REPORT

Supporting Information for Screening for Appropriate Assessment (SISAA)

Wicklow Export Cable Corridor Foreshore Licence Application

Client: Wicklow Sea Wind Limited

Reference: UB1019-RHD-ZZ-XX-RP-Z-0009

Status: S3/P01

Date: 30 June 2022

Royal HaskoningDHV

Enhancing Society Together

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1 Introduction

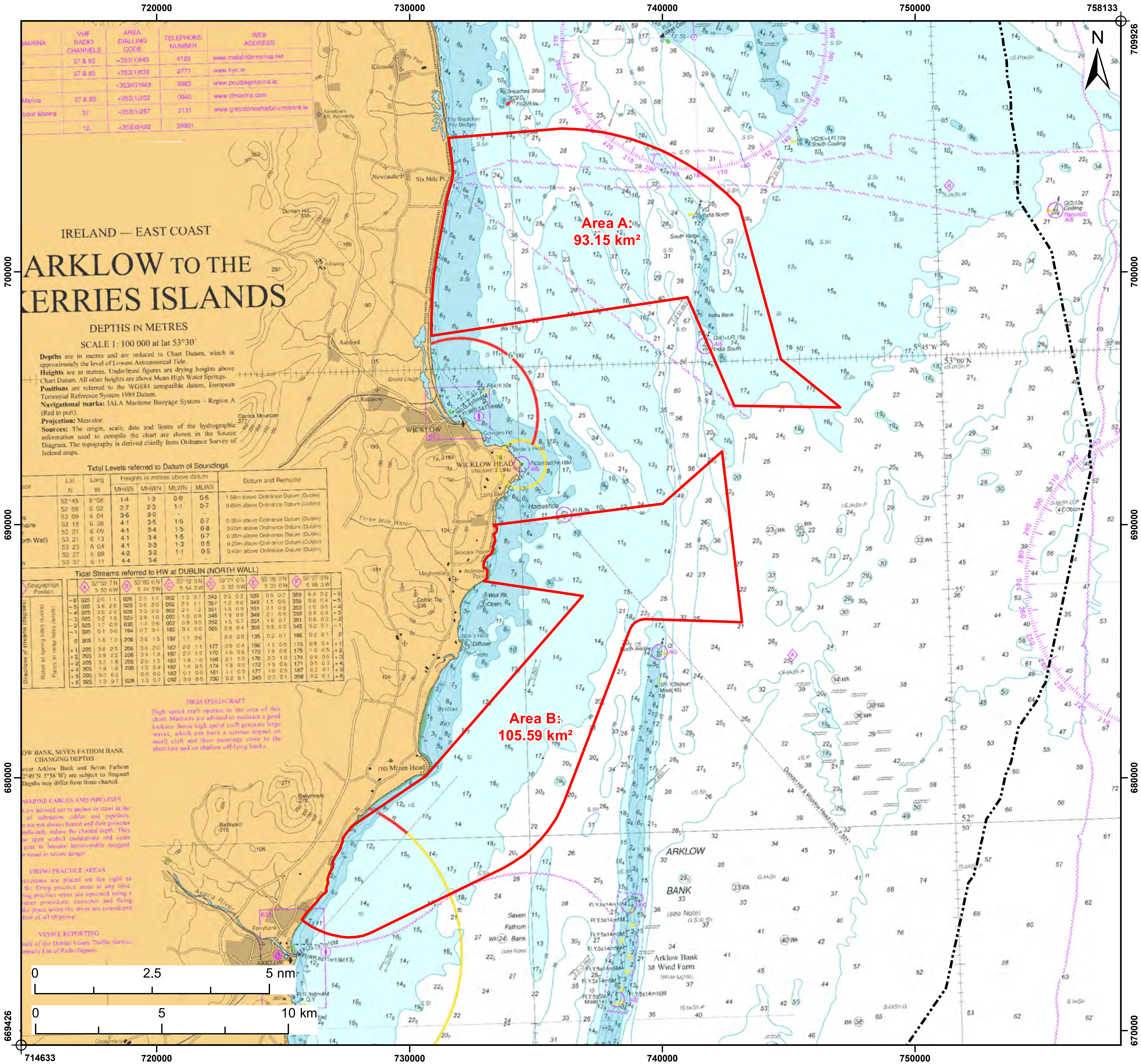
Wicklow Sea Wind Limited wish to undertake surveys to assess the suitability of the area of search (AoS) for the installation of an export cable corridor connecting an offshore wind farm (the Wicklow Project) to the coastline. The Wicklow Project AoS for the export cable corridor (herein the cable Area of Search (AoS)) lies off the east coast of Ireland in the Irish Sea. **Figure 1** shows the location of the cable AoS. A Foreshore Licence is required to permit a developer to carry out surveys in the foreshore under the Foreshore Act 1933, as amended. This report accompanies the Foreshore Investigation Licence Application to provide the necessary information to the competent authority to enable an Appropriate Assessment (AA) Screening to be undertaken in accordance with the requirements set out under Article 6(3) of the Habitats Directive (92/42/EEC).

