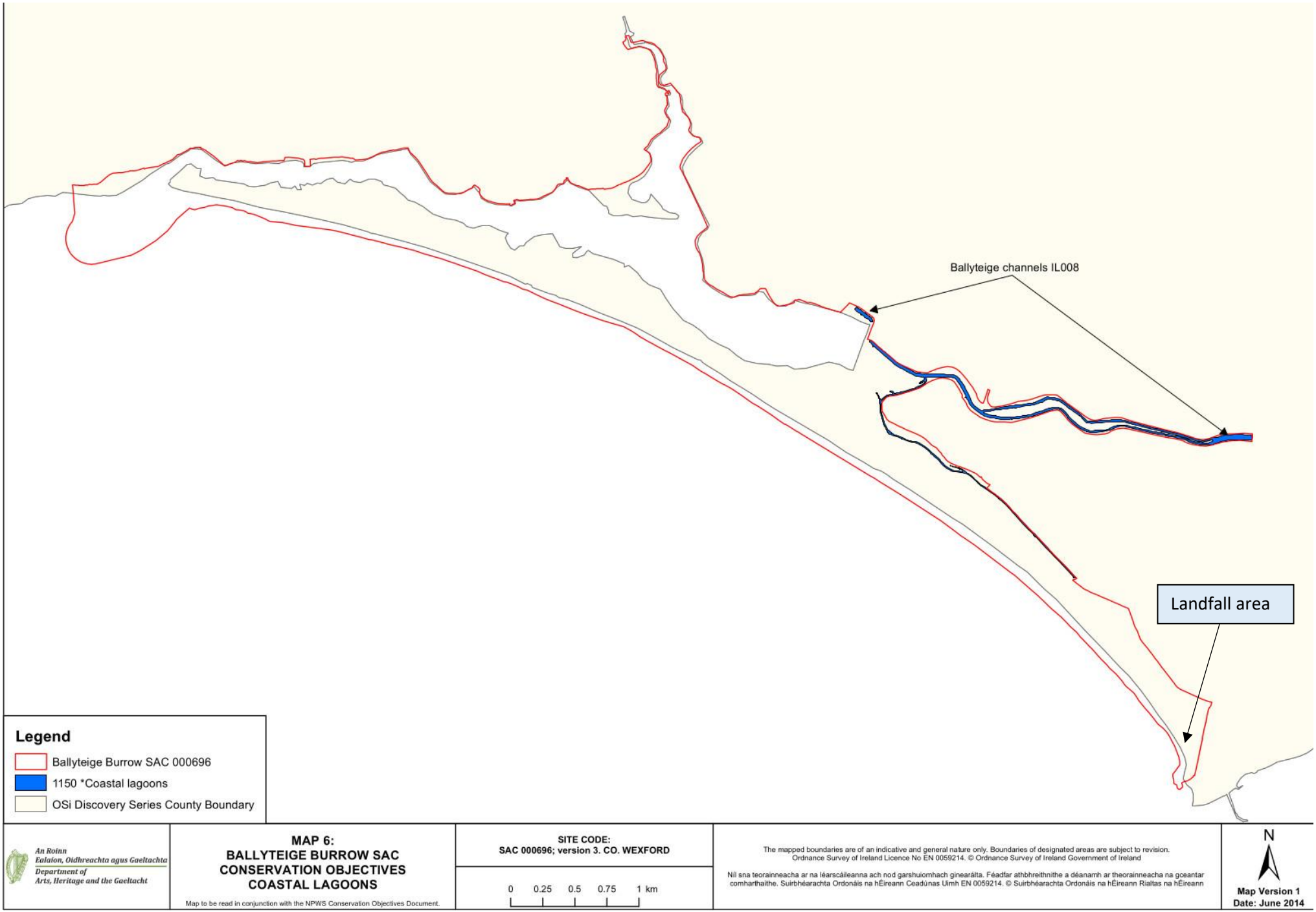

Figure 30. Location of Coastal Lagoons in Ballyteige Burrow SAC

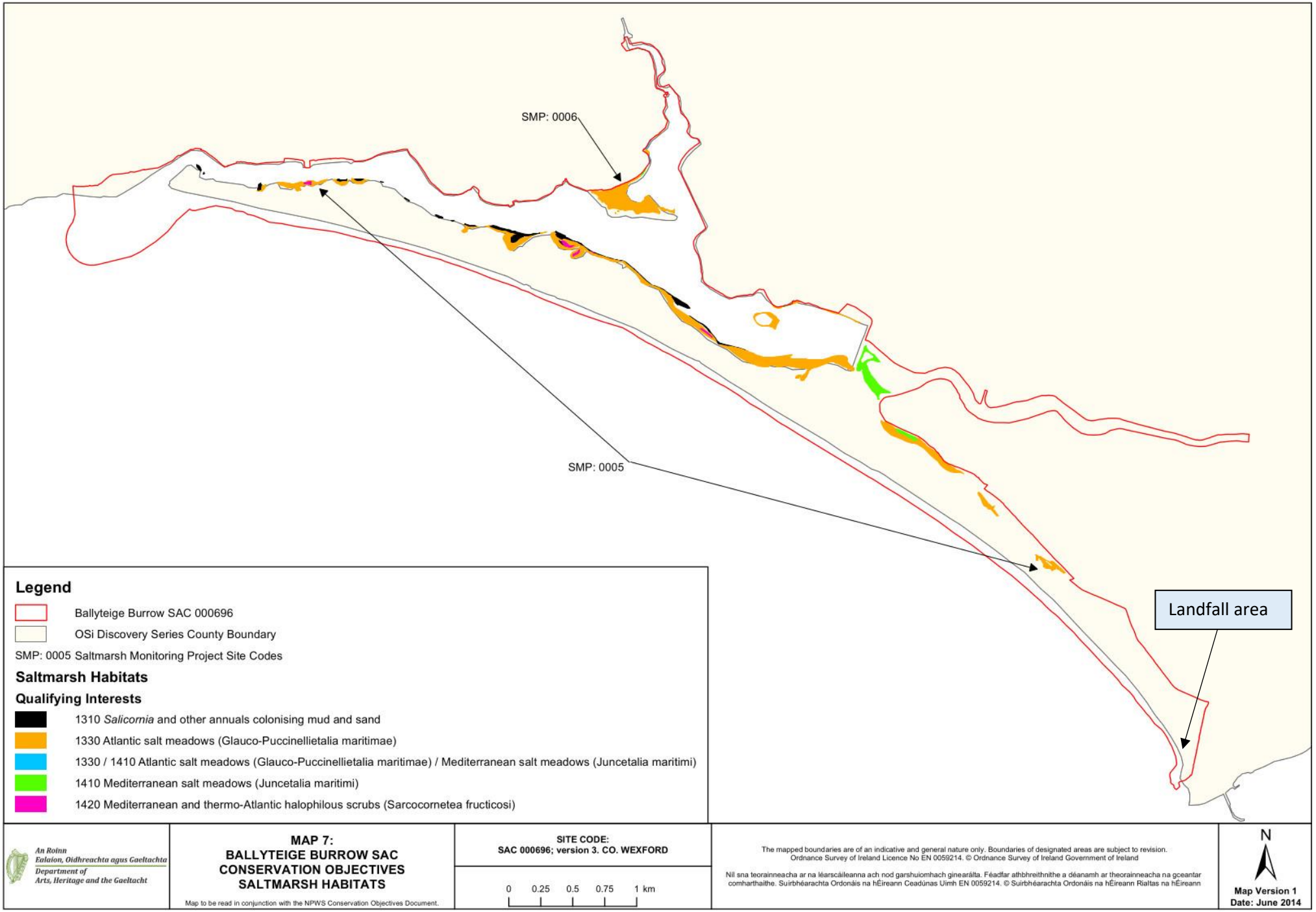

Figure 31. Location of Saltmarsh Habitats in Ballyteige Burrow SAC

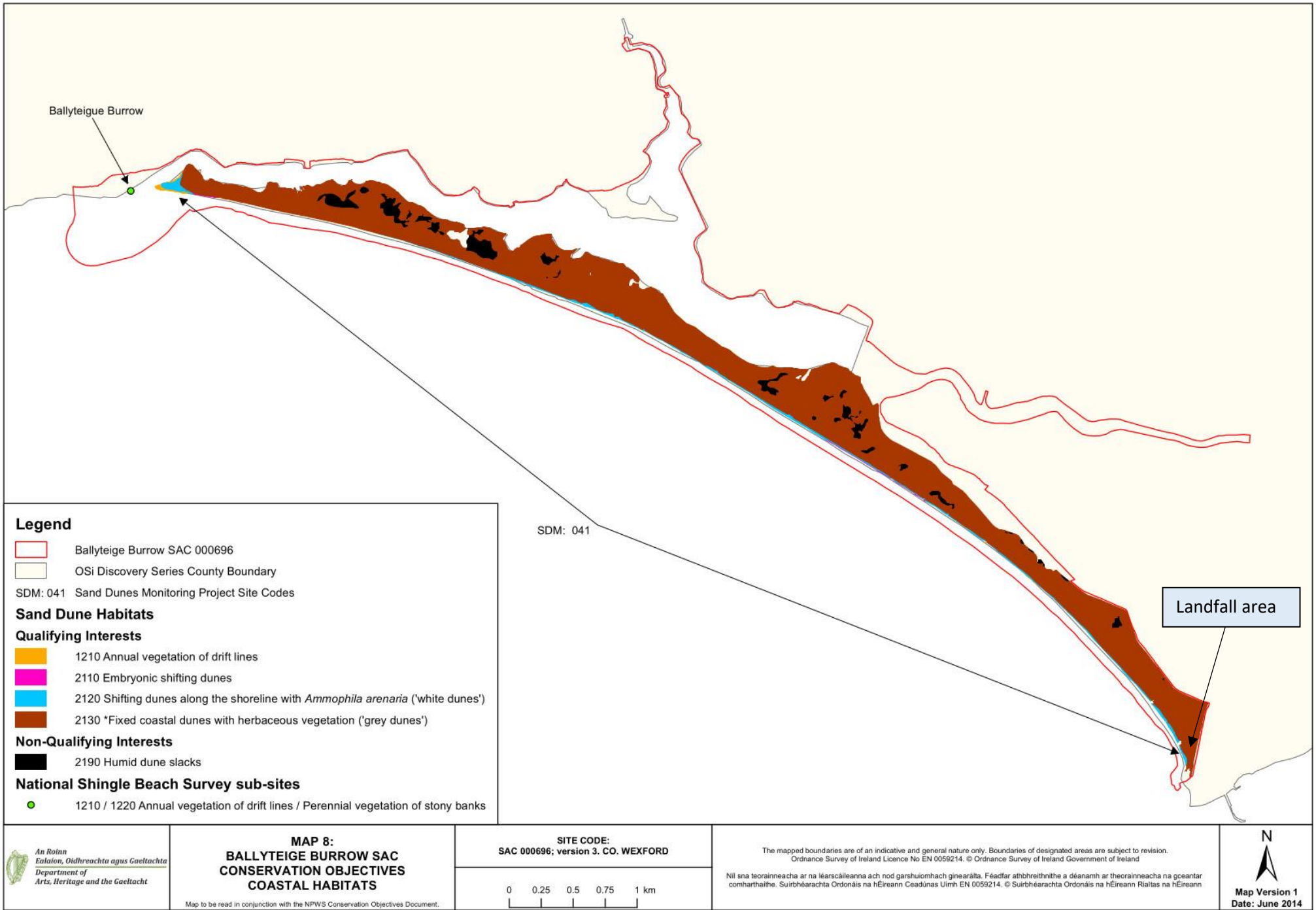

Figure 32. Location of Coastal Habitats in Ballyteige Burrow SAC

Saltee Islands SAC (Site code: 000707)

As outlined in the Saltee Islands SAC Site Synopsis[6] (NPWS 2013):

'*This site comprises the Saltees Islands and a large area of the surrounding seas. There are two islands, Great Saltee and Little Saltee, and a constellation of islets and rocks. The islands are situated between 4 and 5 km off the south Wexford coast. As a group, they constitute a broken reef that protrudes from a seabed of sand and shell. The reef has a north-east/south-west orientation and is typically strewn with boulders, cobbles and patches of sand and gravel. Bedrock is metamorphic schist and gneiss.*

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (= priority; numbers in brackets are Natura 2000 codes):*

[1140] Tidal Mudflats and Sandflats; [1160] Large Shallow Inlets and Bays; [1170] Reefs; [1230] Vegetated Sea Cliffs; [8330] Sea Caves; [1364] Grey Seal (Halichoerus grypus)

The subtidal reefs at this site range from rugged bedrock with steep sided gullies to large boulders mixed with sand or cobbles and pebbles. They range from exposed, to moderately exposed, to wave action. The communities present are excellent examples of those typical of tide-swept areas and many have fauna and flora that are tolerant of sand scour. The area is notable for the range of colonial sea squirts present. With the exception of only a few samples, the communities are very species rich, with samples taken during the BioMar Survey having from 78 to 117 species. No other area surveyed during the BioMar Survey had so many species rich communities.

In shallow water the reefs support a forest of mixed kelp species, with scour tolerant fauna on tide-swept bedrock or a kelp forest of Laminaria hyperborea with a faunal cushion and foliose red algae. With increasing depth the kelp thins to a kelp park. The kelp understorey ranges from a turf of hydroids, bryozoans, sponges and numerous colonial sea squirts, to a community characterised by the bryozoan Flustra foliacea or an understorey foliose red algae. On the sides of boulders a community with Deadman's Fingers (Alcyonium digitatum), the keel worm Pomatoceros triqueter and algal and bryozoan crusts is found.

In deeper water (15-30 m) animal dominated reef communities occur. The most notable of these is a community dominated by the sea squirt Stolonica socialis and the bryozoan Flustra foliacea. This community is rich in colonial sea squirts, in which Archidistoma aggregatum, Sidnyum elegans and Distomus variolosus and the solitary Pyura squammata occur. Stolonica socialis is only known from the south-east and north-west of Ireland, while S. elegans has not previously been recorded in Ireland. Distomus variolosus is only known from between Galway and Tralee Bay on the west coast, and the east and south-east coasts of Ireland. Pyura squammata appears to have a widespread but local distribution in Ireland. The sea anemone Cataphellia brodricii occurs in this community and in shallow water, both around the Saltee Islands and in other areas in the south-east. The only other records for this species are from Roaringwater Bay, Co. Cork. Where the bedrock is steep or large boulders are present the community may be formed of cushion sponges, branching sponges, massive sponges, Nemertesia hydroids, the rose coral Pentapora foliacea, or Alcyonium digitatum. Beds of the brittlestars Ophiothrix fragilis and Ophiocomina nigra are also found in the area, and on very steep to vertical reefs the plumose anemone Metridium senile may be found.

Species not mentioned above, and with limited distribution in Britain and Ireland and considered to be worthy of conservation, include the sponges Tethyspira spinosa and Plocamilla coriacea, the hydroids Aglaophenia acacia, Tamarisca tamarisca, Halecium muricatum and Sertularella gaudichaudi, the sea slug Okenia aspersa, the bryozoan Schizomavella sarniensis and the burrowing brittlestar Amphiura securigera. The majority of these species occur in the ascidian dominated communities and the Stolonica socialis community in particular. Tethyspira spinosa is only known from the Saltees and Roaringwater Bay in Ireland. Plocamilla coriacea is a recently described species, only recorded from the Saltees, Carnsore Point and Tuscar Rock, Co. Wexford and Kilkieran Bay, Co. Galway. Aglaophenia acacia is a southern species and occurs at several sites around the Saltees, with only one previous record in Ireland. Prior to the BioMar survey the only 20th century records for Halecium muricatum in Britain and Ireland were from the Isle of Man. This species is now known to occur at the Saltees and in Co. Donegal. The records for Sertularella gaudichaudi from this area are the only Irish records. The sea slug Okenia aspersa occurs at two sites in the area and these are the only recent records for Ireland. Schizomavella sarniensis is a recently described species of bryozoan and to date in Ireland has only

[6] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000707.pdf

been recorded from around the Saltees. The current known distribution of the burrowing brittlestar Amphiura securigera in Ireland appears to be the south-east of the country and Kenmare River, Co. Cork.

The littoral sediments of the Saltee Islands area are moderately exposed to wave action. Talitrid amphipods live under drift algae on the strand line. The mid shore is characterized by polychaete worms (Hediste diversicolor, Malacoceros fuliginosus, Spio filicornis and Arenicola marina), crustaceans (Crangon crangon) and crabs (Carcinus maenas). The low shore is characterized by the polychaete worms Spio filicornis and Lanice conchilega, the burrowing crustacean Atylus swammerdamei, crabs and bivalve molluscs (Fabulina fabula and occasional Cerastoderma edule). The sublittoral sediment around the Saltees is composed of exposed, tide-swept shelly gravel characterised by the burrowing sea cucumber Neopendactyla mixta, with hydroids and bryozoans attached to cobbles.

Both islands have exposed rocky cliffs on the south and east sides. On Great Saltee these are mostly around 30 m high, and about half this on Little Saltee. The cliffs have a typical sea cliff flora, with Thrift (Armeria maritima), Sea Campion (Silene vulgaris subsp. maritima), Sea Plantain (Plantago maritima), Sea Aster (Aster tripolium), Common Scurvygrass (Cochlearia officinalis), Rock Sea-spurrey (Spergularia rupicola), Sea Mayweed (Matricaria maritima), Red Fescue (Festuca rubra), Sea Spleenwort (Asplenium marinum) and Sea Samphire (Crithmum maritimum). Sea Stork's-bill (Erodium maritimum) also occurs, and Golden-samphire (Inula crithmoides) has been recorded in the past. Excellent displays of lichens (Ramalina spp. and Xanthoria spp.) are present. The northern and western sides of both islands are fringed with shingle and boulder shores, with small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee. Some of these are sublittoral and some have boulder beaches at the back.

Since the abandonment of farming on the islands (apart from sheep grazing on Little Saltee), Bracken (Pteridium aquilinum) has become dominant over much of the terrestrial area and often occurs in association with Bluebells (Hyacinthoides nonscripta). Bramble (Rubus fruticosus agg.) are also frequent. Dry grassland still occurs in some of the old fields, with species such as Yorkshire-fog (Holcus lanatus), Ground Ivy (Glechoma hederacea), Common Ragwort (Senecio jacobaea), Common Nettle (Urtica dioica) and thistles (Cirsium spp.).

Several springs and seepage areas provide habitat diversity. Species present include Water-cress (Nasturtium officinale), Jointed Rush (Juncus articulatus), Bog Stitchwort (Stellaria alsine), Marsh Pennywort (Hydrocotyle vulgaris) and, in at least one location, Early Marsh-orchid (Dactylorhiza incarnata).

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

The Saltee Islands are internationally important for their colonies of breeding seabirds. Particularly notable are the Gannets on Great Saltee (2,050 pairs in 2000), Cormorants on Little Saltee (273 pairs in 2000), Shags on both islands (265 pairs), Fulmars (525 pairs 1998-2000), Kittiwakes (2,125 pairs in 1999), and auks – Guillemots (21,436 individuals), Razorbills (c. 4,000 individuals) and Puffins (1,822 individuals). There is also a small Manx Shearwater colony (c. 150-175 pairs) on Great Saltee. The breeding populations of large gulls have declined dramatically in recent years. The Lesser Black-backed Gull colony is still important (245 pairs), but numbers of Herring Gull (c. 50 pairs) and Great Black-backed Gull (c. 90) are now very low.

There are one or two pairs of breeding Peregrine, and one pair of Chough occur here - at the eastern edge of their Irish range. Both of these species are listed on Annex I of the E.U. Birds Directive. Great Saltee is a major site for spring and autumn landbird migration. Very large numbers of pipits, swallows, martins, thrushes, warblers and finches occur, while smaller numbers of a great variety of other species (some very rare in Ireland) have also been recorded.

The island is also a good site for migrant Lepidoptera, especially Red Admirals, Painted Ladies, Clouded Yellows, Silver Y moths and Humming-bird Hawk Moths.

This site is of high conservation importance for the occurrence of several habitats which are listed on Annex I of the E.U. Habitats Directive, of which the reefs are of exceptional quality and diversity. The site is of international importance for breeding seabirds and has two species which are listed on Annex I of the E.U. Birds Directive. In addition, the site has a breeding population of Grey Seal, an Annex II species on the E.U. Habitats Directive.'