The Habitats Directive (European Communities (Birds and Natural Habitats) Regulations 2011, S.I. No. 477 of 2011) (as amended), require the likely significant effects of a plan or project on European sites, which include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) within the Natura 2000 network, to be assessed. A plan, project or activity can only proceed following the conclusion by the competent authority that no adverse effect on the integrity of the site will occur based upon the site's conservation objectives.

This report provides the information to inform the AA Screening of whether the proposed surveys, either alone or in combination with other plans or projects, are likely to have a significant effect on any SACs, SPAs or their designated habitats and/or species that fall within the Zone of Influence (ZoI) of the proposed surveys, in the absence of mitigation measures. This document provides the information to support the Stage 1 AA Screening Process. The full AA process is detailed in **Section 3.1** of this document.

Stage 1 screens European sites to determine if likely significant effects can be excluded.

This report was prepared by Alix Scullion and Paolo Pizzolla of Royal HaskoningDHV with specialist advice from experts at Royal HaskoningDHV. A Foreshore licence application was prepared by Royal HaskoningDHV with the assistance of Dr Louise Scally MCIEEM of Merc Consultants Ltd for the proposed windfarm area in early 2022 and the current application is based upon that application.



Legend:

- Wicklow Cable Area of Search
- Ireland 12nm Limit

Note: Area given in Irish Transverse Mercator (ITM)

Data Sources: © UKHO, 2022. © HaskoningDHV UK Ltd. 2022.
Basemap: © British Crown and OceanWise, 2022. All rights reserved. License No. EMS-EK001-638207. Not to be used for Navigation. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors.

Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title:

Proposed Wicklow Cable Area of Search

Figure:	1	Drawing No:	PC3392-RHD-ZZ-XX-DR-Z-0066		
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2 Statement of Authority

2.1 [redacted]

[redacted] is an environmental consultant with 4 years' experience in the marine sector following a MSc in Coastal and Marine Environments. [redacted] knowledge spans coastal and offshore habitats. Her work is centred around assessing the impacts of marine developments on the environment and she has worked in roles including project and assistant project manager and technical specialist on a variety of projects encompassing a range of sectors throughout the UK and Ireland including coastal defences, ports and harbours and renewables.

[redacted] has led on the Marine Geology, Oceanography and Physical Processes chapters for Environmental Impact Assessments (EIAs) for offshore windfarms such as East Anglia ONE North and TWO, Dudgeon and Sheringham Extension Projects and Morecambe Offshore Windfarm. She has also supported on the Benthic Environment and Fish and Ecology chapters. Most recently, [redacted] undertook site selection work for ScotWind's offshore wind leasing process for Scotland assessing the risks and constraints to consent.

2.2 Paolo Pizzolla

[redacted] s a Technical Director with 21 years' experience in the marine sector. Having trained as a Marine Ecologist and specialising in marine protected site designation, management and monitoring, he has primarily worked on offshore wind farm projects at Royal HaskoningDHV. His experience ranges from feasibility studies, scoping through to EIA, Post-consent Monitoring and Management and Due-Diligence work.

[redacted] ıas worked on UK Round 2, 2.5, 3 and 4 projects leading the EIA for the Kentish Flats Extension, East Anglia THREE and East Anglia ONE North and East Anglia TWO projects. [redacted] has also led various site feasibility and selection projects for Round 4, ScotWind and Ireland.

3 Methodology

3.1 The AA Process

The AA process is comprised of four main stages and the assessment is undertaken in a stepwise process (European Commission, 2021[1]; DEHLG, 2009). These four stages are outlined in **Figure 2.**

3.1.1 Stage 1: Screening for AA

The Natura 2000 network of European sites is comprised of SACs (including candidate SACs), and SPAs (including proposed SPAs). SACs are selected for the conservation of Annex I habitats and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats. Each has conservation objectives for its interest features (i.e. the Annex I habitats, Annex II species or Annex I birds).

In Stage 1, European sites are identified and screened to determine if there will be a likely significant effect, both in terms of the effects from the project alone or in combination with other plans and projects. The first stage is required under Article 6(3) of the Habitats Directive, to determine whether, firstly, a plan or project is directly connected with or necessary to the management of the site, and secondly, whether it is likely to have a significant effect on the site in view of its conservation objectives. Screening is undertaken without the consideration of mitigation[2]. The assessment moves to Stage 2 if a likely significant effect is determined, or if the conclusion is uncertain. The Department of Communications, Climate Action and Environment (2017) advise that an AA Screening report is produced to assist the competent authority in its determination.

3.1.2 Stage 2: Appropriate Assessment

Where a plan, project or activity is identified as likely to have a significant effect on a European site at Stage 1, further information is obtained to inform the AA as required by Article 6(3). A detailed assessment of the potential effects is undertaken to determine whether the project alone or in combination could adversely affect the integrity of the European site in view of its conservation objectives. The assessment includes consideration of any mitigation measures necessary to avoid or reduce the negative effects on the features of the European sites. This assessment stage is reported in the form of a Natura Impact Statement (NIS) to inform the competent authority's AA. The NIS presents the evidence of the effects on the integrity of the European sites concerned.

In those cases where the conclusion of the NIS is that an adverse effect on the integrity of a European site has been identified, or if the assessment is inconclusive, then the assessment proceeds to stages 3 and 4.

3.1.3 Stage 3: Alternative Solutions

All reasonable alternative solutions should be considered that will enable the plan or project to proceed without an adverse effect on site integrity. As part of the assessment, if alternative solutions are identified these need to be assessed under Stage 2. Alternative solutions can include a proposal of a different scale or a different location. At this stage, if there is still an adverse effect on the integrity of a European site there is a need to demonstrate that the least damaging alternative solution has been selected to progress to Stage 4.

[1] *https://ec.europa.eu/environment/nature/natura2000/management/pdf/methodological-guidance_2021-10/EN.pdf*
[2] *This follows the People Over Wind & Sweetman v. Coillte Teoranta (C-323/17) case. See also EC (2021) page 20 re. mitigation.*

3.1.4 Stage 4: Imperative Reasons of Overriding Public Interest (IROPI) / Derogation

Stage 4 examines whether there are imperative reasons of overriding public interest (IROPI) that would allow a plan or project that would cause an adverse effect on the integrity of a European site to proceed. If it is demonstrated that there are no alternative solutions to the plan, project or activity that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a justified case will be presented that the project must be carried out for IROPI.

If the conclusion is that there are no alternative solutions and IROPI can be demonstrated, then the project may proceed only if appropriate compensatory measures are secured and delivered. The compensation measures would ensure the coherence of the Natura 2000 network and they must be approved by the Minister.