The Natura 2000 Standard Data Form (2020)[7] states that:

'*The site comprises the Saltee Islands and a large area of the surrounding seas. There are two islands (Great Saltee and Little Saltee) and a constellation of islets and rocks. The islands are situated between 4 and 5 km off the south Wexford coast. As a group, they constitute a broken reef that protrudes from a seabed of sand and shell. The reef has a north-east/south-west orientation and is typically strewn with boulders, cobbles and patches of sand and gravel. Bedrock is metamorphic schist and gneiss. The islands are exposed to prevailing wind and swells from the west. Tidal streams tend to be moderate but are strong in some areas, particularly where the reef is shallow. The islands were inhabited and farmed in the past but are now abandoned, although some sheep grazing occurs on Little Saltee. A community dominated by Pteridium aquilinum is the main vegetation type on the islands. Dry grassland occurs within the old field boundaries. Habitats with a minor presence are springs, flushes and scrub. The shorelines vary from rocky cliffs of moderate height to shingle, sand and boulder shores. Small sections of boulder clay cliffs are exposed in places.*

The exposed reef communities of the Saltee Islands are extremely species rich and contain rare or scarce species. In the shallow infralittoral zone, there are extremely species rich kelp parks (79-124 species) and tideswept Halidrys siliquosa and mixed kelp communities (78-100 species). The lower infralittoral communities dominated by red algae are also extremely species rich (79-117 species). Rare and notable species of sponge, anthozoan, brittlestar and hydroid live in these areas. Circalittoral communities are also distinguished by consistently extremely high species richness (average 76 species). There are four notable and scarce sponge species, 6 species of scarce or notable hydroid, a scarce anemone, two scarce nudibranchs and two scarce ascidian species. Perhaps more important than the high number of notable species in the Saltee Islands area is the fact that the populations of ten of those species have extremely high conservation value because they represent a high proportion of the total population in the national territory: these are the sponge Tethyspira spinosa; the hydroids Halecium muricatum, Aglaophenia acacia and Gymnangium montagui; the anemone Cataphellia brodricii, the nudibranchs Okenia aspersa and Aeolidiella glauca; and the ascidians Pycnoclavella aurilucens, Distomus variolosus and Stolonica socialis. The sediment communities are also important. The littoral sediment communities present at Kilmore Quay are characteristic of many similar beaches around the coast. The sublittoral sediment characterized by the sea cucumber Neopendactyla mixta is one of only seven such communities recorded by Biomar. Good examples of vegetated cliff habitat on both islands with a typical south-eastern flora. Has sea caves though marine communities not yet investigated. A long established breeding population of Halichoerus grypus and the only significant population in the south-east region. The Saltee Islands are amongst the most important seabird colonies in the country for populations and species diversity. Internationally important for Uria aalge and Alca torda, and nationally important for a further seven seabird species, including Sula bassana, Phalacrocorax corax, Phalacrocorax aristotelis, Larus fuscus, Rissa tridactyla, and Fratercula arctica. The islands have long-established seabird monitoring programmes. Pyrrhocorax pyrrhocorax occurs at the eastern edge of its Irish range and Falco peregrinus breeds. Great Saltee is a major site for spring and autumn landbird migration.'

As outlined in the Conservation objectives supporting document – coastal habitats (NPWS, 2011)[8]:

'*Vegetated sea cliffs*

Sea cliffs can be broadly divided into two categories: hard (or rocky) cliffs and soft (or sedimentary) cliffs, both of which are covered by the Annex I habitat 'vegetated sea cliffs of the Atlantic and Baltic coasts'. Hard cliffs are composed of rocks such as limestone, sandstone, granite or quartzite that are hard and relatively resistant to mechanical erosion. Soft cliffs are composed of softer rock, such as shale, or unconsolidated material, such as glacial till. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Soft cliff habitats are more prone to slope failure, which results in the presence of fast-colonising pioneer species. Both hard and soft cliffs are found on the Saltee Islands.

Defining the limits of what constitutes a sea cliff is problematic and a number of different interpretations have been used in the past (Fossitt, 2000; Commission of the European Communities, 2003; JNCC, 2004; Browne, 2005). In order to address any inconsistencies, the following definition for sea cliffs was developed and used during the Irish Sea Cliff Survey (Barron et al., 2011):

[7] https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF000707.pdf

[8] https://www.npws.ie/sites/default/files/publications/pdf/000707_Saltee%20Islands%20SAC%20Coastal%20Supporting%20Doc_V1.pdf

"A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave-cut platform or sand, among other substrates. During this survey where cliffs occur within the subtidal zone the base was considered to be the high water mark. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) of 3m high (soft cliffs), or no longer has a steep slope. To be considered in this study, a cliff had to be a minimum of 100m in length. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others."

The cliffs on Great Saltee Island are generally 30m in height, while those on Little Saltee Island are generally half this height. The cliffs are predominantly hard but there are areas of soft boulder clay cliffs along the northern and western shores. There are sea caves at the base of the cliffs on Great Saltee.

The site is also of international importance for breeding seabirds, and as such, is designated a Special Protection Area under the EU Birds Directive.

Overall Objective

The overall objective for 'vegetated sea cliffs of the Atlantic and Baltic coasts' in Saltee Islands SAC is to 'maintain the favourable conservation condition'. This objective is based on an assessment of the current condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area, (b) Range and (c) Structure and Functions.

Area

Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is 'area to remain stable'. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion.

The distribution of vegetated sea cliffs is shown on a map in Appendix I. Rocky sea cliffs occur along the southern and eastern shores of the two islands, while boulder clay cliffs occur along the northern and western shores.

As cliffs are linear features on maps, their extent is measured in kilometres rather than hectares, as you would with other habitats. During the ISCS (Barron et al., 2011), each cliff was divided into sections based on physical characteristics and vegetation cover. Breaks (i.e. non-cliff areas) of between 80m and 500m along a length of cliff were discounted from the calculations. As the site was not assessed by Barron et al. (2011) only the total length of the cliff has been estimated. Whether or not there are sections or breaks has not been established. The total length, as estimated by digitising their extent on the OSi six inch (1:10,560) mapping series, is presented in the following table.

Site name	Length (km) of hard cliff	Length (km) of soft boulder clay cliff	Total length (km) of sea cliff
Great Saltee Island	4.06	1.45	5.51
Little Saltee Island	1.80	1.31	3.11
Totals	**5.86**	**2.76**	**8.62**

Range

Habitat distribution

The distribution of sea cliffs throughout Saltee Islands SAC as identified by data held in NPWS files is presented in Appendix I. The cliffs in Saltee Islands SAC are not likely to be redistributed through natural processes, unlike

other more dynamic coastal systems such as sand dunes or saltmarshes. However, the soft boulder cliffs are likely to recede as they would naturally be more prone to erosion.

Structure and Functions

A fundamental aim of sea cliff conservation is to facilitate some degree of natural mobility through slumping. Sea cliffs can be of geomorphological interest as well as ecological interest and also erosion can expose geological features of interest.

Functionality and hydrological regime

Coastal protection works can disrupt the natural integrity of a sea cliff. The health and ongoing development of vegetated sea cliffs relies on natural processes such as erosion continuing without any impingement. This is generally a bigger issue for soft cliffs which require a degree of slumping and erosion to expose bare soil for pioneer species to colonise; otherwise the vegetation is replaced by hardy grasses and scrub of little conservation value can develop. In addition, cliff erosion provides an important sediment source to sites further along the coast (e.g. sand dunes). Preventing erosion at a cliff site can lead to beach starvation at another site.

Flushes can be associated with cliffs in areas where the groundwater seeps out onto the cliff face. This is more usually associated with soft cliffs where these flushes contribute to the natural instability of the ground and provide patches of wetland habitat. The Annex I priority habitat 'petrifying springs with tufa formation (Cratoneurion) (7220)' can also be associated with sea cliffs, although it is not known whether or not such formations occur on the Saltee Islands.

The target is to maintain, or where necessary restore, the natural geomorphological processes without any physical obstructions and the local hydrological regime, including groundwater quality.

Vegetation structure: zonation

Ecological variation in this habitat type depends on a number of physical and biological factors, in particular climate, degree of exposure to sea-spray, geology and soil type, as well as the level of grazing and sea bird activity.

The target is to maintain the sea cliff habitat, as well as transitional zones, including those to terrestrial communities.

Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing increases the species diversity and is particularly important for maritime grasslands and coastal heath, which are often associated with sea cliffs. The target is to maintain the structural variation in the sward height.

Vegetation composition: typical species & sub-communities

Different sea cliff communities develop in a number of habitat zones related to the degree of maritime influence (exposure to wind and sea spray), geology and soil type. In general Irish sea cliffs display a range of zones running in a series of horizontal bands up the cliff face, each of which has its own distinct sub-communities including:

- *Splash zone*
- *Pioneer zone*
- *Rock crevice/cliff ledge zone*
- *Maritime grassland zone*
- *Maritime heath zone*
- *Maritime slope flush zone*

There is considerable variation but the general pattern would be that the maritime influence is strongest near the base of the cliff and becomes gradually less dominant towards the cliff top. At the cliff base, the vegetation is naturally very open and the species present have a high tolerance to salinity. The splash zone generally has a well developed lichen flora dominated by species such as Verrucaria maura, Ramalina spp. and Xanthoria spp. These plant communities are dependent on rock crevices for rooting. Moving up the cliff, between the splash zone and the cliff top, vegetation on cliff ledges is less open and can support some species which are not exclusively associated with coastal conditions. Closer to the cliff top, maritime grasslands can occur. The plant communities and physical characteristics of maritime grasslands vary depending on the degree of exposure and whether or not grazing is a factor. Plant communities typical of sea birds and maritime therophyte communities (dominated by annual species) are exceptions to this horizontal zonation and can occur as a mosaic with the other plant communities. The following table presents lists of species that are considered typical of the different zones that are generally associated with hard cliffs by Barron et al. (2011).

Typical splash zone species			
Ramalina spp.	*Verrucaria maura*	*Xanthoria* spp.	
Typical crevice & ledge species			
Anthyllis vulneraria	*Asplenium marinum*	*Armeria maritima*	*Aster tripolium*
Atriplex prostrata	*Beta vulgaris* ssp. *maritima*	*Cerastium diffusum*	*Lavatera arborea*
Catapodium marinum	*Crithmum maritimum*	*Festuca rubra*	*Limonium* sp.
Inula crithmoides	*Ligusticum scoticum*	*Plantago coronopus*	*Plantago maritima*
Sedum anglicum	*Spergularia rupicola*	*Sedum rosea*	*Silene uniflora*
Typical coastal heath species			
Calluna vulgaris	*Daboecia cantabrica*	*Empetrum nigrum*	*Erica cinerea*
Erica tetralix	*Vaccinium myrtilus*	*Scilla verna*	*Ulex gallii*
Typical maritime grassland species			
Anthyllis vulneraria	*Armeria maritima*	*Daucus carota*	*Festuca rubra*
Crithmum maritimum	*Hyacinthoides non-scripta*	*Plantago coronopus*	*Plantago maritima*
Sedum anglicum	*Spergularia rupicola*	*Silene uniflora*	*Scilla verna*

The cliffs in Saltee Islands SAC are thought to support a maritime vegetation cover with a typical south-eastern flora. The hard cliffs along the southern and eastern shores are known to be particularly diverse, with a range of species including sea pink (Armeria maritima), scurvy grass (Cochlearia spp.), red fescue (Festuca rubra), sea campion (Silene uniflora), spear-leaved orache (Atriplex prostrata), sea mayweed (Tripleurospermum maritimum), sea plantain (Plantago maritima), English stonecrop (Sedum anglicum), sea samphire (Crithmum maritimum), rock sea spurry (Spergularia rupicola) and sea spleenwort (Asplenium marinum). Some scarce or uncommon species have also been recorded including sea stork's-bill (Erodium maritimum) and golden-samphire (Inula crithmoides). A range of lichens including Ramalina and Xanthoria species are also present.

The boulder clay cliffs along the northern and western shores are less species-rich, but do support sea pink (Armeria maritima), red fescue (Festuca rubra), sea mayweed (Tripleurospermum maritimum), creeping bent (Agrostis stolonifera) and false oat-grass (Arrhenatherum elatius).

The target for this attribute is to ensure that the typical flora of vegetated sea cliffs is maintained, as are the range of sub-communities within the different zones.

Vegetation composition: negative indicator species

Negative indicator species can include non-native species (e.g. Hebe sp., Carpobrotus edulis, Gunnera tinctoria), species indicative of changes in nutrient status (e.g. Urtica dioica) and species not considered to be typical of the habitat (e.g. Pteridium aquilinum).

The target for this attribute is that negative indicator species (including non-native species) should make up less than 5% of the vegetation cover.

Vegetation composition: bracken and woody species

Encroachment of bracken (Pteridium aquilinum) and woody/scrub species on cliffs, particularly onto maritime grasslands, leads to a reduction in species diversity.

The target for this attribute on the Saltees is that bracken should make up less than 10% of the vegetation cover, while woody species should make up no more than 20% of the vegetation cover.'

As outlined in the Conservation objectives supporting document –marine habitats (NPWS, 2011)[9]:

'*The Saltee Islands and Forlorn Point forms the semi enclosed eastern boundary of Ballyteigue Bay (figure 1). This large, open, south-westerly facing bay is bounded to the west by the Hook Head Peninsula and is exposed to prevailing winds and swells from the south-west and moderate to locally strong tidal streams.*

This Annex I habitat of Large shallow inlets and bays partly encompasses communities of the Annex I habitats of Reefs and Submerged or partly submerged sea caves; these will be dealt with separately. An additional benthic community: Coarse sediment with Pomatoceros spp. and Pisidia longicornis community was recorded within the Annex I habitat of Large shallow inlet and bay at this site (figure 5).

Within the SAC but outside this Annex I habitat, the subtidal sediment substrate is mixed; it occurs in depths greater than 30m and is dominated by epibenthic crustaceans.

Coarse sediment with Pomatoceros spp. and Pisidia longicornis community

This community occurs on the north-east portion of the site in depths of between approximately 8m and 30m (figure 5).

The substrate here is that of coarse material with gravel and cobbles and the fauna reflects this, being typical of coarse sediments in general.

The most numerically abundant species is the serpulid polychaetes Pomatoceros spp. and the long clawed porcelain crab Pisidia longicornis (table 1). Other notable taxa present are barnacles (including Balanus sp.), the ophiuroid Ophiothrix fragilis and the polychaetes Pholoe baltica and Harmothoe sp.

Distinguishing species of the Coarse sediment with *Pomatoceros* spp. and *Pisidia longicornis* community	
Pomatoceros triqueter	*Liljeborgia pallida*
Pomatoceros sp.	*Harmothoe* sp.
Pisidia longicornis	*Sphaerosyllis taylori*
Ophiothrix fragilis	Aoridae
Pholoe baltica (sensu Petersen)	*Amblyosyllis formosa*
Nemertea	Pectinidae
Eusyllis assimilis	

Table 1. Distinguishing species of the Coarse sediment with *Pomatoceros* spp. and *Pisidia longicornis* community.

MUDFLATS AND SANDFLATS NOT COVERED BY SEAWATER AT LOW TIDE.

This Annex I habitat occurs intertidally between the Mean Low Water Mark (MLWM) and the Mean High Water Mark (HMWM), with the lower shore extent being defined by the Ordnance Survey Mean Low Water boundary. At this site intertidal sediments occurs from Kilmore Quay to Ringbaun on the northern margin of the SAC; it is also recorded on the Little Saltee Island as a thin band above the intertidal reef. Within this SAC this habitat is represented by a single community complex.

The development of a community complex target arises when an area possesses similar abiotic features but records a number of biological communities that are not regarded as being sufficiently stable and/or distinct temporally or spatially to become the focus of conservation efforts. In this case, examination of the available data from Saltee Islands identified a number of biological communities whose species composition overlapped significantly. Such biological communities are grouped together into what experts consider are sufficiently stable units (i.e. a complex) for conservation targets.

Intertidal sand to muddy sand dominated by polychaetes community complex

This community complex occurs intertidally from Kilmore Quay to Ringabaun and on the Little Saltee Island above the intertidal reef (figure 5).

The sediment varies from sand (coarse sand ranges from 0.13 to 40.5%, medium sand from 0.28 to 61.3% and fine sand from 0.87 to 37.9%) to muddy sand (very fine sand ranges from 0.3 to 56.1% and silt-clay from 1.1 to

[9] https://www.npws.ie/sites/default/files/publications/pdf/000707_Saltee%20Islands%20SAC%20Marine%20Supporting_Doc_V1.pdf

61.7%). Mixed sediment (gravel ranges from 15.6 to 34.2%) is associated with the mid to upper shore on the beach from Kilmore Quay to Ringabaun.

The fauna is dominated by the polychaetes Eteone longa, Capitella spp., Malacoceros fuliginosus and Arenicola marina (table 2) on the mid to lower shore, in coarser sediments the crustaceans Eurydice pulchra and Pontocrates sp. are more prominent. Oligochaetes predominate on the mid to upper shore.

Distinguishing species of the Intertidal sand to muddy sand dominated by polychaetes community complex	
Eteone longa	*Malacoceros fuliginosus*
Capitella sp. agg.	*Arenicola marina*
Eurydice pulchra	*Pontocrates* sp.
Oligochaetes	

Table 2: Distinguishing species of the Intertidal sand to muddy sand dominated by polychaetes community complex.

REEFS

Within this SAC reef is widespread through the site. Intertidally, it is recorded from the pier at Kilmore Quay to St. Patrick's Bridge and on some shores of the Saltee Islands. Subtidally, the reef occurs as a broad northeast/south-west band traversing the site (figure 5).

The intertidal reef consists of boulders and sloping bedrock and is classified as exposed to moderately exposed around the islands and as sheltered on the mainland around Kilmore Quay. The subtidal reef substrate ranges from rugged bedrock with steep sided gullies to large boulders mixed with sand or cobbles and pebbles; its exposure regime is classified as exposed.

Ecologically, the reef in Saltee Islands SAC can be classified into three main groups, Intertidal reef community complex, Subtidal reef dominated by echinoderms and sponges community complex and Laminaria dominated community (figure 5). These community types are described below.

Intertidal reef community complex

This community complex occurs on all intertidal reefs within the site; its exposure regime ranges from exposed, moderately exposed to sheltered (figure 5). Lichens dominate the top of the shore, while fucoids, wracks, gastropods and barnacles are prevalent further down the shore (table 3). The algae Ulva spp., Cladophora rupestris and Ceramium sp. and the barnacle Balanus balanus are more common on the sheltered reef while the fucoid Fucus serratus, the gastropods Littorina obtusata and Patella depressa, the barnacle Chthamalus montagui and the anemone Actinia equina are associated with the more exposed areas at this site. Other fauna recorded include the algae Lithothamnion sp., Mastocarpus stellatus and the serpulid polychaete Pomatoceros sp.

Species associated with the Intertidal reef community complex	
Fucus vesiculosis	*Fucus spiralis*
Fucus serratus	*Ascophyllum nodosum*
Porphyra purpurea	*Porphyra umbilicalis*
Patella vulgata	*Patella depressa*
Palmaria palmata	*Verrucaria maura*
Chthamalus montagui	*Balanus balanus*
Nucella lapillus	*Actinia equina*
Littorina littorea	*Littorina obtusata*
Gibbula umbilicalis	

Table 3. Species associated with Intertidal reef community complex.

Subtidal reef dominated by echinoderms and sponges community complex

This reef community complex is recorded throughout the site between depths of 15m and 40m (figure 5). The substrate is that of bedrock with steep sided gullies to large boulders mixed with sand or cobbles and pebbles. The exposure regime of this community is recorded as exposed.

This community complex is dominated by the echinoderms Echinus sp. and Asterias sp. and the sponges Alcyonium sp., Cliona sp. and encrusting sponges (table 4). At the shallow depths above 20m a variety of algae species, including encrusting calcareous red algae, also occur.

Species associated with Subtidal reef dominated by echinoderms and sponges community complex	
Echinus sp.	*Cliona* sp.
Alcyonium sp.	*Labrus* sp.
Encrusting sponges	Red algae
Asterias sp.	