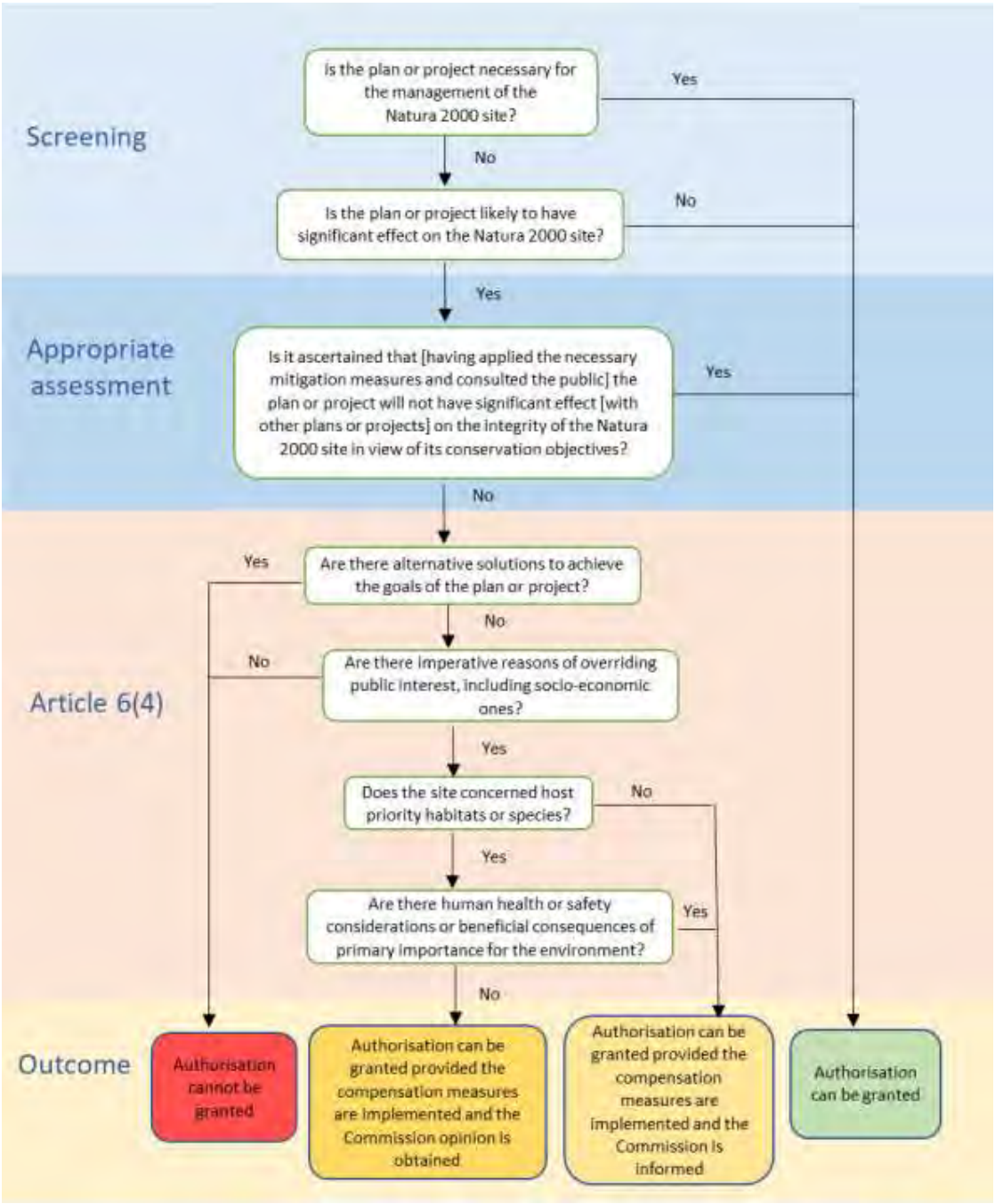


Figure 2 Flow chart of Article 6(3) and 6(4) procedure of the Habitats 92/43/EEC

3.2 Assessment Approach

A thorough literature search and data search was undertaken to inform the assessment. This included data available from the National Parks and Wildlife Service (NPWS). European sites that could be potentially affected by the export cable corridor were identified by considering the proximity and potential connectivity to the cable AoS.

The assessment of a Likely Significant Effect (LSE) on the features of the Natura 2000 sites was undertaken using a 'Source-Pathway-Receptor' approach.

- Source – the origin of a potential impact (noting that one source may have several pathways and could affect many receptors).
    - Example: Geophysical survey;
- Pathway – the means by which the effect of the activity could impact a receptor.
    - Example: Sound produced from the geophysical survey; and
- Receptor – the element of the receiving environment that is affected by the activity.
    - Example: presence of a receptor e.g. harbour porpoise *Phocoena phocoena,* within the direct footprint of physical effect or within range of disturbance (e.g. noise).

Where there was no pathway or the pathway was so long that the effect from the source has dissipated to a negligible level before reaching the receptor, there was justification for the screening out of that particular receptor. For any site interest feature not screened out, further assessment was undertaken to determine the potential for an adverse effect on the integrity of the site; and are included in the NIS (Royal HaskoningDHV, 2022a - document reference: UB1019-RHD-ZZ-XX-RP-Z-0010). The assessment considered all direct, indirect, short term, long term, permanent, cumulative and in combination effects.

The assessment was informed by topic specific expert advice and guidance and advice by Louise Scally of MERC for the offshore windfarm array foreshore licence applications. Louise has an in-depth knowledge of the cable AoS (marine area and related species) and its environs.

3.3 Legislation, Policy and Guidance

The Supporting Information for Screening for AA (SISAA) and preparation of this report has been undertaken following European Directives, national legislation, relevant guidance issued by the European Commission, national governmental bodies, NPWS and other environmental bodies. Guidance used includes:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna. Official Journal of the European Communities.
- Marine Strategy Framework
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version).
- Marine Spatial Planning Directive 2014/89/EC

- Maritime Area Planning Act 2021
- Foreshore Act 1993, as amended
- European Communities (Birds and Natural Habitats) Regulations 2011. SI No. 477 of 2011, as amended.
- European Commission (2018). Managing European sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.
- European Commission (2011). European Union (EU) Guidance on wind energy development in accordance with EU nature legislation. Publications Office of the European Union, Luxembourg.
- European Commission (2021). Assessment of plans and projects significantly affecting European sites; Methodological Guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.
- DEHLG (2009). AA of Plans and Projects in Ireland, Guidance for Planning Authorities.
- Department of Communications, Climate Action and Environment (DCCAE) (2017). Guidance on the preparation of Environment Impact Statements (EIS) and NIS for offshore renewable energy projects.
- The Department of Arts, Heritage and the Gaeltacht (DAHG) (2012). Marine NISs in Irish Special Areas of Conservation: A Working Document.
- DCCAE (2014) Offshore Renewable Energy Development Plan (OREDP) - A Framework for the Sustainable Development of Ireland's Offshore Renewable Energy Resource.
- DCCAE (2018) OREDP Interim Review May 2018.
- Department of Communications, Energy & Natural Resources (DCENR) (2014). OREDP Strategic Environmental Assessment - SEA Statement.
- Sustainable Energy authority of Ireland (2010). Strategic Environmental Assessment (SEA) of OREDP in the Republic of Ireland.
- DCENR (2013). OREDP for Ireland: NIS.
- DHLGH (2021) National Marine Planning Framework and associated SEA and AA.
- DHLGH (2019) Marine Planning Policy Statement (Consultation Draft).
- OPR (2021) Office of the Planning Regulator Practice Note PN01 - AA Screening for Development Management.

3.4 Baseline Data

A review of available literature and spatial data was undertaken to establish the baseline environment. The baseline data used includes:

- Site synopsis for each designated site: https://www.npws.ie/maps-and-data/habitat-and-species-data;
- European Site data forms;
- European site conservation objectives;

- GIS layers:
    - Article 17 Habitats and species (2019): https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17/2019;
    - Article 12 Breeding distributions and ranges (2012): https://www.npws.ie/maps-and-data/habitat-and-species-data/article-12-data;
    - Ireland Whale and Dolphin Group (2005-2011) (from Ireland's Marine Atlas): https://www.npws.ie/maps-and-data/habitat-and-species-data;
    - Russel *et al.* (2017) Seals at sea density: https://data.marine.gov.scot/dataset/estimated-sea-distribution-grey-and-harbour-seals-updated-maps-2017;
    - Marine Institute (2009): Species Spawning and Nursery Areas https://data.gov.ie/dataset/species-spawning-and-nursery-areas
    - Coull, J.A., Johnstone, R. and Rogers, S.I., 1998. Fisheries Sensitivity Maps in British waters. United Kingdom Offshore Operators Association Ltd;
    - Ellis, J., Milligan, S., Readdy, L., South, A., Taylor, N. and Brown, M. (2010) Mapping spawning and nursery areas of species to be considered in Marine Protected Areas (Marine Conservation Zones) – Report No. 1: Final Report on development of derived data layers for 40 mobile species considered to be of conservation importance. Final Version August 2010. Defra project code MB5301;
    - EU Sea Map (2016) Broad-scale predictive habitat map following EUNIS 2007-2011 classification: https://www.emodnet-seabedhabitats.eu/access-data/download-data/?linkid=1;
- Small Cetaceans in the European Atlantic and North Sea (SCANS-III) data (Hammond et al., 2021);
- ObSERVE aerial surveys (Rogan et al., 2018);
- Sea Watch Foundation sightings (Sea Watch Foundation, 2019);
- Revised Phase III data analysis of Joint Cetacean Protocol (JCP) data resources (Paxton et al., 2016);
- UK seal at sea density estimates and usage maps (Carter *et al*., 2020);
- Special Committee on Seals (SCOS) annual reporting of scientific advice on matters related to the management of seal populations (SCOS, 2020);
- Literature on the impact of noise on marine mammals;
- Literature on bird disturbance and displacement; and
- Benthic surveys of sandbanks in the Irish Sea;
- A comprehensive list of data and literature reviewed can be found in References (**Section 10**).