Table 4. Species associated with subtidal reef dominated by echinoderms and sponges community complex.

Other species present include the anemones Actinothoe sp., Sagartia sp., Urticina sp., bryozoans including Flustra sp., the crustaceans Cancer pagurus, Palinurus sp. and Necora puber, the echinoderms Henricia sp., Luidia sp., Marthasterias glacialis, Ophiocomina nigra, Ophiothrix sp. and Stichastrella sp., hydroids including Nemertesia sp., the sponges Myxilla sp., Pachymastia sp., Polymastia sp., Pentapora sp., Suberites sp. and Tethya sp., the bivalve Mytilus sp. and the polychaete Pomatoceros sp. Several species of fish were also recorded on the reef, namely the goby Gobiusculus sp., the cod species Gadus morhua and Trisopterus luscus, and the dogfish Scyliorhinus sp.

Laminaria dominated community

Assemblages of Laminaria are recognised as being among the most ecologically dynamic and biologically diverse of habitats on the planet. Kelp species are the most common prominent constituents of the temperate lower intertidal and subtidal rocky shore. They are considered to be an important genus with a diverse community of fauna and other algae associated with them.

In Saltee Islands SAC, the Laminaria dominated community occurs on bedrock in exposed conditions between the low water mark and 20 meters depth (figure 5).

The species associated with this community are listed in table 5. Two species of Laminaria, L. digitata and L. hyperborea predominate, a third kelp species Saccharina latissima has also been recorded here. Several other algae species are found on this reef including Fucus serratus, Saccorhiza polyschides, Halidrys siliquosa, Polysiphonia sp., Ahnfeltia sp., Chorda filum, Membranoptera sp., Delesseria sp., Desmarestia sp., Palmaria palmata, Gelidium sp., Dilsea carnosa, Dictyota dichotoma, Alaria sp., and encrusting calcareous red algae.

The fauna recorded from this community include the sponges, Halichondria sp., Alcyonium sp., Cliona sp. and encrusting sponges, the anemone Actinothoe sphyrodeta, hydroids including Obelia sp., bryozoans including Membranipora sp., Pomatoceros sp. and spirorbid polychaetes, barnacles, the crabs Carcinus maenas and Cancer pagurus, and the gastropod Calliostoma zizyphinum. Fish species recorded include the wrasse Labrus sp. and the dogfish Scyliorhinus sp.

Species associated with the *Laminaria* dominated community	
Laminaria digitata	*Desmarestia* sp.
Foliose red algae	*Pomatoceros* sp.
Laminaria hyperborea	Spirorbids
Saccharina latissima	*Obelia* sp.
Hydroids	Bryozoans
Encrusting sponges	*Dilsea carnosa*
Membranipora sp.	*Saccorhiza polyschides*

Table 5. Species associated with the *Laminaria* dominated community.

SUBMERGED OR PARTLY SUBMERGED SEA CAVES

The distribution and ecology of intertidal or subtidal sea caves has not been the subject of scientific investigation in Ireland and the extent of very few individual caves have been mapped in detail. The

Department of Communications, Marine and Natural Resources previously commissioned a coastal oblique aerial survey for the purpose of coastal protection. Analysis of this imagery has yielded some information concerning the location of partly submerged sea caves in Saltee Islands SAC, which appear to be limited to the Great Saltee Island (figure 4). There is no additional information available concerning the likely distribution of permanently submerged sea caves in the site at present. Whilst surveys undertaken in the UK indicate the structure and function of sea caves are largely influenced by hydrodynamic forces and water quality, no such information is yet available for Ireland.

ANNEX II SPECIES

HALICHOERUS GRYPUS (GREY SEAL)

This marine mammal species occurs in estuarine, coastal and offshore waters but also utilises a range of intertidal and terrestrial habitats for important life history functions such as breeding, moulting, resting and social activity. Its aquatic range for foraging and inter-site movement extends predominantly into continental shelf and slope waters. Grey seal occupies both aquatic and terrestrial habitats in Saltee Islands SAC, including intertidal shorelines that become exposed during the tidal cycle and outlying rocky skerries when these are not inundated by wave action. It is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (Aug-Dec approx.), moulting (Dec-April approx.) and non-breeding foraging and resting phases. In acknowledging the limited understanding of aquatic habitat use by the species within the site, it should be noted that all suitable aquatic habitat is considered relevant to the species' range and ecological requirements at the site and is therefore of potential use by grey seals.

Grey seals are vulnerable to disturbance during periods when time is spent ashore by individuals or groups of animals. This occurs immediately prior to and during the annual breeding season, which takes place predominantly during the months of August-December. Pups are born on land, usually on remote beaches and uninhabited islands or in sheltered caves. While there may be outliers in any year, specific established sites are used annually for breeding-associated behaviour by adult females, adult males, newborn pups and weaned pups. Such habitats are critical to the maintenance of the species within any site since pups are nursed there for a period of several weeks by the mother prior to weaning and abandonment. During this period, adult females also mate with adult males at or adjacent to breeding sites. In addition to delivering information on breeding dynamics, pup production (i.e. the number of pups born each year) can be measured or estimated in order to deliver an assessment of population size. However the relationship between pup production and total population size is not well known. An estimated 163 pups were born in Saltee Islands SAC in 2005. The corresponding minimum population estimate for the site numbered 571-734 grey seals of all ages. Known and suitable habitats for the species in Saltee Islands SAC during the breeding season are indicated in figure 6. Current breeding sites in Saltee Islands SAC are broadly as follows: Great Saltee Island and Little Saltee Island.

Grey seal also occurs at the site during the annual moult (i.e. hair shedding and replacement), a protracted period during which individual animals spend significant periods of days or weeks on the shore. Moulting is considered an intensive, energetically-demanding process that all seals must undergo, incurring further vulnerability for individuals during this period. Terrestrial or intertidal sites where seals can be found ashore are known as haul-out sites. Moult locations may be preferentially selected by the species. Those currently described in Ireland are remote from human habitation and interference, being on uninhabited islands or remote beaches, with specific established sites used annually by moulting adult females, adult males and juveniles. In Ireland the moulting phase in the annual life cycle occurs predominantly during the months of December to April. A minimum estimate of 246 grey seals was recorded at the site during the moult season in 2007. Known moult haul-out locations at the site are indicated in figure 7, broadly consisting of Great Saltee Island and the Coningmore Rocks.

Grey seal is a successful aquatic predator that feeds on a wide variety of fish and cephalopod species. For individual grey seals of all ages, intervals between foraging trips in coastal or offshore waters are spent resting ashore at terrestrial or intertidal haul-out sites, or in the water. Resting locations selected by grey seals may be more variable and dispersed than those used during the breeding or moulting seasons. While outliers may occur for very small numbers of animals, there is nevertheless a tendency for recurrent selection by grey seal of particular habitats and sites for terrestrial/intertidal resting behaviour (e.g., low-lying rocks and skerries). Known and suitable habitats for resting by the species are indicated in figure 8. Current sites described in Saltee Islands SAC are broadly as follows: Great Saltee Island, Little Saltee Island, the Coningmore Rocks and The Brandies.

Section 2: Appropriate Assessment Notes

Many operations/activities of a particular nature and/or size require the preparation of an environmental impact statement of the likely effects of their planned development. While smaller operations/activities (i.e., sub threshold developments) are not required to prepare such statements, an appropriate assessment and Natura Impact Statement is required to inform the decision-making process in or adjacent to Natura 2000 sites. The purpose of such an assessment is to record in a transparent and reasoned manner the likely effects on a Natura 2000 site of a proposed development. The Department of the Environment, Heritage and Local Government has prepared general guidance on the completion of such assessments (www.npws.ie).

Annex I Habitats

It is worth considering at the outset that in relation to Annex I habitat structure and function, the extent and quality of all habitats varies considerably in space and time and marine habitats are particularly prone to such variation. Habitats which are varying naturally, i.e., biotic and/or abiotic variables are changing within an envelope of natural variation, must be considered to have favourable conservation condition. Anthropogenic disturbance may be considered significant when it causes a change in biotic and/or abiotic variables in excess of what could reasonably be envisaged under natural processes. The capacity of the habitat to recover from this change is obviously an important consideration (i.e., habitat resilience) thereafter.

This Department has adopted a prioritized approach to conservation of structure and function in marine Annex I habitats.

1. *Those communities that are key contributors to overall biodiversity at a site by virtue of their structure and/or function (keystone communities) should be afforded the highest degree of protection and any significant anthropogenic disturbance should be avoided.*
2. *In relation to the remaining constituent communities that are structurally important (e.g., broad sedimentary communities) within an Annex I marine habitat, there are two considerations.*
   - *2.1 Significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g., effluent discharge within a given area). Drawing from the principle outlined in the European Commission's Article 17 reporting framework that disturbance of greater than 25% of the area of an Annex I habitat represents unfavourable conservation status, this Department takes the view that licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15%. Thereafter, an increasingly cautious approach is advocated. Prior to any further licensing of this category of activities, an inter-Departmental management review (considering inter alia robustness of available scientific knowledge, future site requirements, etc) of the site is recommended.*
   - *2.2 Some activities may cause significant disturbance but may not necessarily represent a continuous or ongoing source of disturbance over time and space. This may arise for intermittent or episodic activities for which the receiving environment would have some resilience and may be expected to recover within a reasonable timeframe relative to the six-year reporting cycle (as required under Article 17 of the Directive). This Department is satisfied that such activities could be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*

The following technical clarification is provided in relation to specific conservation objectives and targets for Annex I habitats to facilitate the appropriate assessment process:

Objective - To maintain the favourable conservation condition of Large shallow inlets and bays in the Saltee Islands SAC, which is defined by the following list of attributes and targets

Target 1*- The permanent habitat area is stable or increasing, subject to natural processes.*

- *This habitat also partly encompasses the Annex I habitats of Reefs, Submerged or partly submerged sea caves and vegetated sea cliffs; however targets for these habitats should be addressed in their own right.*

- *This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

***Target 2**- The following community should be maintained in a natural condition: Coarse sediment with Pomatoceros spp. and Pisidia longicornis community.*

- *A semi-quantitative description of this community has been provided in Section 1.*
- *An interpolation of its likely distribution is provided in figure 5.*
- *The estimated areas of this community (within the Annex 1 habitat of Large shallow inlet and bay) given below are based on spatial interpolation and therefore should be considered indicative: Coarse sediment with Pomatoceros spp. and Pisidia longicornis community 2,712ha.*
- *Significant continuous or ongoing disturbance of community should not exceed an approximate area of 15% of the interpolated area of the community, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.*
- *Proposed activities or operations that cause significant disturbance to the community but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*

Objective - To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Saltee Islands SAC, which is defined by the following list of attributes and targets

***Target 1**- The permanent habitat area is stable or increasing, subject to natural processes.*

- *This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals*

***Target 2**- The following community should be maintained in a natural condition: Intertidal sand to muddy sandy dominated by polychaetes community complex.*

- *A semi-quantitative description of this community has been provided in Section 1.*
- *An interpolation of its likely distribution is provided in figure 5.*
- *The estimated areas of the community given below are based on spatial interpolation and therefore should be regarded as indicative: Intertidal sand to muddy sand dominated polychaetes community 20 ha*
- *Significant continuous or ongoing disturbance of the community should not exceed an approximate area of 15% of the interpolated area of the community, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.*
- *Proposed activities or operations that cause significant disturbance to the community but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*

Objective - To maintain the favourable conservation condition of Reefs in the Saltee Islands SAC, which is defined by the following list of attributes and targets

***Target 1**- The distribution of reefs should remain stable, subject to natural processes.*

- *The likely distribution of reef habitat in this SAC is indicated (figure 3).*
- *This target refers to activities or operations that propose to permanently remove reef habitat, thus reducing the range over which this habitat occurs within the site. It does not refer to long or short term disturbance of the biology of reef habitats.*

- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

Target 2*- The permanent area is stable, subject to natural processes.*

- *This target refers to activities or operations that propose to permanently remove habitat from the site, thereby reducing the permanent amount of habitat area. It does not refer to long or short term disturbance of the biology of a site.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

Target 3*- The following reef community complexes should be maintained in a natural condition: Intertidal reef community complex; and Subtidal reef dominated by echinoderms and sponges community complex.*

- *A semi-quantitative description of the communities has been provided in Section 1.*
- *An interpolation of their likely distribution is provided in figure 5.*
- *The estimated areas of the communities within the Reefs habitat given below are based on spatial interpolation and therefore should be regarded as indicative: Intertidal reef community complex 43 ha Subtidal reef dominated by echinoderms and sponges community complex 4,296ha*
- *This target relates to the structure and function of the reef and therefore it is of relevance to those activities that may cause disturbance to the ecology of the habitat.*
- *Significant continuous or ongoing disturbance of communities should not exceed an approximate area of 15% of the interpolated area of each community type, at which point an inter-Departmental management review is recommended prior to further licensing of such activities.*
- *Proposed activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.*

Target 4*- The extent of Laminaria dominated community should be conserved, subject to natural processes.*

- *Laminaria dominated communities are considered to be keystone communities that are of considerable importance to the overall ecology and biodiversity of a habitat by virtue of their physical complexity.*
- *Any significant anthropogenic disturbance to the extent of the Laminaria dominated community should be avoided.*
- *An interpolation of the likely distribution of the Laminaria dominated community is provided in figure 5 and should be regarded as indicative. Based on this interpolation the estimated area is 256 ha.*

Target 5*- The biology of the Laminaria dominated community should be conserved, subject to natural processes.*

- *It is important to ensure the quality as well as the extent of the Laminaria dominated community is protected.*
- *Any significant anthropogenic disturbance to the flora and fauna associated with the Laminaria dominated community complex should be avoided.*

Objective - To maintain the favourable conservation condition of submerged or partly submerged sea caves in the Saltee Islands SAC, which is defined by the following list of attributes and targets

Target 1*- The distribution of sea caves occurring should remain stable, subject to natural processes.*

- *The distribution of all sea caves in this SAC has not yet been fully evaluated.*
- *This target refers to activities or operations that propose to permanently remove sea cave habitat thus reducing the range over which this habitat occurs within the site. It does not refer to long or short term disturbance of the biology of sea cave habitats.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for such proposals.*

Target 2*- Human activities should occur at levels that do not adversely affect the ecology of sea caves.*

- *This target relates to proposed activities or operations that may result in the deterioration of key resources (e.g., water quality) that are likely to drive or influence community structure of sea caves in the site. In the absence of complete knowledge on these elements in this site, such considerations should be assessed where appropriate on a case-by-case basis.*

The following technical clarification is provided in relation to specific conservation objectives and targets for Annex II species to facilitate the appropriate assessment process:

Objective - To maintain the favourable conservation condition of grey seal in the Saltee Islands SAC, which is defined by the following list of attributes and targets

***Target 1**- Species range within the site should not be restricted by artificial barriers to site use.*

- *This target may be considered relevant to proposed activities or operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein.*
- *It does not refer to short-term or temporary restriction of access or range.*
- *Early consultation or scoping with the Department in advance of formal application is advisable for proposals that are likely to result in permanent exclusion.*

***Target 2**- The breeding sites should be maintained in a natural condition.*

- *Target 2 is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) breeding behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual breeding season.*
- *Operations or activities that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.*

***Target 3**- The moult haul-out sites should be maintained in a natural condition.*

- *Target 3 is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) moulting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual moult.*
- *Operations or activities that cause displacement of individuals from a moult haul-out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.*

***Target 4**- The resting haul-out sites should be maintained in a natural condition.*

- *Target 4 is relevant to proposed activities or operations that will result in significant interference with or disturbance of (a) resting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used for resting.*
- *Operations or activities that cause displacement of individuals from a resting haul-out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.*

***Target 5**- The grey seal population occurring within the site should contain adult, juvenile and pup cohorts annually.*

- *Resting haul-out sites and the composition of haul-out groups may be different to those normally observed during breeding or moulting. There is some evidence of cohort-linked preferential selection by grey seals of terrestrial/intertidal sites elsewhere in Ireland.*
- *Whilst information is limited in Saltee Islands SAC at this time, disturbance at a specific location may have the effect of causing cohort-specific disturbance within the population. Population composition, whether in aquatic or terrestrial/intertidal habitats within the entire site or at individual locations, is likely to vary naturally within and between years.*
- *For the effective maintenance of the population, the above cohorts should be represented in the population occurring naturally within the site each year and any disturbance likely to cause such a cohort-specific effect should be carefully considered*

***Target 6**- Human activities should occur at levels that do not adversely affect the grey seal population.*

- *Proposed activities or operations should not introduce man-made energy (e.g., aerial or underwater noise, light or thermal energy) at levels that could result in a significant negative impact on individuals and/or the population of grey seal within the site. This refers to both the aquatic and terrestrial/intertidal habitats used by the species in addition to important natural behaviours during the species' annual cycle.*
- *Target 6 also relates to proposed activities or operations that may result in the deterioration of key resources (e.g., water quality, feeding, etc) upon which grey seals depend. In the absence of complete knowledge on the species' ecological requirements in this site, such considerations should be assessed where appropriate on a case-by-case basis.'*