4 Details of Proposed Project

This foreshore licence application for Wicklow Sea Wind Limited is to survey the export cable corridor connecting a fixed foundation offshore wind project in the Irish Sea, located approximately 8km off the east coast of Ireland (**Figure 1**). The cable AoS was identified considering a variety of constraints (i.e. engineering and environmental constraints such as areas of steep gradients, wrecks, dumping grounds and environmental designations such as SACs designated for benthic features).

This SIAA is being submitted as part of a Foreshore Licence application by Wicklow Sea Wind Limited for permission to carry out site investigation surveys for the export cable corridor for the Wicklow Project[3]. These surveys will establish a baseline which will inform the project design, EIA and HRA. In line with the National Marine Planning Framework (NMPF) the proposals will be undertaken so that environmental effects are avoided, minimised or mitigated. The project also complies with Ireland's Offshore Renewable Energy Development Plan (OREDP) and with the OREDP Interim Review 2018. The findings and recommendations of the OREDP SEA, NMPF (and associated SEA and AA), have been used to inform the development of the project and the preparation of this SISAA report.

The data obtained from the surveys will be used to minimise uncertainty for various issues at an early design stage and inform the development feasibility and optimise project design. Survey information would also be used to assess the suitability of the area of interest for a renewable energy project from an environmental, economic and wider stakeholder prospective. Many of the site investigation surveys are listed in the OREDP as project level mitigation measures to establish a baseline and inform the impact assessment for individual developments such as geophysical and benthic survey.

The Wicklow Project will contribute to the Government's ambitious target of net zero carbon emissions by 2050 and at least 5GW of installed offshore wind capacity by 2030.

The proposed cable AoS is for the Wicklow Project offshore export cable corridor, which will hereafter be described as the 'cable AoS'. It should be noted that the cable AoS allows for optionality in routeing and that the area surveyed may be reduced from the full extent included in this application (if, for example, any potential landfall options are removed as a result of further project refinement). The final export cable corridor area will be considerably smaller than the cable AoS applied for, and the information gathered in the proposed surveys will determine the route ultimately selected.

A full description of the proposed site investigation surveys is outlined in Schedule of Works (Royal HaskoningDHV, 2022b - document reference: UB1019-RHD-ZZ-XX-RP-Z-0011).

[3] *This application is for the site investigation surveys only. The installation of the export cable corridor would be subject to an application under the new consent regime for offshore wind currently undergoing the multi-step legislative process in the Oireachtas.*

5 Ecology of the Site

5.1 Overview

The following describes the ecology of the proposed cable AoS. A brief description is given in the context of the benthic environment, marine mammals, fish and bird baselines. All species and habitats considered in this report are those protected by the Habitats Directive through the Natura 2000 network of European sites (see **Section 3**).