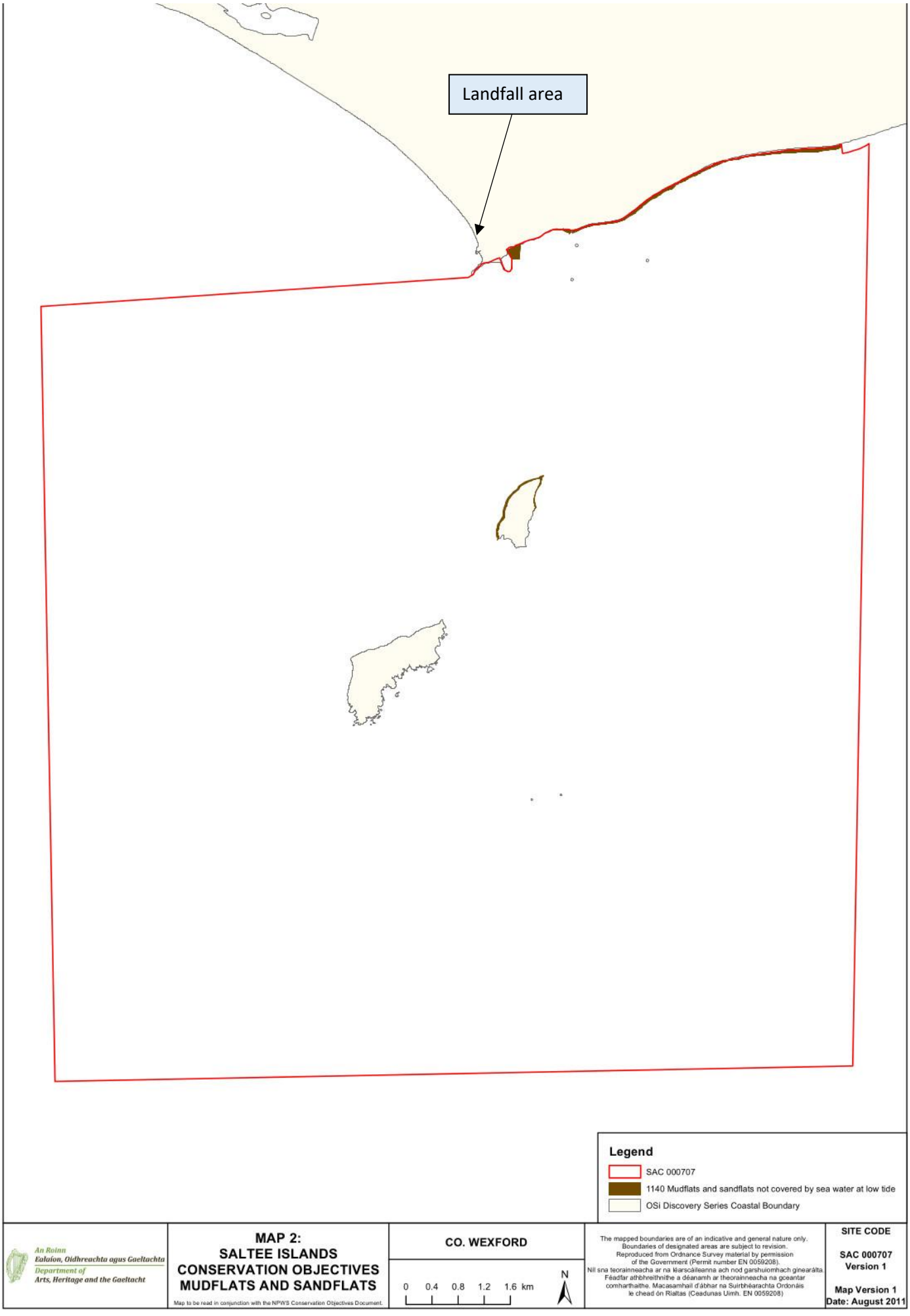

Figure 33. Location of Mudflats and Sandflats in Saltee Islands SAC

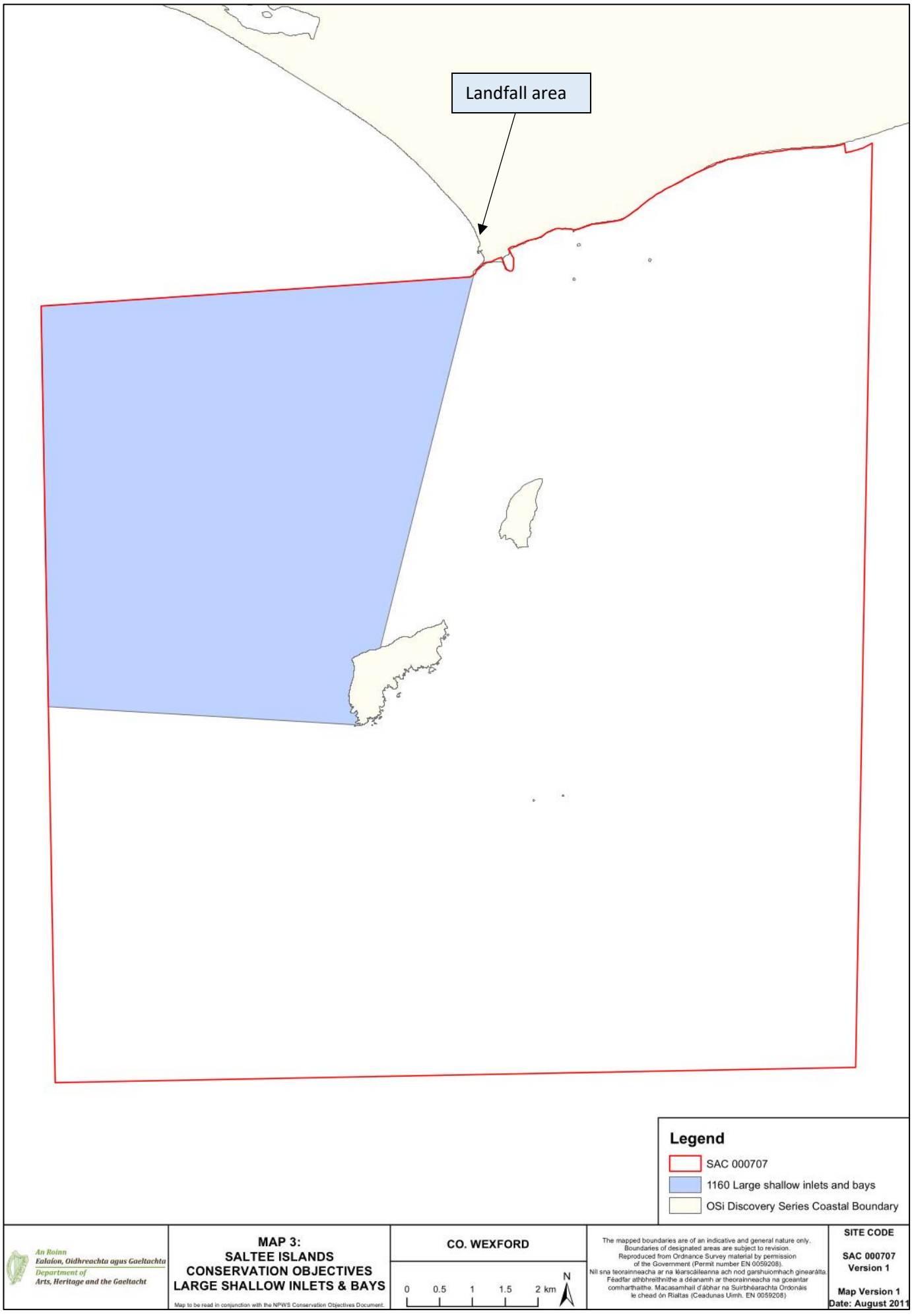

Figure 34. Location of Large Shallow inlets and Bays in Saltee Islands SAC

Figure 35. Location of Reefs in Saltee Islands SAC

Figure 36. Location of Marine Community Types in Saltee Islands SAC

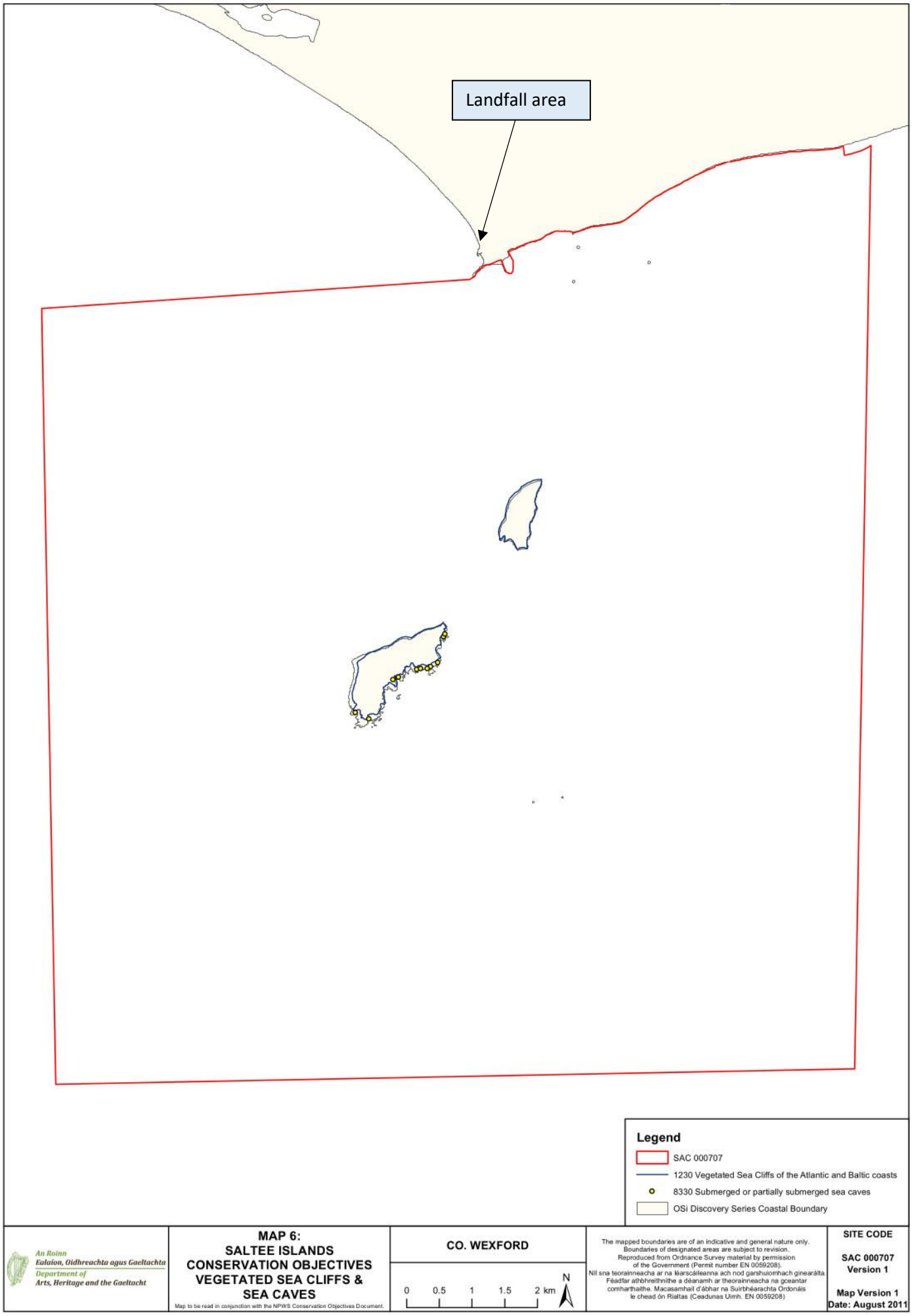

Figure 37. Location of Vegetated Sea Cliffs and Sea Caves in Saltee Islands SAC

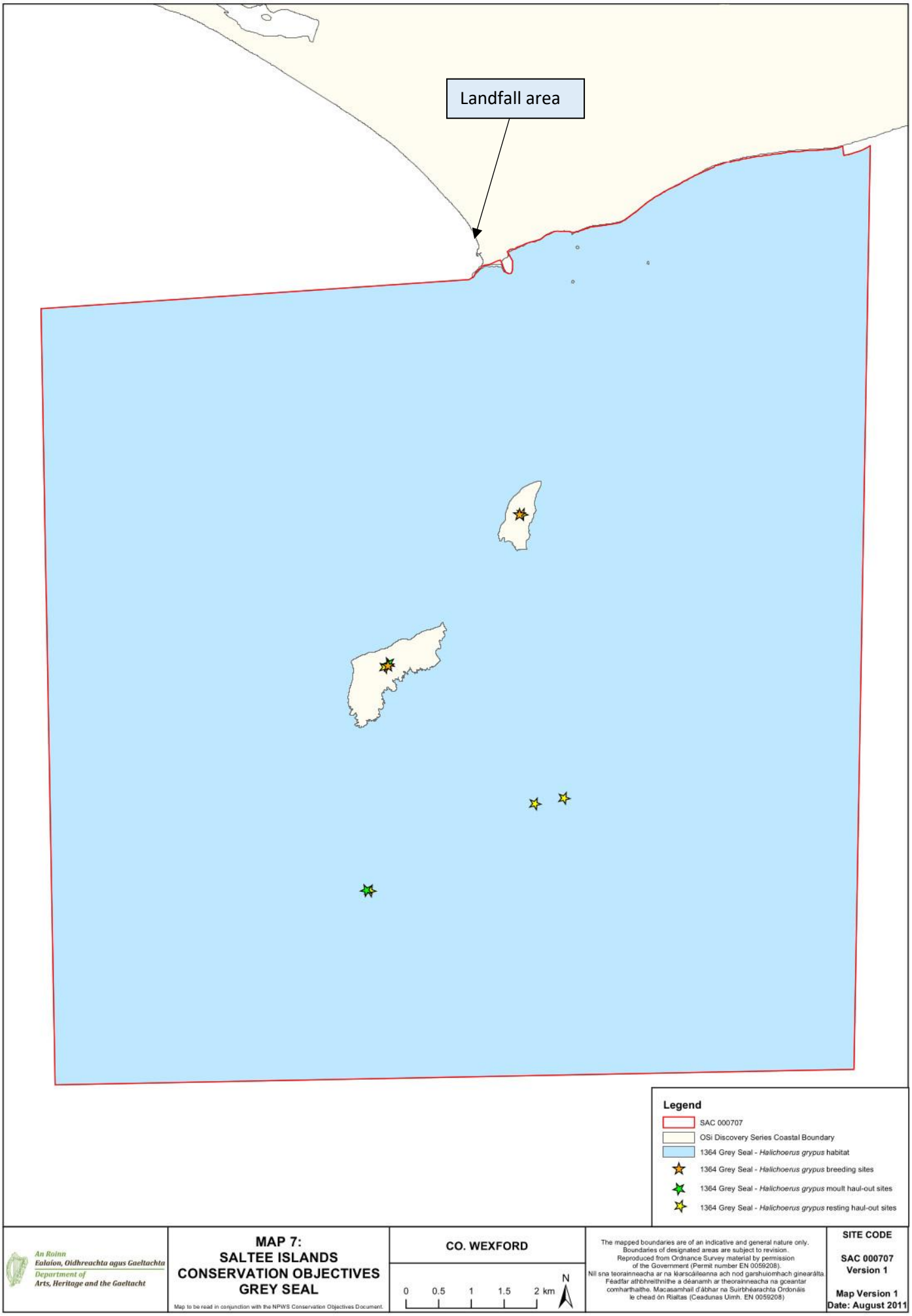

Figure 38. Location of Grey Seal in Saltee Islands SAC

Ballyteige Burrow SPA (Site code: 004020)

As outlined in the Conservation Objectives Supporting Document "*The site contains several coastal habitats listed on Annex I of the E.U. Habitats Directive, including saltmarshes, fixed dunes and lagoon. Consequently the site is also designated as a Special Area of Conservation (SAC 0696). Most of the site is designated a Nature Reserve.*

The site is important for wintering waterbirds and provides excellent feeding grounds plus sheltered and secure high-tide roosts. The site supports non-breeding (wintering) Light-bellied Brent Goose and Black-tailed Godwit in numbers of international importance plus a further five waterbird species in numbers of all-Ireland importance."

As outlined in the Ballyteige Burrow SPA Site Synopsis[10] (2014):

'*Ballyteige Burrow SPA is located on the south coast of Co. Wexford between the towns of Kilmore Quay and Cullenstown. It comprises a sand and shingle barrier beach, approximately 8 km in length, and the estuary of the Duncormick River. The extensive overlying sand spit is known as the Burrow, while the estuary that it encloses is known as the Cull. Some areas of adjacent polderland, particularly to the east, also form part of the site.*

The site has a range of coastal habitats, including various types of sand dunes, salt meadows, and intertidal sand and mud flats. Saltmarsh vegetation fringes The Cull, with such species as Sea Aster (Aster tripolium), Sea Arrowgrass (Triglochin maritima), Sea Lavender (Limonium humile) and Glasswort (Salicornia spp.). The estuary empties almost entirely on most tides, apart from the main central channel. Sediments vary from muds in the innermost areas, especially towards Duncormick, to sands elsewhere. In addition to the Duncormick River, the estuary receives the flow from a network of canals which drain the extensive polders to the east and north-east of the site.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Golden Plover, Grey Plover, Lapwing, Black-tailed Godwit and Bar-tailed Godwit. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The principal ornithological importance of the site is wintering waterfowl, with internationally important populations of Light-bellied Brent Goose (290) and Black-tailed Godwit (474) occurring – all figures are five year mean peaks for the period 1995/96 to1999/2000. It also supports nationally important numbers of Shelduck (167), Golden Plover (4,630), Grey Plover (69), Lapwing (7,808), and Bar-tailed Godwit (582). Several other species occur in numbers of regional importance, including Wigeon (306), Ringed Plover (133), Dunlin (1,020) and Redshank (206). The estuarine habitats provide feeding and roosting areas for the waterfowl species, though a lot of the birds also feed on the intensively managed lands of the adjacent polders.

Cullenstown Strand has a small colony of breeding Little Tern, though nesting may not occur in every year.

Ballyteige Burrow SPA is of ornithological importance because it supports internationally important populations of Light-bellied Brent Goose and Black-tailed Godwit, and nationally important populations of a further five species. Of particular note is that three of the species that occur at the site, i.e. Golden Plover, Bar-tailed Godwit and Little Tern, are listed on Annex I of the E.U. Birds Directive. Ballyteige Burrow is a Biogenetic Reserve site and part of the Ballyteige Burrow SPA is a Statutory Nature Reserve.'

The Natura 2000 Standard Data Form (2018)[11] states that:

'*The site is located on the south coast of Co. Wexford between the towns of Kilmore Quay and Cullenstown. It is comprised of a sand and shingle barrier beach, approximately 8 km in length, and the estuary of the River Duncormick. The extensive overlying sand spit is known as the Burrow, while the estuary that it encloses is known as the Cull. The site possesses a range of coastal habitats, including various types of dunes, salt meadows, and intertidal sand and mud flats. Former estuarine areas adjacent to the site have been reclaimed as polders and are intensively managed for agriculture.*

[10] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004020.pdf
[11] https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004020.pdf

The site has an internationally important population of Branta bernicila hrota, and supports nationally important numbers of Tadorna tadorna, Pluvialis apricaria, Charadrius hiaticula, Vanellus vanellus, Limosa limosa and Limosa lapponica. The estuarine habitats provide feeding and roosting areas for the waterfowl species, though a lot of the birds also feed on the intensively managed lands of the adjacent polders. There is a small colony of breeding Sterna albifrons in the site, though nesting may not occur every year. Salt marsh habitats are particularly well represented, with one of only two extant sites in Ireland which has halophilous scrub vegetation characterised by Arthrocnemum perenne. Within the site are 6 Red Data Book plant species and the only Irish site for the lichen Fulgensia subbracteata. The site is a Statutory Nature Reserve and managed for conservation.'

Saltee Islands SPA (Site code: 004020)

As outlined in the Saltee Islands SPA Site Synopsis[12] (2012):

'*The Saltee Islands SPA is situated some 4-5 km off the coast of south Co. Wexford and comprises the two islands, Great Saltee and Little Saltee, and the surrounding seas both between them and to a distance of 500 m from them. The bedrock of the islands is of Precambrian gneiss and granite. Both islands have exposed rocky cliffs on their south and east – those on Great Saltee being mostly c. 30 m high, those on Little Saltee about half this height. The northern and western sides of both islands are fringed with shingle and boulder shores, backed by boulder clay cliffs, as well as small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee.*

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Fulmar, Gannet, Cormorant, Shag, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill and Puffin. The site is also of special conservation interest for holding an assemblage of over 20,000 breeding seabirds.

The Saltee Islands are internationally important for holding an assemblage of over 20,000 breeding seabirds. The nationally important Gannet colony on Great Saltee has been well documented since its establishment in the1920s and 2,446 pairs were present in 2004. The following species have populations of national importance (all counts in the 1998-2000 breeding seasons): Fulmar (520 pairs), Cormorant (273 pairs), Shag (268 pairs), Lesser Black-backed Gull (164 pairs), Herring Gull (73 pairs), Kittiwake (2,125 pairs), Guillemot (14,362 pairs), Razorbill (2,505 pairs) and Puffin (1,822 pairs). An estimated 250 pairs of Manx Shearwater occur on these islands. Seabird populations are monitored annually and large numbers of chicks, especially of Gannets, auks and Shags, are ringed.

Peregrine Falcon breeds (1-2 pairs) and Chough (1 pair) occurs at the eastern edge of its Irish range. Hen Harrier uses the site for autumn passage and overwintering.

Great Saltee is a major site for spring and autumn landbird migration and was the site for Ireland's first bird observatory. While the observatory is no longer operational, substantial numbers of migrants are still ringed annually. Large numbers of pipits, swallows and martins, thrushes, warblers and finches occur, while smaller numbers of a great variety of other species (some very rare in Ireland) are also recorded.

The Saltee Islands SPA is of international importance for breeding seabirds; it also supports populations of three species that are listed on Annex I of the E.U. Birds Directive, i.e. Peregrine, Chough and Hen Harrier. It is one of the best-documented sites in the country and is monitored annually.'

The Natura 2000 Standard Data Form (2020)[13] states that:

'*The site comprises the two Saltee Islands (Great Saltee and Little Saltee) which are situated between 4 and 5 km off the south Wexford coast. The bedrock is metamorphic schist and gneiss. The islands are exposed to prevailing wind and swells from the west. The islands were inhabited and farmed in the past but are now abandoned, although some sheep grazing occurs on Little Saltee. A community dominated by Pteridium aquilinum is the main vegetation type on the islands. Dry grassland occurs within the old field boundaries. Good examples of vegetated cliff habitat with a typical south-eastern flora occur on both islands. The shorelines vary from rocky cliffs of moderate height to shingle, sand and boulder shores. Small sections of boulder clay cliffs are exposed in places. Sea caves are found in several parts of the site. Other habitats present include springs, flushes and scrub. The site includes an area of the surrounding seas to a distance of 500 m from the shoreline where seabirds feed, bathe and socialise.*

[12] https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004002.pdf
[13] https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004002.pdf

The Saltee Islands support one of the most important seabird colonies in the country (for populations and species diversity) and hold the most important colony in the south-east for populations and species diversity. The site is nationally important for eleven seabird species: Fulmarus glacialis, Sula bassana, Phalacrocorax carbo, Phalacrocorax aristotelis, Larus fuscus, Larus marinus, Larus argentatus, Uria aalge, Alca torda, Rissa tridactyla and Fratercula arctica. The islands, especially Great Saltee, have a long-established seabird monitoring programme, and in particular the growth of the Sula bassana colony since its establishment in the 1920s has been well documented. There is a long-term seabird ringing programme in operation. Pyrrhocorax pyrrhocorax occurs at the eastern edge of its Irish range and Falco peregrinus breeds. Great Saltee is a major site for spring and autumn landbird migration and the island formerly had a bird observatory. Ringing of migrants still takes place. The site has a long established breeding population of Halichoerus grypus which is the only significant population in the south-east region.'