5.2 Benthic Environment

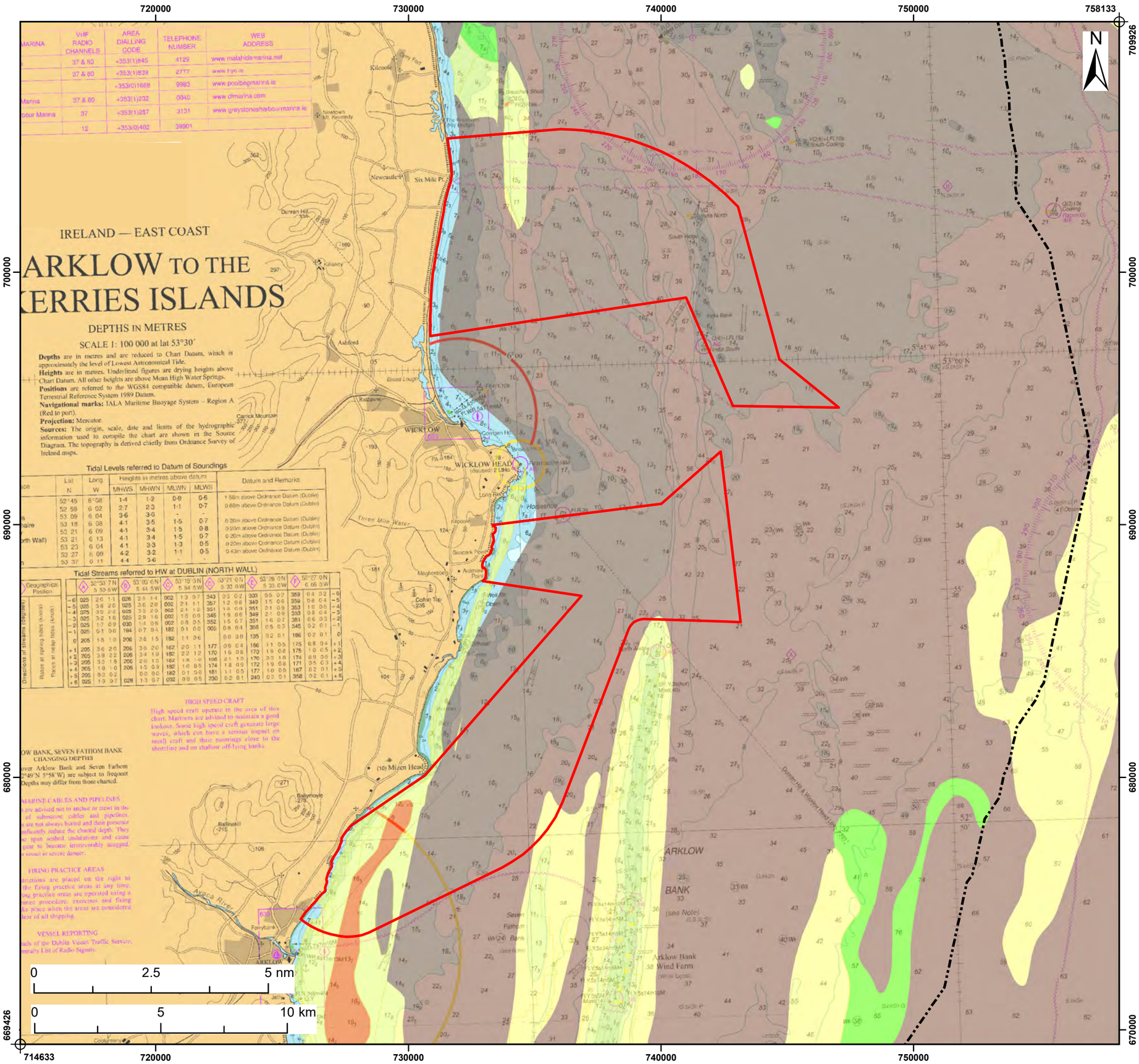
The cable AoS has water depths ranging from approximately 0m – 61m. Based on data obtained from the European Nature Information System (EUNIS) habitat classification system, the sediment of the cable AoS is characterised by predominantly coarse substrate with sand and mixed sediment at the south and east of the cable AoS (**Figure 3**).

EMODnet seabed habitat data shows that the cable AoS includes the following habitats:

- **Circalittoral coarse sediment:** this habitat is dominated by coarse sands, gravel and shingle and can be found in tidal channels of marine inlets, along exposed coasts and offshore. Characteristic species of this habitat are polychaetes, crustacea and bivalves (EMODnet, 2022).
- **Deep circalittoral coarse sediment:** this habitat is dominated by coarse sands and gravel or shells and may cover large areas of the offshore continental shelf. Habitats are quite diverse compared to shallower versions of this habitat and generally include infaunal polychaete and bivalve species. Animal communities supported by this habitat include *Modiolus modiolus* larvae and mussels (EMODnet, 2022).
- **Circalittoral fine sand:** this habitat is dominated by clean, fine sands covering areas of the open coast, tide-swept channels in depths over 20m. It can commonly be found in offshore benthic areas and supports a diverse range of echinoderms, polychaetes and bivalves (EMODnet, 2022).
- **Circalittoral muddy sand:** this habitat typically has a silt content of 5% to 20%. It is found at depths over 20m and supports a rich infaunal community of organisms including polychaetes, bivalves and echinoderms such as *Amphiura* spp. (EMODnet, 2022).
- **Circalittoral sandy mud:** this habitat typically has over 20% silt/clay content, found in depths over 10m. Usually found in deeper bays and less exposed locations with weak tidal streams. Characteristic species of this habitat include sea pens, brittlestars, tube building polychaetes and deposit feeding bivalves such as *Mysella bidentata* (EMODnet, 2022).
- **Atlantic and Mediterranean high energy infralittoral rock:** this habitat is exposed to extremely exposed wave action or strong tidal streams. The rock supports a community of kelp *Laminaria hyperborean* with foliose seaweeds and animals. The sublittoral fringe is characterised by dabberlocks *Alaria esculenta* (EMODnet, 2022).
- **Circalittoral rock and other hard substrata:** circalittoral rock can be split into two sub-zones: the upper circalittoral and lower circalittoral. The habitat can then be characterised in three energy levels: high, moderate and low energy circalittoral rock. The criterion for categorisation is dependent on the biotopes found within the specific area, and therefore the habitat complexity level. It is common for the habitats to host a wide variety of organisms, with circalittoral habitats being animal dominated communities (EMODnet, 2022).
- **Infralittoral fine sand:** this habitat is composed of clean sands in shallow water, typically found in open waters or tide swept channels. Fauna found in this habitat are resilient, robust organisms including amphipods and polychaetes such as *Nephtys cirrose*. Seaweed is rarely found in these habitats (EMODnet, 2022).