The Qualifying Interests (QI) (Features of Interest), Special Conservation Interests (SCIs) for the SAC and SPA sites and the National conservation status of the Natura 2000 sites subject to the NIS are seen in Table 15. The site specific conservation Objectives for Natura 2000 sites are seen in Table 16.

***Table 15**. Qualifying Interests, Conservation Status, Management Objectives, Conditions underpinning site integrity for Natura 2000 sites*

Qualifying Interests, Conservation Status, Management Objectives, Conditions underpinning site integrity for relevant European sites		
Natura 2000 Site Name & Code	Qualifying Interests	Current Conservation Status & Trend
Special Areas of Conservation (SAC)		
Ballyteige Burrow SAC	[1130] Estuaries [1140] Tidal Mudflats and Sandflats [1150] Coastal Lagoons* [1210] Annual Vegetation of Drift Lines [1220] Perennial Vegetation of Stony Banks [1310] Salicornia Mud [1330] Atlantic Salt Meadows [1410] Mediterranean Salt Meadows [1420] Halophilous Scrub [2110] Embryonic Shifting Dunes [2120] Marram Dunes (White Dunes) [2130] Fixed Dunes (Grey Dunes)* [2150] Decalcified Dune Heath* [2190] Humid Dune Slacks.	**Inadequate** **Inadequate** **Bad** **Inadequate** **Inadequate** **Favourable** **Inadequate** **Inadequate** **Bad** **Inadequate** **Inadequate** **Bad** **Inadequate** **Inadequate**
Saltee Islands SAC	[1140] Tidal Mudflats and Sandflats [1160] Large Shallow Inlets and Bays [1170] Reefs [1230] Vegetated Sea Cliffs [8330] Sea Caves [1364] Grey Seal (*Halichoerus grypus*)	**Inadequate** **Bad** **Inadequate** **Inadequate** **Favourable** **Favourable**
Hook Head SAC	[1160] Large Shallow Inlets and Bays [1170] Reefs [1230] Vegetated Sea Cliffs	**Bad** **Inadequate** **Inadequate**
Special Protection Areas (SPA)		
Ballyteige Burrow SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Golden Plover (*Pluvialis apricaria*) [A140]	**Amber*** **Amber** **Red**

	Grey Plover (*Pluvialis squatarola*) [A141] Lapwing (*Vanellus vanellus*) [A142] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Wetland and Waterbirds [A999]	**Amber** **Red** **Amber** **Amber** **N/A**
Saltee Islands SPA	Fulmar (*Fulmarus glacialis*) [A009] Gannet (*Morus bassanus*) [A016] Cormorant (*Phalacrocorax carbo*) [A017] Shag (*Phalacrocorax aristotelis*) [A018] Lesser Black-backed Gull (*Larus fuscus*) [A183] Herring Gull (*Larus argentatus*) [A184] Kittiwake (*Rissa tridactyla*) [A188] Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200] Puffin (*Fratercula arctica*) [A204]	**Green** **Amber** **Amber** **Amber** **Amber** **Red** **Amber** **Amber** **Amber** **Amber**
Keeragh Islands SPA	Cormorant (*Phalacrocorax carbo*) [A017]	**Amber**

*Birds of Conservation Concern (BOCCI) 4: 2020 – 2026 (Gilbert et al., 2021)

***Table 16**. Site specific conservation objectives for Natura 2000 sites*

Ballyteige Burrow SAC (000696		
Attribute	**Measure**	**Target**
Estuaries [1130] (Maintain the favourable conservation condition)		
Habitat area	Hectares	Permanent habitat area is stable or increasing, subject to natural processes
Community distribution	Hectares	Conserve the following community types in a natural condition: Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex; Sand with crustaceans and *Nephtys hombergii* community complex.
[1140] Tidal Mudflats and Sandflats (Maintain the favourable conservation condition)		
Habitat area	Hectares	Permanent habitat area is stable or increasing, subject to natural processes
Community distribution	Hectares	Conserve the following community type in a natural condition: Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex..
[1150] Coastal Lagoons* (Restore the favourable conservation condition)		
Habitat area	Hectares	Area stable, subject to slight natural variation.
Habitat distribution	Occurrence	No decline, subject to natural processes

Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural range
Hydrological regime	Metres	Annual water level fluctuations and minima within natural range
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoon and sea, including where necessary, appropriate management
Water quality: Chlorophyll a	µg/L	Annual median chlorophyll *a* within natural range and less than 5 µg/L
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural range and less than 0.1mg/L
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural range and less than 0.15mg/L
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to at least 2m depth
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation
Negative indicator species	Number and % cover	Negative indicator species absent or under control
[1210] Annual Vegetation of Drift Lines (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable, subject to slight natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali*) and orache (*Atriplex spp*.)
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover
[1220] Perennial Vegetation of Stony Banks (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable, subject to slight natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.

Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain the typical vegetated shingle flora including the range of subcommunities within the different zones
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover
[1310] Salicornia Mud (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable, subject to slight natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain, or where necessary restore, natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and subcommunities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in SMP (McCorry and Ryle, 2009)
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (Spartina anglica). No new sites for this species and an annual spread of less than 1% where it is already known to occur
[1320] *Spartina* swards - Spartina swards (*Spartinion maritimae*) was originally listed as a qualifying Annex I habitat for Ballyteige Burrow SAC. However, all stands of cordgrass in Ireland are now regarded as common cordgrass (S. anglica) (McCorry et al., 2003; McCorry and Ryle, 2009), an alien invasive species. Thus, no conservation objective has been prepared for this habitat. It will therefore not be necessary to assess the likely effects of plans or projects against this Annex I habitat.		

[1330] Atlantic Salt Meadows (Restore the favourable conservation condition)		
Habitat area	Hectares	Area stable, subject to slight natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain range of subcommunities with typical species listed in SMP (McCorry and Ryle, 2009)
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (Spartina anglica), with an annual spread of less than 1% where it is known to occur
[1410] Mediterranean Salt Meadows (Maintain the favourable condition)		
Habitat area	Hectares	Area stable or increasing, subject to slight natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward

Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain range of subcommunities with characteristic species listed in SMP (McCorry and Ryle, 2009)
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1% where it is already known to occur.
[1420] Halophilous Scrub (Restore the favourable conservation condition)		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and subcommunities	Percentage cover	Maintain range of subcommunities with typical species listed in SMP (McCorry and Ryle, 2009)
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with annual spread of less than 1%.
[2110] Embryonic Shifting Dunes (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession.

Habitat distribution	Occurrence	No decline, subject to natural processes
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (*Elytrigia juncea*) and/or lyme grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities with typical species: sand couch grass (*Elytrigia juncea*) and/or lyme grass (*Leymus arenarius*)
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover
[2120] Marram Dunes (White Dunes) (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram grass (*Ammophila arenaria*) and/or lyme grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lymegrass (*Leymus arenarius*)
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover
[2130] Fixed Dunes (Grey Dunes)* (Restore the favourable conservation condition)		
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession.
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes.

Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain range of subcommunities with typical species listed in Delaney et al. (2013)
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control
[2150] Decalcified Dune Heath* (Maintain the favourable conservation condition)		
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes
Physical structure: functionality and sediment supply	Presence/absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward
Vegetation composition: typical species and subcommunities	Percentage cover at a representative number of monitoring stops	Maintain range of subcommunities with typical species listed in Delaney et al. (2013)
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control

Saltee Islands SAC (000707)		
Attribute	**Measure**	**Target**
[1140] Tidal Mudflats and Sandflats (Maintain the favourable conservation condition)		
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.
Community extent	Hectares	The following community should be maintained in a natural condition: Intertidal sand to muddy sand dominated polychaetes community complex
[1160] Large shallow inlets and bays (Maintain the favourable conservation condition)		
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes.
Community extent	Hectares	The following communities should be maintained in a natural condition: Coarse sediment with *Pomatoceros spp*. and *Pisidia longicornis* community.
[1170] Reefs (Maintain the favourable conservation condition)		
Distribution	Occurrence	The distribution of reefs should remain stable, subject to natural processes.
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes.
Community structure	Biological composition	The following reef community complexes should be maintained in a natural condition: Intertidal reef community complex; and Subtidal reef dominated by echinoderms and sponges community complex.
Community extent	Hectares	The extent of *Laminaria* dominated community should be conserved, subject to natural processes.
Community structure	Biological composition	The biology of the *Laminaria* dominated community should be conserved, subject to natural processes
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts (Maintain the favourable conservation condition)		
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Great Saltee Island- 5.51km and Little Saltee Island- 3.11km.
Habitat distribution	Occurrence	No decline, subject to natural processes.
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward

Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in the Irish Sea Cliff Survey (Barron et al., 2011)
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (Pteridium aquilinum) on grassland less than 10%. Cover of woody species on grassland less than 20%
[1364] Grey Seal (*Halichoerus grypus*) (Maintain the favourable conservation condition)		
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition.
Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition.
Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition.
Population composition	Number of cohorts	The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the grey seal population
[8330] Submerged or partially submerged sea caves (Maintain the favourable conservation condition)		
Distribution	Occurrence	The distribution of sea caves should remain stable, subject to natural processes.
Community structure	Biological composition	Human activities should occur at levels that do not adversely affect the ecology of sea caves
Ballyteige Burrow SPA (004020)		
Attribute	**Measure**	**Target**
[A046] Brent Goose (*Branta bernicla hrota*); [A048] Shelduck (*Tadorna tadorna*); [A140] Golden Plover (*Pluvialis apricaria*); [A141] Grey Plover (*Pluvialis squatarola*); [A142] Lapwing (*Vanellus vanellus*); [A156] Black-tailed Godwit (*Limosa limosa*); [A147] Bar-tailed Godwit (*Limosa lapponica*) – (Maintain the favourable conservation condition)		
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas, other than that occurring from natural patterns of variation
[A999] Wetlands (Maintain the favourable conservation condition)		

Habitat areas	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 559 hectares, other than that occurring from natural patterns of variation.
Saltee Islands SPA (004002)		
Attribute	**Measure**	**Target**
[A009] Fulmar (*Fulmarus glacialis*); [A016] Gannet (*Morus bassanus*) - Maintain the favourable conservation condition		
Breeding population abundance: apparently occupied sites (AOSs)	Number	No significant decline
Productivity rate	Mean number	No significant decline
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
Prey biomass available	Kilogrammes	No significant decline
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
Disturbance at the breeding site	Level of impact	No significant increase
Disturbance at marine areas immediately adjacent to the colony	Level of impact	No significant increase
[A017] Cormorant (*Phalacrocorax carbo*); [A018] Shag (*Phalacrocorax aristotelis*); [A183] Lesser Black-backed Gull (*Larus fuscus*); [A184] Herring Gull (*Larus argentatus*); [A188] Kittiwake (*Rissa tridactyla*) - Maintain the favourable conservation condition		
Breeding population abundance: apparently occupied sites (AOSs)	Number	No significant decline
Productivity rate	Mean number	No significant decline
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
Prey biomass available	Kilogrammes	No significant decline
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
Disturbance at the breeding site	Level of impact	No significant increase
[A199] Guillemot (*Uria aalge*); [A200] Razorbill (*Alca torda*) - Maintain the favourable conservation condition		
Breeding population abundance: individual adult	Number	No significant decline
Productivity rate	Mean number	No significant decline

Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
Prey biomass available	Kilogrammes	No significant decline
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
Disturbance at the breeding site	Level of impact	No significant increase
Disturbance at marine areas immediately adjacent to the colony	Level of impact	No significant increase
[A204] Puffin (*Fratercula arctica*) – Maintain the favourable conservation condition		
Breeding population abundance: apparently occupied burrow (AOB)	Number	No significant decline
Productivity rate	Mean number	No significant decline
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline
Prey biomass available	Kilogrammes	No significant decline
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase
Disturbance at the breeding site	Level of impact	No significant increase
Disturbance at marine areas immediately adjacent to the colony	Level of impact	No significant increase

Additional information on species/habitats

Grey Seal

Saltee Islands have been identified as the location of a key colony and an important breeding area for Grey Seal populations in the Republic of Ireland. Outlined below are surveys and studies undertaken by NPWS in relation to Grey Seal populations in the vicinity of Kilmore Quay and Saltee Islands.

As outlined in the "Grey seal moult population survey in the Republic of Ireland, 2007"[14]:

Grey Seal Distribution Recorded During Moult Surveys

*Data gathered during February and March 2007 indicated that moulting grey seals were particularly concentrated along the Atlantic coastline of Ireland in Counties Kerry, Galway, Mayo and Donegal (*Fig. 54). *However, nationally-significant haul-out groups were also recorded at key sites off the coasts of Co. Cork, Co. Dublin and Co. Wexford (Appendix III). The research also indicated that national grey seal distribution ashore during the moult season may be somewhat narrower than that observed during breeding* (Fig. 54), *when the recording of newborn pups is the primary focus of survey effort (Ó Cadhla et al., 2007). Such differences were most apparent in haul-out data from Counties Galway, Mayo and Donegal (Appendix III).*

Minimum Population Estimates in March 2007

Based on count data obtained by means of aerial survey imagery and a small number of real time counts, the minimum population estimate delivered by the survey programme was as follows:

Republic of Ireland moult population estimate, 2007 = 5,343 grey seals

Two islands – Inishkea North, Co. Mayo and the Great Blasket Island, Co. Kerry, contained over 45% of all grey seals recorded nationally during the moult survey. Large haul-out group sizes of over 900 animals were recorded on large sheltered sandy beaches at each of these islands (Appendix III). In total 27.7% of all grey seals recorded during the nationwide survey (Fig. 55) were located at Inishkea North, most centred about a site known as 'the Dock' (Plate 2). The Inishkea Group as a whole contained a minimum estimate of 1,882 grey seals on 2 nd March – over 35% of the national figure.

Other haul-out group sizes noteworthy in a regional context (Fig. 2; Appendix III) were recorded at Low Island, the West Calf Island (Plate 3) and Carbery Island (Co. Cork), Ferroon Rocks, Chapel Island & Inishgort (Co. Galway), Inishkea South & Inishkeeragh (Co. Mayo), Slievetooey (within Location 109: Glenlough to Maghera) & Inishtrahull (Plate 4; Co. Donegal), St. Patrick's Island & Lambay Island (Co. Dublin), and Raven Point & ***Great Saltee Island (Co. Wexford).*** **(Emphasis added)**

Terrestrial habitats used by moulting grey seals around the Irish coastline varied from rocky skerries (e.g. Bomore, Co. Sligo), island coastlines consisting of rock ledges and outcrops to sand beaches and sandbanks (e.g. Ballisadare Bay, Co. Sligo; Raven Point, Co. Wexford). In two cases (Ferroon Rocks and Glassillan, Co. Galway), haul-out groups were recorded on the grassy summits of islands.

[14] https://www.npws.ie/sites/default/files/publications/pdf/OCadhla_&_Strong_2007_Grey_Seal_Moult_Survey.pdf

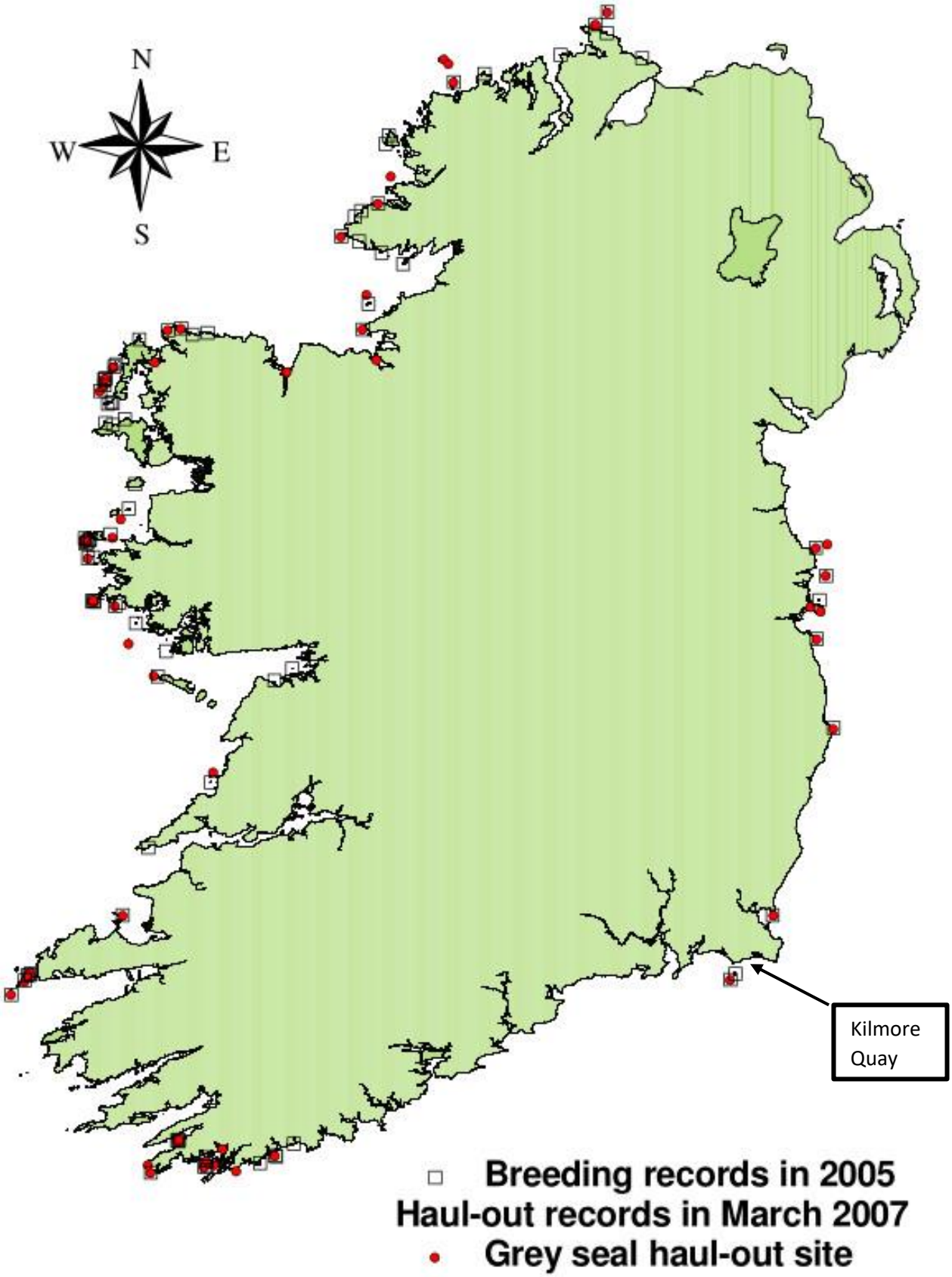

Figure 39. *The distribution of grey seal haul-out sites in the Republic of Ireland in March 2007, relative to known breeding locations recorded in 2005. Haul-out locations are plotted as the centre points assigned to individual sites*

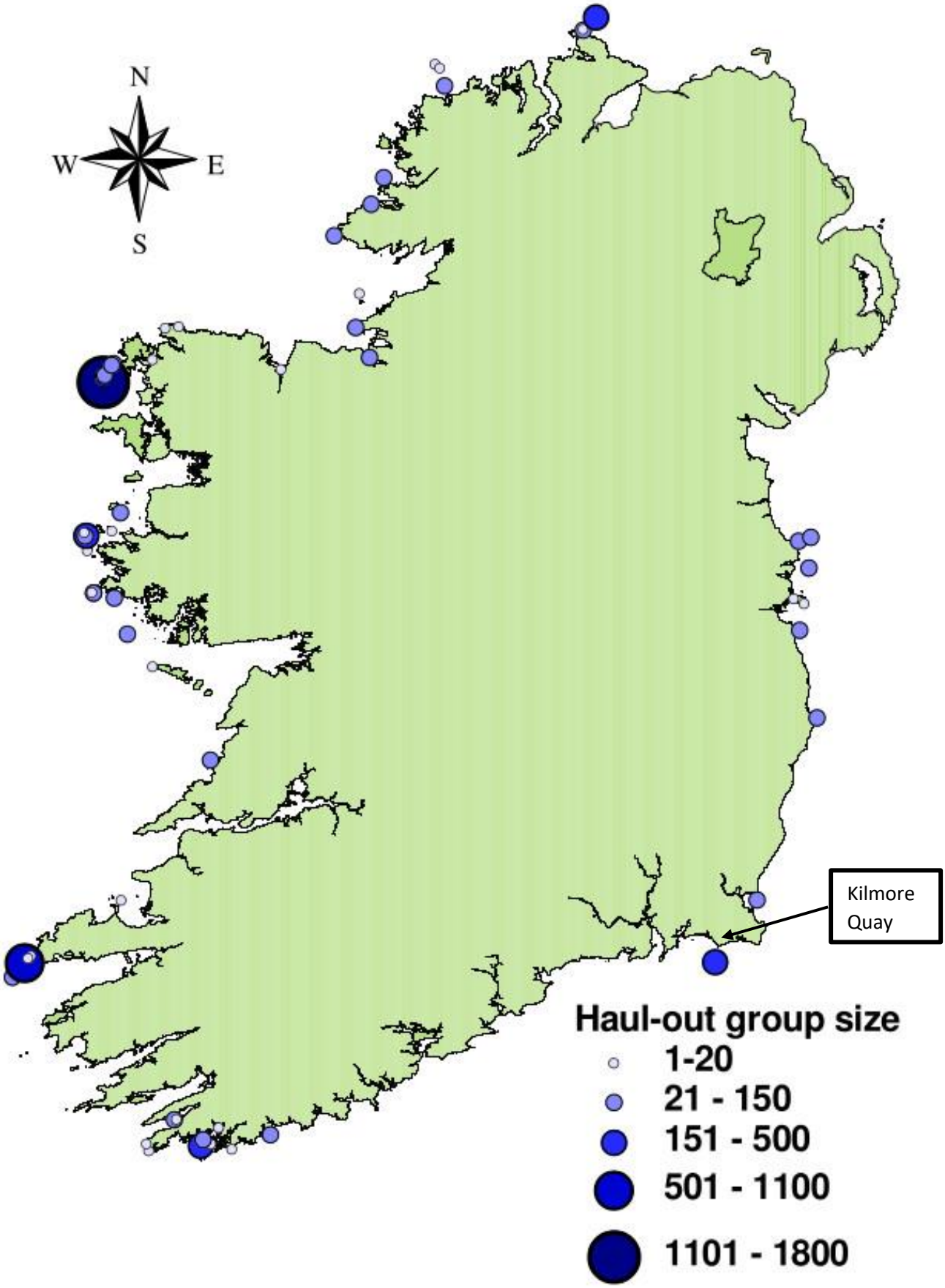

Figure 40. *Grey seal regional distribution and group sizes derived from aerial imagery and data gathered in the Republic of Ireland in March 2007, during the annual moult season.*

Discussion

The 2007 moult survey represents the first large-scale numerical assessment conducted in Irish or UK waters during the season and confirms the method's potential use as a long-term population monitoring tool. Heretofore efforts to estimate grey seal populations have traditionally focused on the breeding period (Ó Cadhla et al., 2007). In this context the survey established an important reference point in the investigation of grey seal stock distribution throughout the year, building on similar data collected during the summer of 2003 (Cronin et al., 2004).

The moult survey delivered a figure approaching the 2005 minimum population estimate of 5,509-7,083 (Ó Cadhla et al., 2007). It must be noted, however, that the survey programme was short-term in nature, with reconnaissance and aerial surveys spanning only 2-3 weeks of a protracted season (November-April; Kiely, 1998). Given that a turnover in animals doubtlessly occurs throughout the entire moult season, the total 5,343 grey seals counted between 1st-9th March must be considered a minimum subset of the available all-age population during the season. Based on data collected historically in Ireland (Kiely, 1998; Kiely et al., 2000) similar nationwide surveys conducted in the months of December, January and February would provide significant additional context to the current estimate and better address questions of population size, distribution and habitat use during the season as a whole.

The data obtained in 2007 confirmed, in a national context, several findings from previous research during the moult season in Ireland. Firstly the importance of islands in the Inishkea Group and Blasket Islands for moulting grey seals (Kiely, 1998) was reiterated in 2007 and given a national setting. Previous moult data gathered at the Inishkea Group recorded up to 2,200 grey seals among haul-out sites in the area with group sizes variable from day to day and month to month (Kiely, 1998). The 2007 data also reaffirmed the importance of specific moult sites within the Inishkea Group, most significantly 'the Dock' site, the use of which appears to be confined to the moult season only. The nearby island of Inishkeeragh also contains a specific moult site not utilised at other times of the year (Kiely, 1998). Such data highlight the need to consider a seasonal component in conservation and management planning to account for changes in terrestrial site use by the species.

The total of 989 grey seals recorded at the Blasket Islands in 2007, 947 of which were ashore on the Great Blasket Island, represents the highest number on record at these islands, more than twice that obtained in 1996-97 (Kiely, 1998) and considerably higher than that provided by anecdotal or unpublished sources (O. Ó Cadhla, CMRC, unpubl.). While it is difficult to interpret the result, given inconsistent and breedingfocused monitoring, it is noteworthy that the figure exceeds the 2005 all-age population estimate by c. 150 seals (see Ó Cadhla et al., 2007). Group sizes at several other locations (e.g. Low Island, Calf Islands, Carbery Island, the Inishkea Group) also exceeded population estimates based on breeding data (Ó Cadhla et al., 2007) suggesting a level of seasonal immigration first described at the Inishkea Group (Kiely, 1998).

In contrast, 2007 moult estimates for several other key breeding areas (e.g. Saltee Islands, northwest Galway, southwest Donegal) were well below 2005 breeding population figures, which is to be expected in a 'closed population' scenario where only a proportion of the animals associated with a given location are moulting simultaneously and a level of moult population turnover occurs during the season as a whole.

The 2007 survey thus indicated that changes in population distribution may occur seasonally in the Republic of Ireland, operating on a regional scale and conferring on certain sites an importance exceeding breeding population expectations. Data gathered in 2005 indicate that Ireland's breeding population may be increasing at key colonies (Ó Cadhla et al., 2007). Given that the species' moult phase occurs prior to the key annual foraging period, whether male or female (Bonner, 1990), it is important that moult-based research and monitoring continue, to facilitate a better understanding of Ireland's changing grey seal population and its role in the wider marine ecosystem.

Conclusions

Grey seal moult population size in the Republic of Ireland

The current grey seal moult population estimate for the Republic of Ireland is 5,343 seals of all ages. This is a minimum estimate and as such represents an appropriate national baseline figure during this phase of the annual cycle.

Areas of importance for moulting grey seals, regional and local

The moult population assessment underlined the importance on a national scale of nine key colonies located in Counties Donegal (north and southwest), Mayo (Inishkea Group), Galway (Inishgort & adjacent islands; Slyne Head islands), Kerry (Great Blasket Island), Cork (Western Calf Island), Wexford (Great Saltee Island) and Dublin (Lambay Island). Other moult haul-out sites of regional and local importance were identified. Most occurred along the Atlantic coastline from west Cork to Donegal.

Population changes at key colonies

Seasonal changes in population size at grey seal colonies are to be expected. The data gathered nationally during the moult season indicate that a number of locations may experience seasonal immigration during this phase of the annual cycle. It is not clear at this stage whether the represents a regional redistribution of national stock or the involvement of breeding stocks from outside the island of Ireland.'

As outlined in the "Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003"[15]:

'*Grey seals in Ireland are widespread but greatest concentrations are found on exposed south-western, western and northern coasts. Populations of grey seals are also found on the east and south coasts (Kiely et al., 2000). The largest populations of grey seal on the Irish Coast are found on the Blasket Islands, Inishkea Island group, the Saltees and the Raven (both off County Wexford). Between the tides they haul themselves out on to rocks, usually on uninhabited offshore islands, though some haul-outs are on secluded mainland beaches. Grey seals are gregarious at these haul-outs, sometimes forming large groups of several hundred animals, especially when they are moulting their fur in the spring.'*

'Whilst NPWS surveys have concentrated on the Inishkeas and Blaskets, a number of other important populations are found on the Irish Coast (see Appendix I). However, it is notable that most sampling effort has been undertaken upon the west coast. A recent study on the Irish and Celtic Seas (Kiely et al. 2000) has shown that there are some relatively large populations that have remained to a large extent outside of NPWS sampling effort. The most important in order of grey seal abundance and all-age estimates calculated concurrently during surveys by Kiely et al. (2000) during 1997 and 1998 were:

The Saltees (78.9 ± 9.2 (SE)) (Co. Wexford)
Raven Point (75.6 ± 7.2 (SE)) (Co. Wexford)
Lambay Island (53.0 ± 4.0 (SE)) (Co. Dublin)
Skerries Islands (28.2 ± 3.7 (SE)) (Co. Dublin)
Blackrock (24.5 ± 3.9 (SE)) (Co. Wexford)
Carnsore Point (12.2 ± 3.1 (SE)) (Co. Wexford)
Rockabill (9.7 ± 3.9 (SE)) (Co. Dublin)
Ireland's Eye (9.3 ± 2.7 (SE)) (Co. Dublin).'

Further, there is an Appendix to this study that outlines the Moult Haul-Out Data for the Republic of Ireland, 2007. From this dataset, the estimated haul-out group size (Ng) for Great Saltee Island is 246, whilst there was a recorded Ng of 0 for Little Saltee Island.

The "Grey seal breeding population assessment in the Republic of Ireland, 2005"[16] also identifies the Saltee Islands as a key breeding area for grey seals. A research project designed to carry out a comprehensive survey and deliver a reliable breeding population estimate for grey seals in Ireland, this study estimates a minimum pup count of 163 across both Great and Little Saltee Island, with a mean birth date of September 21st. An all-age population size was estimated to be between 571-734. These population estimates are visualised in the figure below.

[15] https://www.npws.ie/sites/default/files/publications/pdf/IWM13.pdf
[16] https://www.npws.ie/sites/default/files/publications/pdf/OCadhla_et_al_2005_Grey_Seal_Population_Survey.pdf

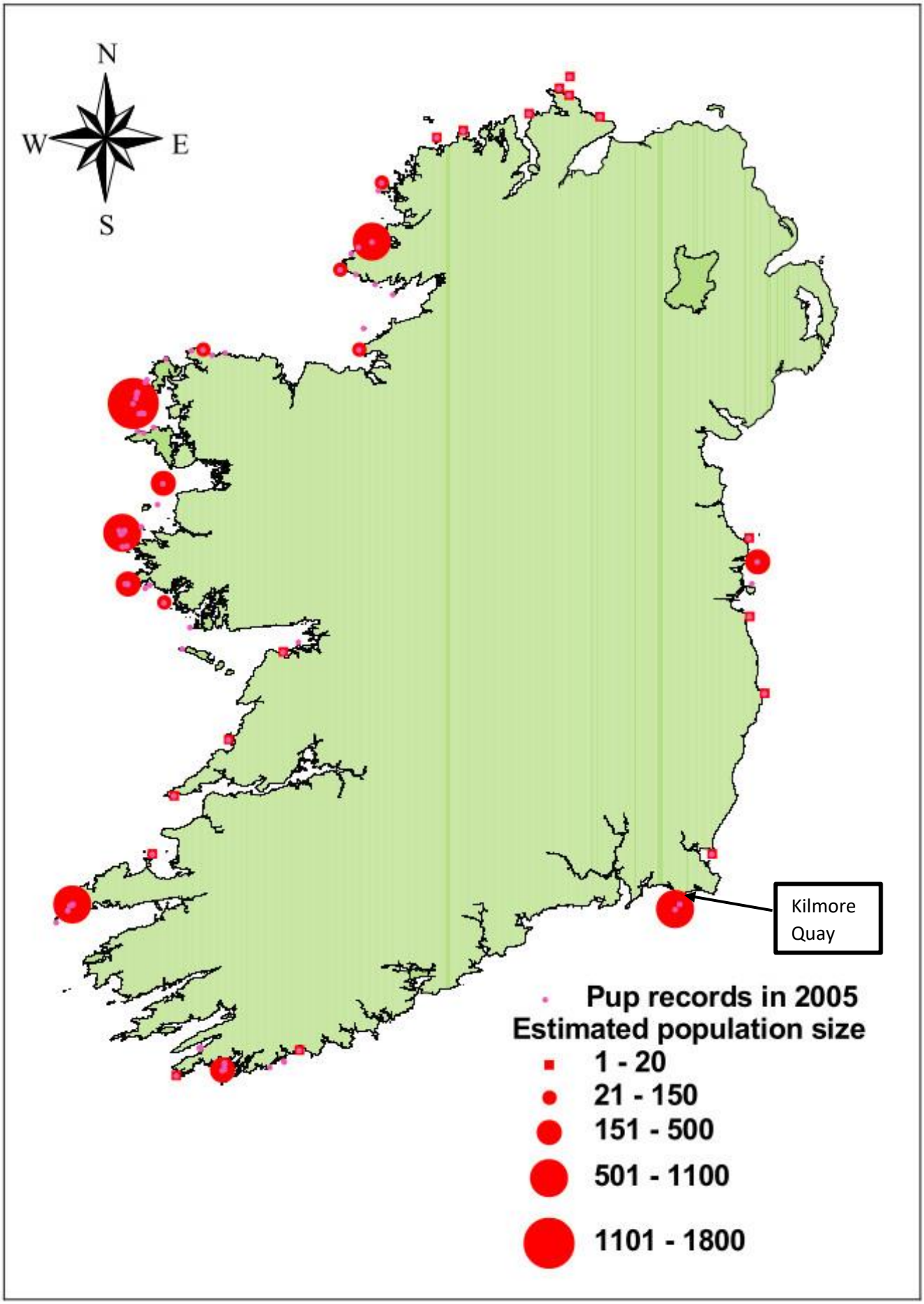

Figure 41. *All-age grey seal population sizes and regional distribution derived from data gathered in the Republic of Ireland, August – December 2005. Data for low-production breeding colonies are pooled and included within nearby population estimates as appropriate*

As demonstrated in the "Harbour seal population assessment in the Republic of Ireland" (August, 2003)[17], there have been a number of recorded sightings of grey seals in the vicinity of Kilmore Quay (red circle).

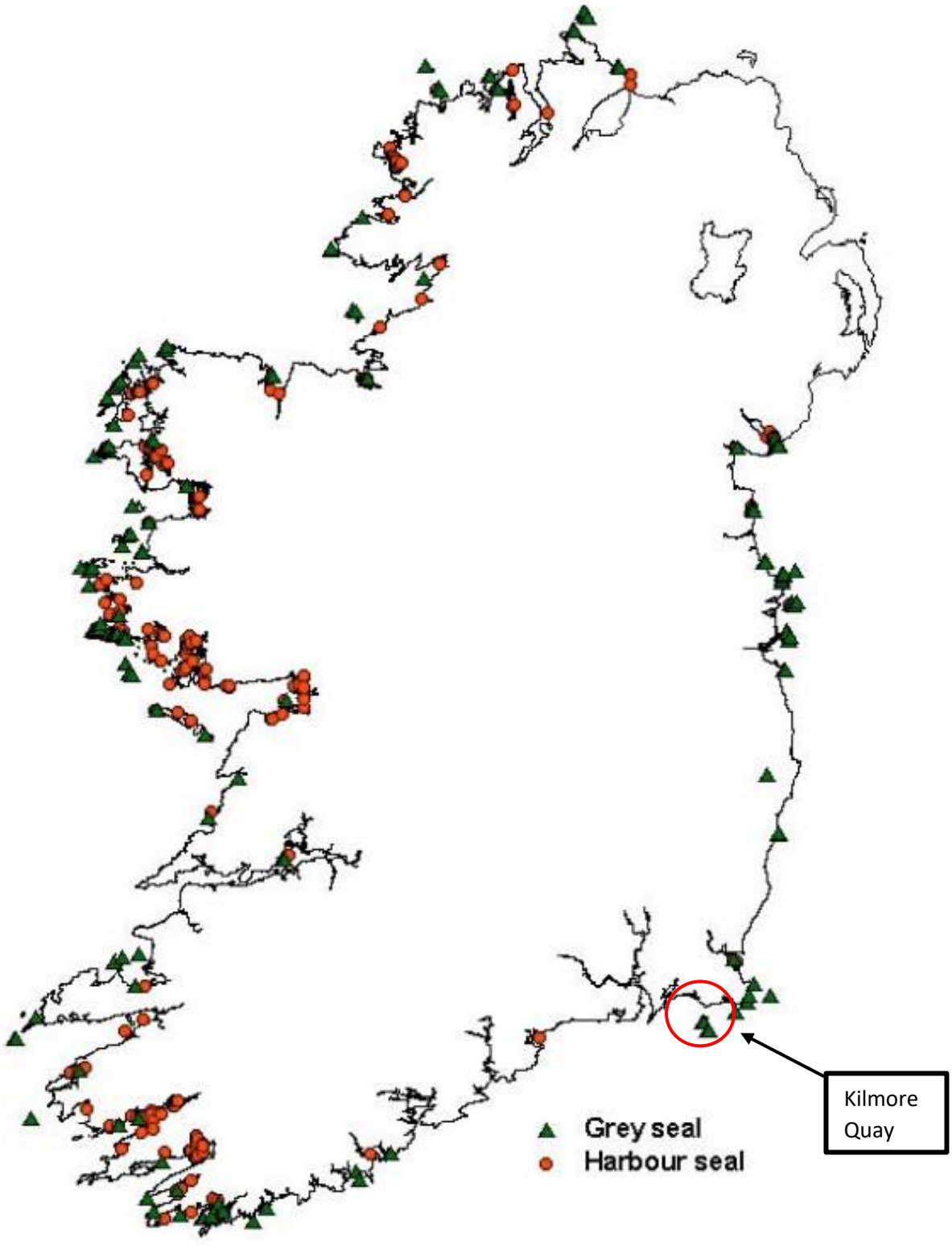

Figure 42. *Map of the locations of groups of grey seals (Halichoerus gyprus) and harbour seals (Phoca vitulina) recorded on the Republic of Ireland and Carlingford Lough, Co. Down, August 2003.*

[17] https://www.npws.ie/sites/default/files/publications/pdf/IWM11.pdf

As demonstrated in "An aerial survey of harbour seals in Ireland: Part 2- Galway Bay to Carlingford Lough" (August – September 2012)[18], grey seals have been recorded in close proximity to Kilmore Quay. Surveys undertaken in August 2003 recorded 61 grey seals in the vicinity of Saltee Islands, whilst surveys in August-September 2012 recorded 95 grey seals in the vicinity of Saltee Islands. Recordings of grey seals in close proximity to Kilmore Quay are outlined below:

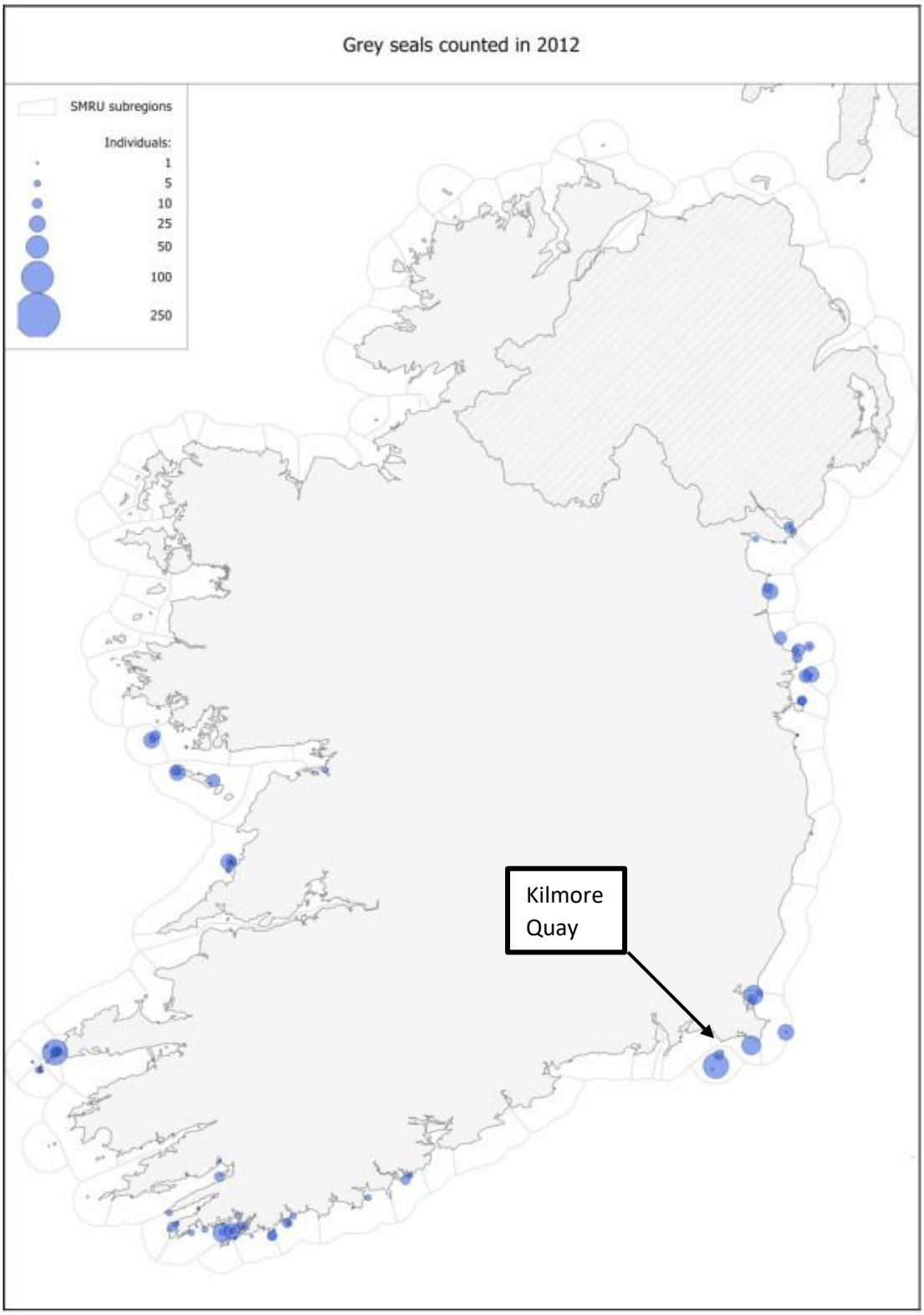

Figure 43. *The number and distribution of grey seals counted in the west, south-west, south and east of Ireland in August-September 2012.*

[18] https://www.npws.ie/sites/default/files/publications/pdf/Harbour%20seal%202012_2%20Duck_Morris.pdf

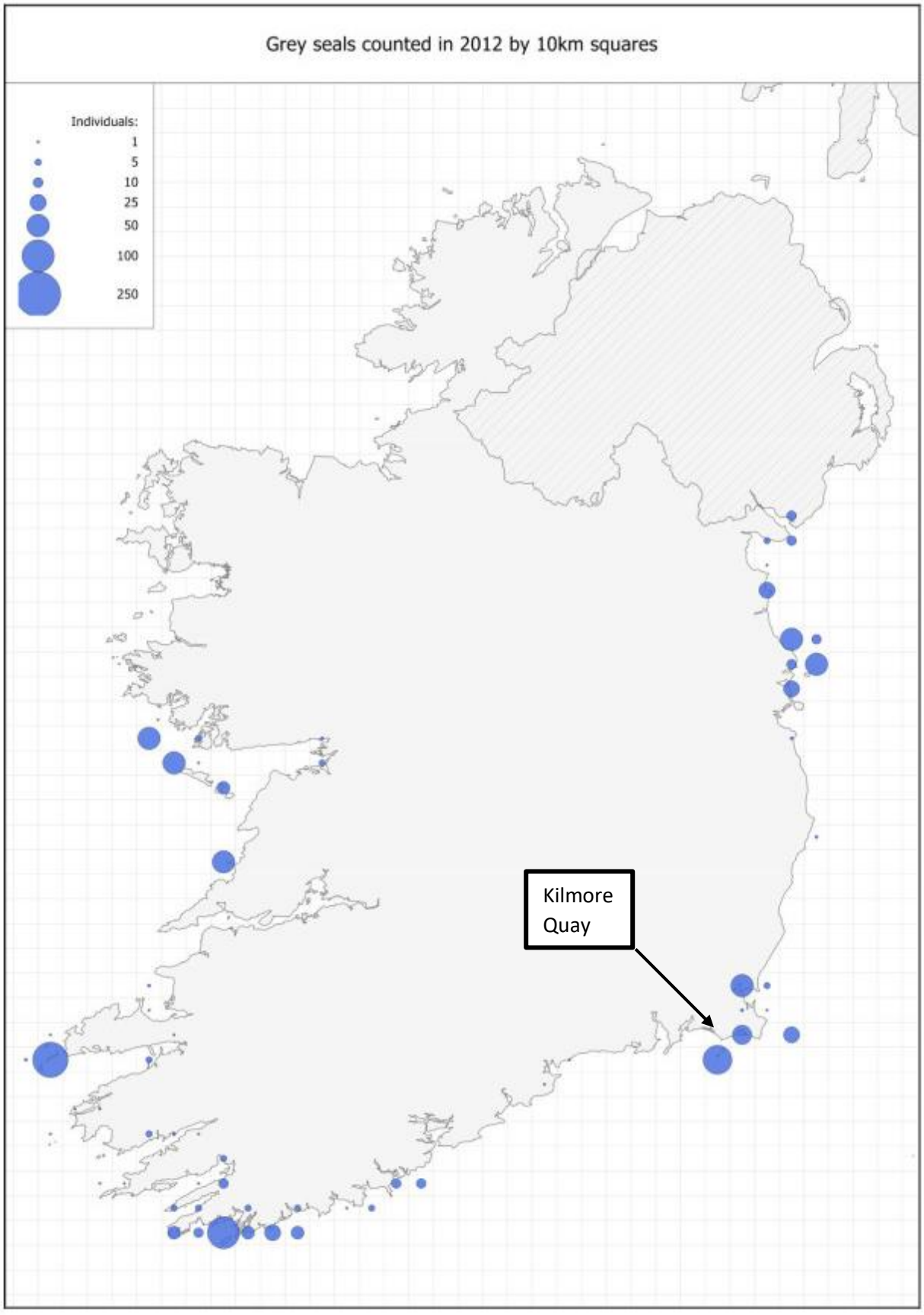

Figure 44. *This map shows the same grey seal data in the west, south-west, south and east of Ireland as Figure 34 but counts are aggregated by 10km squares (background grid).*

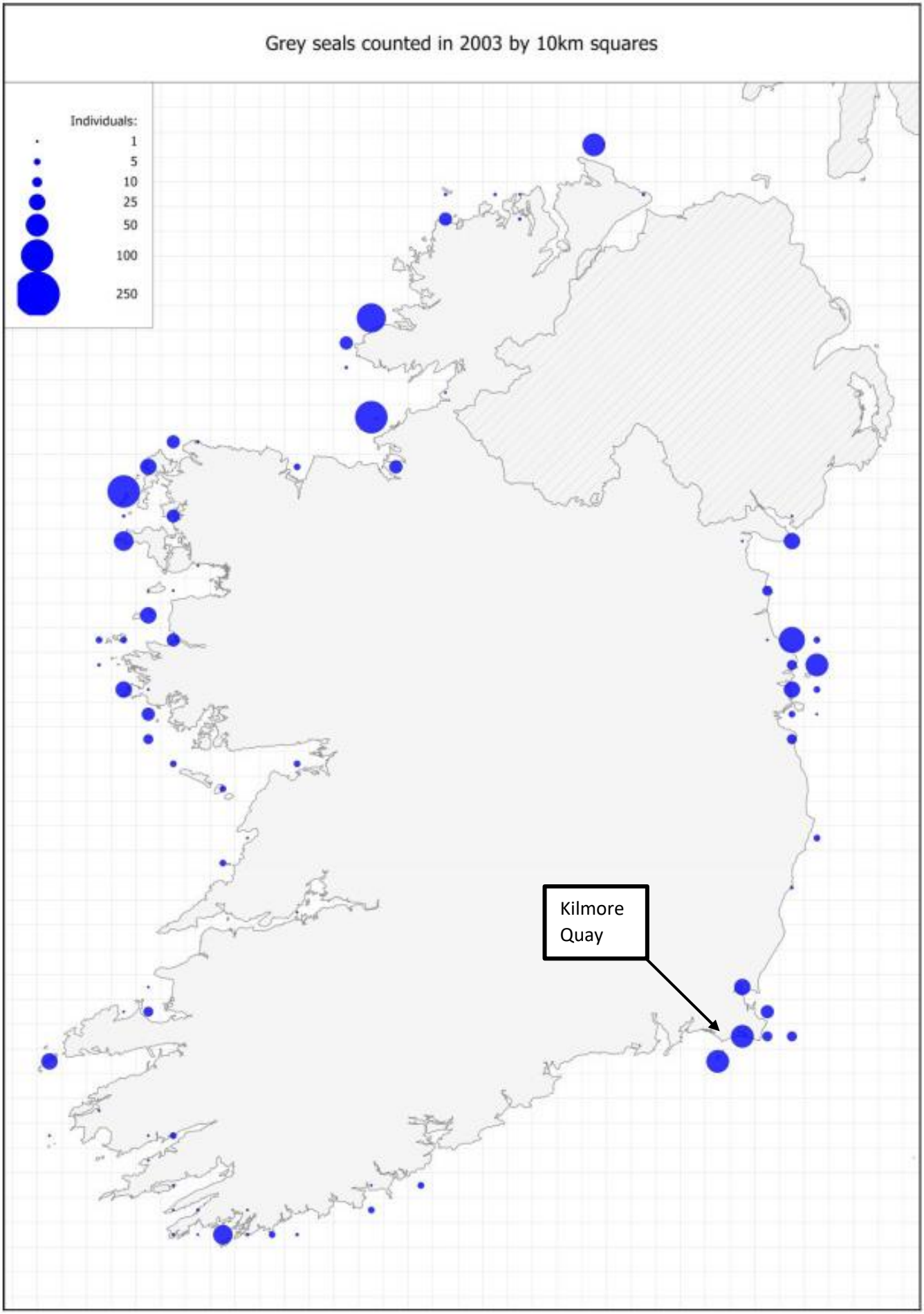

Figure 45. *Grey seal distribution in Ireland in August 2003, with counts aggregated by 10km squares (background grid). This Figure is included for comparison with the 2011/2012 data (Figure 35).*

Habitats and Species – On-Site Fieldwork

During fieldwork (13th May 2023), habitats in the vicinity of the survey route were classified according to Fossitt (2000). Observations on species were made on a receding tide, as well as at Low Water. It should be noted that the entire project was designed in consultation with Altemar in order to limit the potential impact of the proposed project. As a result, the footprint of the proposed works is small, using existing formal terrestrial routes and does not involve the placing of machinery or personnel within the dune system. As the existing duct under the dune system will be used no terrestrial works are proposed in this area. Excavation works are proposed on the beach at the end of the duct, which is not located within the dune system.

Plate 1. Beach from the car park area (L). Area beneath car park (R).

LS2 Sand Shores

The intertidal cable route consists of Littoral Sediment- Sand shores. In the vicinity of the end of the duct and the excavation route (Plate 2) the sediment was coarse (plate 3) and appeared to be well trodden. No fauna or flora were noted along the intertidal route. However, the entire beach is classed in the conservation objectives document as Mudflats and sandflats not covered by sea water at low tide consisting of Mixed sediment to sand with nematodes and *Tubificoides benedii* community complex. However, it would be expected that *Tubificoides benedii* would be found in less mobile environments primarily. There was a drift line in this location in May 2023. Rock Samphire (*Crithmum maritimum*) was noted in the area beside the car park. No seagrass (*Zostera sp*) was noted on site.

Plate 3. Coarse sediment in the vicinity of the landfall area.

Plate 2. Beach in the vicinity of the landfall area Yellow indicative route).

BL-Built Land

Built land in the vicinity of the proposed works included the roads, footpaths, walls and car parking areas, (Figure 43). These areas are of low biodiversity importance and will not be impacted by the proposed works. It is proposed to use the existing duct infrastructure to go under these areas and not impact on the structural integrity of these areas.

CD2 Marram Dunes and ED2 Bare Ground

The proposed works are in the Ballyteige Burrow SAC and the dune system form an important component of the qualifying interests. Embryonic shifting dunes [2110], Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120], Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130], Atlantic decalcified fixed dunes (Calluno-Ulicetea) [2150] and Humid dune slacks [2190] are all features of interest of this SAC. Based on the conservation objectives supporting document Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') [2120] and Fixed coastal dunes with herbaceous vegetation ('grey dunes') [2130] are located in the landfall area. Species within the vicinity of the proposed project include Marram grass (*Ammophila arenaria),* Chamomile *(Chamaemelum nobile),* Scurvygrass *(Cochlearia anglica), Bracken (Pteridium aquilinum), bramble (Rubus fruticosus agg.),* Cat's-ear *(Hypochoeris radicata) and* Selfheal *(Prunella vulgaris).* No excavation are proposed in the dune systems. Works in the dune system relate to machinery and pedestrian access on existing paths and localised works in the vicinity of the existing beach manhole.

Plate 4. Existing pedestrian access to the beach

Plate 5. Existing beach manhole (not covered by dune habitat)

Species

Birds

The proposed landfall is within a SPA. It is proximate to Kilmore Quay and a public carpark and is an important area for overwintering birds. Please see main NIS document for information on the species of importance in this area. The site was visited outside of overwintering bird season. Bird species noted on site included black-headed gull (*Larus ridibundus*), little egret (*Egretta garzetta*), grey heron (*Ardea cinerea*) and pied wagtail (*Motacilla alba yarrellii*).

Amphibians

The common frog (*Rana temporaria*) was not observed in the surrounding terrestrial areas. NPWS records of rare and threatened species in addition to the NBDC sightings records were investigated and showed no records in proximity of the landfall or beach area. No streams or drainage ditches were observed in the terrestrial element of the cable route and existing terrestrial duct infrastructure will be used. No amphibians of conservation importance are recorded on NPWS data.

Terrestrial Mammals

No badger setts or evidence of terrestrial mammals of conservation importance were seen in the vicinity of the landfall area. Records of sightings of the badger, pine marten, otter and hedgehog were examined from the NBDC and NPWS rare and threatened species records showed no records in proximity of the landfall area. However, the conservation objectives supporting document highlights a 250m buffer from High Water as otter habitat within the SAC. Otters were not observed on site.

Potential Effects of the Proposed works

Natura 2000 Sites

The potential impact of the proposed works for the screened IN NATURA 2000 sites are summarised in the table below (Table 17):

Table 17: Potential impact on Qualifying interests/Features of interest of Natura 2000 sites.

IE 000696 Ballyteige Burrow SAC	
Features of interest	Impact in the absence of mitigation
Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) [1420] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (Calluno-Ulicetea) [2150] Humid dune slacks [2190]	The proposed beach access and survey works are within the Mudflats and sandflats not covered by seawater at low tide [1140] habitat. There is potential for localised short term compaction, disturbance in addition to risk in relation to pollution discharges from machinery. Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] and Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] habitats are in the vicinity of the terrestrial survey works. However, existing cable ducts are present on site and no excavations are required in the dune areas. Potential impacts on dune habitat include compaction and accidental removal /damage to dune habitat from personnel and machinery. The formal and informal access path is 175m long from the car park area to the beach manhole. The existing pedestrian path to the beach including steps is 47m long. Other habitats noted as features of interest are not within proximity of the proposed survey works route and no impact is foreseen in relation to these habitats. However, mitigation measures will be implemented for these habitats based on precautionary principle. Mitigation measures are required to limit the potential impacts on the features of interest of the SAC.

IE 000707 Saltee Islands SAC	
Qualifying Interest	Impact in the absence of mitigation
Mudflats and sandflats not covered by seawater at low tide [1140] Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Submerged or partially submerged sea caves [8330] Grey Seal (*Halichoerus grypus)* [1364]	Works were designed to avoid this SAC in consultation with NPWS. No works or access will be carried out within this SAC. However, offshore survey works will be 350m from the SAC. Due to the scale and timing of the proposed survey works, and the distance from the proposed survey area to this SAC, in the absence of mitigation, there will be no significant effects on the terrestrial features of interest from the proposed works associated with this survey license application. However, Grey Seal on Great Saltee or in the vicinity of the works, particularly during moulting (between December and April) would be sensitive to disturbance during survey works. Mitigation measures in the way of ecological supervision are required to ensure all aspects of the works are carried out as per NIS and accompanying EcIA and that no impacts are seen on the conservation objectives of this SAC. Ecological supervision is required to ensure that the works do not enter the SAC. Trial Pits on the beach and subtidal will involve the disturbance of the seabed to 2.5m. In the subtidal the process will involve a ship moving at a speed of approximately 4kn and generating acoustic noise.

IE 004020 Ballyteige Burrow SPA	
Qualifying Interest	Impact in the absence of mitigation
Light-bellied Brent Goose (Branta bernicla hrota) [A046] Shelduck (Tadorna tadorna) [A048] Golden Plover (Pluvialis apricaria) [A140] Grey Plover (Pluvialis squatarola) [A141] Lapwing (Vanellus vanellus) [A142] Black-tailed Godwit (Limosa limosa) [A156] Bar-tailed Godwit (Limosa lapponica) [A157] Wetland and Waterbirds [A999]	No works are proposed in the SPA. The works are 700m from this SPA, on a busy section of beach beside a car park. Roosting birds from this SPA may be present and could be disturbed by the proposed intertidal works. However, mitigation measures will need to be implemented in the way of ecological supervision in the event that qualifying interests of this SPA are near the works area. The cable route would see invertebrate mortalities along the machinery access areas and in the vicinity of the excavations. This would be primarily due to compression by the machinery in a maximum 4m wide track and the disturbance of sand during the burial action, during one tidal cycle (outside SPA).

IE 004002 Saltee Islands SPA	
Qualifying Interest	Impact in the absence of mitigation
Fulmar (Fulmarus glacialis) [A009] Gannet (Morus bassanus) [A016] Cormorant (Phalacrocorax carbo) [A017] Shag (Phalacrocorax aristotelis) [A018] Lesser Black-backed Gull (Larus fuscus) [A183] Herring Gull (Larus argentatus) [A184] Kittiwake (Rissa tridactyla) [A188] Guillemot (Uria aalge) [A199] Razorbill (Alca torda) [A200] Puffin (Fratercula arctica) [A204]	No works are proposed in the SPA. It is possible that the qualifying interests of the SPA are in the vicinity of the proposed works and could be impacted by disturbance. The works are on a busy section of beach beside a car park. However, mitigation measures will need to be implemented in the way of ecological supervision to ensure that the works do not impact on qualifying interests of this SPA that may be near the works area including offshore.

Marine Mammals

All cetaceans are listed under Annex IV of the Habitats Directive, which means that they are protected wherever they occur. Bottle-nosed Dolphin and Harbour Porpoise are also listed under Annex II of the Directive. Annex II species require that core areas of their habitat are designated as sites of Community importance.

The proposed survey would be expected to impact on cetaceans primarily through the emission of noise due to the vessel and from survey equipment including multibeam. As outlined by O'Brien (2005), '*sound travels 4.5 times faster in water than in air and low frequency sounds travel farther underwater than high frequency sounds*.' Multi-beam can be defined as Low frequency (<1 kHz), Mid-frequency (1-10 kHz) and High Frequency (>10 kHz).

Southall *et al*. (2019) outlined in their publication "*Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*" revised the marine mammal hearing groups, which are seen in Table 18.

Table 18. *Marine Mammal Functional Hearing Groups and Estimated Functional Hearing groups Proposed by Southall et al. (2019)*

Marine mammal hearing group	Auditory weighting function	Genera (or species) included
Low-frequency cetaceans	LF	*Balaenidae (Balaena, Eubalaenidae spp.); Balaenopteridae (Balaenoptera physalus, B. musculus)*
		Balaenopteridae (Balaenoptera acutorostrata, B. bonaerensis, B. borealis, 1 B. edeni, B. omurai; Megaptera novaeangliae); Neobalenidae (Caperea);Eschrichtiidae (Eschrichtius)
High-frequency cetaceans	HF	*Physeteridae (Physeter); Ziphiidae (Berardius spp., Hyperoodon spp., Indopacetus, Mesoplodon spp., Tasmacetus, Ziphius); Delphinidae (Orcinus)*
		Delphinidae (Delphinus, Feresa, Globicephala spp., Grampus, 2 Lagenodelphis, Lagenorhynchus acutus, L. albirostris, L. obliquidens, L. obscurus, Lissodelphis spp., Orcaella spp., Peponocephala, Pseudorca, Sotalia spp., Sousa spp., Stenella spp., Steno, Tursiops spp.); Montodontidae (Delphinapterus, Monodon); Plantanistidae (Plantanista)
Very high frequency cetaceans	VHF	*Delphinidae (Cephalorhynchus spp.; Lagenorhynchus cruciger, L. australis); Phocoenidae (Neophocaena spp., Phocoena spp., Phocoenoides); Iniidae (Inia); Kogiidae (Kogia); Lipotidae (Lipotes); Pontoporiidae (Pontoporia)*
Phocid carnivores in water	PCW	*Phocidae (Cystophora, Erignathus, Halichoerus, Histriophoca, Hydrurga,Leptonychotes, Lobodon, Mirounga spp., Monachus, Neomonachus, Ommatophoca, Pagophilus, Phoca spp., Pusa spp.)*

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA, 2018) outlined the hearing groups of marine mammals including the generalised hearing range of these cetacean groups (Table 19). They also noted that "*Exposures exceeding the specified respective criteria level for any exposure metric are interpreted as resulting in predicted temporary threshold shift (TTS) or permanent threshold shift (PTS) onset*." The onset of PTS on marine mammals was also outlined in NOAA 2018 (Table 20). The updated figures for PTS and TTS for are outlined in Table 21.

The hearing ranges and sensitivity of marine mammals differ from one species to another depending on their audiogram. "*For example, harbour porpoises are sensitive from 3 kHz to 130 kHz, with peak sensitivity at 125-130 kHz, and bottlenose dolphins from 5-110 kHz, with peak sensitivity at 40 and 60-116 kHz*" (Southall *et al.,* 2007). Common seals are sensitive 4-45 kHz (peak sensitivity at 32 kHz) and grey seals 8-40 kHz. Humans are sensitive only to frequencies from 20 Hz to 16-18 kHz but with peak sensitivity from 2-4 kHz.

Table 19. Hearing Groups of Marine Mammals (NOAA, 2018)

Hearing Group	Generalized Hearing Range*
Low-frequency (LF) cetaceans (baleen whales)	7 Hz to 35 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

***** Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans (Southall et al. 2007) and PW pinniped (approximation).

Table 20. Onset of PTS in Marine mammals

	PTS Onset Thresholds (Received Level)	
Hearing Group	Impulsive[1]	Non-impulsive[2]
Low-Frequency (LF) Cetaceans	Cell 1 *Lpk,flat:* 219 dB *LE,LF,24h:* 183 dB	Cell 2 *LE,LF,24h:* 199 dB
Mid-Frequency (MF) Cetaceans	Cell 3 *Lpk,flat*: 230 dB *LE,MF,24h:* 185 dB	Cell 4 *LE,MF,24h*: 198 dB
High-Frequency (HF) Cetaceans	Cell 5 *Lpk,flat:* 202 dB *LE,HF,24h:* 155 dB	Cell 6 *LE,HF,24h:* 173 dB
Phocid Pinnipeds (PW) (Underwater)	Cell 7 *Lpk,flat:* 218 dB *LE,PW,24h*: 185 dB	Cell 8 *LE,PW*,24h: 201 dB
Otariid Pinnipeds (OW) (Underwater)	Cell 9 *Lpk,flat:* 232 dB *LE,OW,24h:* 203 dB	Cell 10 *LE,OW,24h:* 219 dB

[1]Impulsive: produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI 1986; NIOSH 1998; ANSI 2005).

[2]Non-impulsive: produce sounds that can be broadband, narrowband or tonal, brief or prolonged, continuous or intermittent) and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI 1995; NIOSH 1998).

Table 21. Southall *et al.* (2019) TTS- and PTS-onset thresholds for marine mammals exposed to impulsive noise: SEL thresholds in dB re 1 μPa^2s under water and dB re (20 $\mu Pa)^2s$; and peak SPL thresholds in dB re 1 µPa under water.

Hearing Group	Impulsive Noise		Non-impulsive Noise
	Unweighted SPLpeak(dB re 1 µPa)	Weighted SELcum (dB re 1 μPa^2s)	Weighted SELcum (dB re 1 μPa^2s)
PTS Criteria			
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very-frequency cetaceans (VHF)	202	155	173
Phocid carnivores in water (PCW)	218	185	201
TTS Criteria			
Low-frequency cetaceans	213	168	179
High-frequency cetaceans	224	170	178
Very high-frequency cetaceans	196	140	153
Phocid carnivores in water	212	170	181

Most small cetaceans, excluding harbour porpoise, have an auditory bandwidth of 150 HZ to – 160 kHz, while harbour porpoise have an auditory bandwidth within 200 Hz to 180 kHz. Pinnipeds in water are thought to have an auditory bandwidth of between of 75 Hz to 75 kHz and from 75 Hz to 30 kHz in air (Southall et al. 2007)."

The proposed survey equipment and the noise frequency emissions are seen in Table 22.

Equipment Type	Purpose	Frequency Range	Duration	*Maximum* Source Pressure Level (re 1µPa at 1 m)	Reference
Multibeam Echo Sounder (MBES)	Measure detailed bathymetry by transmitting sound pulses (active sonar).	200 kHz to 500 kHz	0.05 - 10 ms	210 - 245 dB.	Danson 2005, Hopkins 2007, DECC 2011, Lurton and DeReutier 2011, Lurton 2016, BEIS 2020, Crocker & Fratantonio 2016
Side Scan Sonar (SSS)	Determine surficial nature of the seabed and detect objects by transmitting sound pulse.	200 kHz to 700 kHz	0.4 - 1.0 ms	200 - 240 dB.	BOEM 2016, BEIS 2020, DAHG 2014, Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Pinger	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 15 kHz	0.5 - 30 ms	214 dB.	Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Chirper	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	2 kHz to 13 kHz	5 - 40 ms	185 - 215 dB.	Crocker & Fratantonio 2016, Hartley Anderson 2020
Sub-bottom Profiler (SBP) - Boomer	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	500 Hz to 15 kHz	0.5 - 1.0 ms	205 - 215 dB.	Crocker & Fratantonio 2016
Sub-bottom Profiler (SBP) - Parametric	Identify different geological layers encountered in the shallow sediments and sediment thicknesses beneath the seabed.	4 to 15 kHz, 85 to 115 kHz	0.2 - 30 ms	238 - 247 dB. 200 - 206 dB.	Hartley Anderson 2020
Ultra-Short Base Line (USBL)	Subsea positioning.	20 kHz to 50 kHz	5 - 10 ms	194 - 207 dB.	Kongsberg
Magnetometer	Identify ferrous anomalies for metal obstructions, shipwrecks, etc. on and under the seabed.	Passive	N/A	Passive	N/A
Survey Vessels	Carry out the survey and deploy the equipment.	50 Hz to 300 Hz	N/A	160 - 190 dB.	DECC 2011

Table 22a. Details of the proposed types of acoustic equipment which emit sound.

Equipment Type	Purpose	Number of locations within Application Area (up to)	Frequency Range	*Maximum* Source Pressure Level (re 1µPa at 1 m)	Reference
Cone Penetration Test (CPT)	Determine geotechnical engineering properties of seabed sediments.	26	28 Hz	118 - 145 dB.	BOEM 2012, EIRGRID 2014
Gravity Corer	Retrieve a seabed sediment sample by penetrating seabed with a steel core barrel under self-weight	19	N/A	N/A	N/A
Vibrocorer	Retrieve a seabed sediment sample by penetrating seabed with a vibrating steel core barrel	19	30 Hz	187.4 dB.	LGL 2010
Grab Samples	Collect small sediment samples from seabed surface with clamshell mechanism	17	N/A	N/A	N/A

Table 22b. Details of the proposed types of geotechnical equipment.

The cetacean species observed in the survey area are high frequency, mid-frequency and low frequency cetaceans. Grey and Common Seals may also be present. The proposed survey equipment and the noise frequency emissions are seen in Table 17. The high frequencies emitted from the equipment are above the auditory range of the mid frequency (150Hz-160 kHz) but within the hearing range of high frequency cetaceans (275Hz -160kHz)- observed and on the proposed survey area.

The Multibeam Echo Sounder (MBES) (200 kHz to 500 kHz) and Side Scan Sonar (SSS)(200 kHz to 700 kHz), single beam echo sounder and Multi Beam Echo Sounder (MBES) will emit noise above the hearing frequency of marine mammals. The hull mounted Sub-bottom Profiler (SBP) – Pinger (2 kHz to 15 kHz) and Sub-bottom Profiler (SBP) - Chirper(2 kHz to 13 kHz), Sub-bottom Profiler (SBP) - Boomer (15 to 500 Hz), Sub-bottom Profiler (SBP) – Parametric (4 to 15 kHz, 85 to 115 kHz) and Ultra-Short Base Line (USBL) Subsea positioning. (20 kHz to 50 kHz) emits low and mid frequency noise, within the auditory range of all marine mammals including harbour porpoise, grey seal and harbour seal. However, all of the equipment (peak noise) at 1m from source emit noise above the onset of PTS for non-impulsive sounds for high, medium, low frequency cetaceans and Phocid Pinnipeds outlined by NOAA (2018) was 173 dB, 198 dB, 199 dB and 219dB respectively and the 198dB proposed injury levels indicated by Southall et al. (2019). As a result negative impacts may be foreseen if marine mammals are close enough to the equipment to receive sound levels above this indicative threshold. As outlined in Table 10 the inshore Geophysical Survey will be undertaken in 3 to 4 days (weather and sea state dependent) and the offshore Geophysical Survey in 14 to 18 days (weather and sea state dependent).

Lurton (2016) modelled the sound field radiated by multibeam echosounders for acoustical impact assessment. He stated that "considering the injury criteria, the results illustrate that injury hazards are possible only at very short distances from the source: e.g. about 5 m for maximum Sound Pressure Level and 12 m for cumulative Sound Exposure Level in the case of a 240-dB source level, considering cetaceans. For behavioural response criteria, the corresponding values are 9 m and 70 m."

The estimated time that the survey would take (excluding SI) based on a speed of 4kn out to the EEZ within the would be approximately 9 hours. The operations would comply with the NPWS (2014) "*Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters*". These guidelines would be deemed adequate to mitigate the negative impacts of the proposed works. Cetaceans in the vicinity of the vessel during start up procedures would be given ample time to leave the site with the soft start procedures outlined in the guidelines. In addition, vessel speeds are extremely slow which would give marine mammals ample opportunity to move from the area.

Note: in relation to consistency between Southall (2019) and NOAA (2018)

The Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA, 2018) (or National Marine Fisheries Service, 2018 (as quoted in Southall 2019)), outlines the hearing groups of marine mammals including the generalised hearing range of these cetacean groups (Annex II). NOAA (2018) also noted that "*Exposures exceeding the specified respective criteria level for any exposure metric are interpreted as resulting in predicted temporary threshold shift (TTS) or permanent threshold shift (PTS) onset.*" The thresholds for the onset of PTS on marine mammals were also outlined in NOAA 2018. The updated Southall (2019) figures for PTS and TTS for are outlined in Annex IV.

Southall (2019) outlined the main differences between their publication and previous publications including NOAA (2018) which was referenced as NMFS (2018) in Southall (2019). Southall (2019) states that "The noise criteria here represent the next step in a sequential process of evolution of the criteria proposed by Southall et al. (2007), substantially modified with new analytical methods by Finneran (2016), and recently adopted as U.S. regulatory guidance by the NMFS (2016, 2018). While the quantitative process described herein and the resulting exposure criteria here are based on, and in many respects are identical to, those derived by Finneran (2016) and adopted by the NMFS (2016, 2018), there are a number of significant distinctions. The exposure criteria here appear in a peer-reviewed publication and include all marine mammal species for all noise exposures, both under water and in air for amphibious species. NMFS (2016, 2018) provides regulatory guidance only for the subset of marine mammals under their jurisdiction and do not include criteria for aerial noise exposures, an important consideration in many locations for which some earlier assessments were made (Finneran & Jenkins, 2012). The exposure criteria here, while based on the Finneran (2016) quantitative method and consistent with the NMFS (2016, 2018) guidance where they overlap, are thus more broadly relevant, peer-reviewed, and less subject to potential changes in national regulatory policy."

Southall (2019) also stated that "It should be noted that this results in some proposed differences in the terminology of hearing groups relative to those used in Finneran (2016) and NMFS (2016, 2018). These proposed differences in nomenclature may be confusing, but we believe they are justified (see the "Marine Mammal Hearing Groups and Estimated Group Audiograms" section and Appendices 1-6) and will support future criteria as new information emerges."

The difference in nomenclature between NOAA 2018 and Southall (2019) is that NOAA (2018) classified cetaceans as Low-frequency (LF) cetaceans (baleen whales), Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales) and High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger & L. australis) while Southall reclassified these groups to Low-frequency cetaceans, High-frequency cetaceans, Very high-frequency cetaceans. As outlined in Southall (2019) "*The distinction between HF and VHF cetacean groups (as opposed to mid- and high-frequency) reflects the regions of best hearing sensitivities within these groups, often including frequencies approaching or exceeding 100 kHz; these frequencies would be more appropriately described within marine bioacoustics as high to very high. Further, as discussed in more detail below, a number of anatomical and sound production properties suggest a potential distinction of very low-(VLF) and LF cetaceans among mysticetes. Some evidence also suggests a potential segregation of mid-frequency (MF) and HF cetaceans in addition to the distinction of HF and VHF cetaceans*." This is in effect a relabelling of Mid-Frequency (MF) Cetaceans and High-Frequency (HF) Cetaceans to High-frequency cetaceans and Very high-frequency cetaceans respectively. It should be clearly noted that the PTS values within the updated groups were identical between NOAA, 2018 and Southall 2019 and it was in effect a renaming of the groups.

Mitigation Measures & Monitoring

Specific controls will be incorporated into the proposed project to minimise the potential negative effects on the features of interest of the Natura 2000 sites screened in for NIS and are outlined in below:

Minor short-term impacts may result as a consequence of the survey phase of the project, but these are believed not to be at the scale to impact on the integrity of the Natura 2000 sites, species or the site-specific conservation objectives. However, following the precautionary principle, mitigation measures have been developed to minimise the ecological impacts of the project, in relation to Natura 2000 Annex habitats and species. This is primarily as a result of noise disturbance and the potential for pollution within the marine environment.

Disturbance

The proposed survey route is within an area of high disturbance due to the presence of a car park and high pedestrian and canine activity. In addition, the works are proximate to Kilmore Quay with vessel activity. As a result, the presence of additional personnel on the shore, intertidal and subtidal would not cause a significant additional disturbance. However, there is potential for disturbance of the mudflats and sandflats and as a result the following mitigation measures would be carried out:

1. An ecologist would be onsite during the surveys within the terrestrial/intertidal and subtidal within Ballyteige Beach and Kilmore Quay in order to minimise disturbance and ensure site integrity is maintained.
2. Drift lines and vegetation on the shore in close proximity to the proposed route would contain the highest proportion of potential food source for bird species. If present, these should be avoided by machinery and personnel.
3. Any temporary access arrangements or structures that are put in place to allow machinery access to the shore area should be prepared in consultation with an ecologist and the site should be fully reinstated post works. Silt protection measures will be in place if deemed necessary by the project ecologist.
4. Bilges will be emptied prior to entering works areas and oil if present removed by oil absorbent materials. All boats will possess spill kits and oil absorbent material/booms.
5. Works in the intertidal area of Ballyteige Beach will take place when the mudflats and sandflats are not covered by water.

Reinstatement

Reinstatement of the intertidal habitat should be carried out to pre-construction conditions. Any concerns in relation to the survey process or resulting reinstatement of the habitat to pre survey conditions will be raised with NPWS by the project ecologist prior to the removal of personnel from the site.

Subtidal

Mitigation impacts are primarily concerned with the survey and the following mitigation measures would be enforced.

1. Mitigation measures will include the presence of a MMO onboard the survey vessel. The purpose of the MMO is to ensure that there is no disturbance of seal /cetacean populations.
2. The NPWS Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters' (NPWS, 2014) should be followed throughout the survey.
3. The MMO/ecologist will ensure that mitigation measures are carried out. Sufficient resources should be made immediately available on the survey vessel to deal with accidental oil spills including hydraulic hoses bursting etc. and reported to the on-board ecologist.

a) The vessels operating within Kilmore Quay will be inspected by the ecologist for pollution sources. Any pollutions sources identified by the ecologist to form a risk to the European Sites will be rectified immediately before works commence/recommence. The ecologist will maintain a watching brief in relation to pollution risks and observations.

Natura Impact Statement Conclusions

The conservation objectives of Natura 2000 sites within, and beyond 15km where there is a potential for significant effects, of the proposed cable survey route were assessed.

It was determined that the project may cause localised disturbance to the habitats within Ballyteige Beach and Kilmore Quay due to pollution risk. In addition, there is potential for noise effects to grey seals during the survey periods, in the absence of mitigation. However, these impacts are deemed to be short term for the period of works (3-4 days for inshore marine survey). Mitigation measures including ecological supervision and compliance with "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014) are to be carried out.

This NIS has involved the examination, analysis and evaluation of all relevant information including, a description of the proposed project, its survey methodology, the environment in which the project will be placed, Natura 2000 sites within 15km and has applied the precautionary principle in the preparation of the conclusion. It is the professional opinion of the author of this report that there will be no adverse effects on the integrity of any Natura 2000 sites following the implementation of the mitigation measures outlined. The implementation of standard mitigation measures including the measures outlined, including onsite monitoring, the presence of a MMO, will be sufficient to prevent adverse effects on the integrity of Natura 2000 sites.

The mitigation measures detailed in this NIS have been carefully considered to ensure no adverse effects on the integrity of the following NATURA 2000 sites in light of the site's conservation objectives and status:

- Ballyteige Burrow SAC, Saltee Islands SAC, Ballyteige Burrow SPA, Saltee Islands SPA (potential effects as a result of pollution) and,
- Saltee Islands SAC (potential impact on grey seal). Standard mitigation measures used for grey seal,

Based on the assessment of the proposed development (survey) alone and in combination with other projects and plans, including the implementation of mitigation measures, it can be concluded that no adverse effects on the sites' (Ballyteige Burrow SAC, Saltee Islands SAC, Ballyteige Burrow SPA, Saltee Islands SPA) integrity will arise, in view of the site's conservation objectives.

This report presents a Stage II Natura Impact Statement for the proposed survey, outlining the information required for the competent authority to screen for appropriate assessment and to determine whether or not the Proposed Development, either alone or in combination with other plans and projects, in view of best scientific knowledge, will adversely affect the integrity of European sites.

On the basis of the content of this report, the competent authority is enabled to conduct an Appropriate Assessment and consider whether, either alone or in combination with other plans or projects, in view of best scientific knowledge and in view of the sites conservation objectives, will adversely affect the integrity of the European site

No significant effects will arise on Natura 2000 sites, their features of interest or conservation objectives. The proposed project will not will adversely affect the integrity of European sites.

Data Used for AA Screening

NPWS site synopses and Conservation objectives of sites within 15km were assessed. The most recent SAC and SPA boundary shapefiles were downloaded and overlaid on Bing road maps and satellite imagery.

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