- **Infralittoral muddy sand:** this habitat is composed of non-cohesive muddy sand with 5% - 20% silt/clay content. It is found in extreme lower shores and stable circalittoral ones at a depth of 15-20m. This habitat hosts animal dominated communities including polychaetes, bivalves and the urchin *Echinocardium cordatum* (EMODnet, 2022).

The closest SACs of relevance for benthic ecology are the Magherabeg Dunes SAC, Wicklow Reef SAC The Murrough Wetlands SAC and Buckroney-Brittas Dunes And Fen SAC which are all overlapped by the cable AoS.



Legend:

- Wicklow Cable Area of Search
- Ireland 12nm Limit

EUNIS Substrate Type

- Coarse Substrate
- Mixed Sediment
- Muddy Sand
- Sand

Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title: Benthic Environment

Figure:	Drawing No:				
3	PC3392-RHD-ZZ-XX-DR-Z-0070				
Revision:	**Date:**	**Drawn:**	**Checked:**	**Size:**	**Scale:**
01	10/06/2022	[redacted]		A3	1:150,000

Co-ordinate system: IRENET95 Irish Transverse Mercator

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5.3 Migratory Fish

There are a number of rivers on the south and east coast of Ireland which have been designated as SACs for Annex II migratory fish. Although these SACs are not marine, the migratory fish for which they were designated have a marine phase of the lifecycle. These species rely on the sea to migrate to feeding grounds before returning to rivers to spawn.

The following are the species from the SACs in Ireland and the times of year of their migrations:

- Sea lamprey *Petromyzon marinus* – late April to early June;
- River lamprey *Lampetra fluviatilis* – September to June;
- Twaite shad *Alosa fallax* – year-round and migrate into rivers from April-July; and
- Atlantic salmon *Salmo salar* – May to June and autumn months.

The closest SAC designated for the species outlined above to the cable AoS is the Slaney River Valley SAC which is approximately 54km away and the qualifying interests include the species above.

Note that Brook lamprey does not migrate to the sea and therefore will not be considered in this assessment.

5.4 Marine Mammals

5.4.1 Otters

Coastal otters mostly feed close to the shore in water less than 3m deep (Natural Resources Wales (NRW), 2017). For otters, the maximum potential home range can be up to 40km on land (Green *et al.*, 1984; Roche *et al.*, 1995).

The cable AoS reaches the coastline, and it is possible that some of the surveys could be undertaken from a small vessel with a shallow draught. Therefore, there is the potential for effect to any otter within the inshore and coastal regions of the cable AoS (as noted above, otters are likely to forage close to shore, to waters up to 3m deep only).

A comprehensive otter survey was undertaken between May 2010 and January 2011 by NPWS, and covered a total of 852 sites (Reid *et al.*, 2013). The survey was undertaken in accordance with the Standard Otter Survey method, developed by Jeffries (1966) and adopted by Lenton *et al.,* (1980). Sites were selected at intervals of between 5 and 8km along river systems, coasts, lakes, shores, at bridges or other suitable sites, and surveys carried out for signs of otter presence (e.g. spraints, footprint, fish remains), and wherever otter presence is detected, the site is recorded as positive for otter presence.

A total of 134 otter surveys sites were coastal locations, and 76 of those (or 56.7%) were found to have signs of otter presence (spraints, footprints and fish remains). Within the eastern survey area, of which the cable AoS is located adjacent to, there were 65 locations surveyed, with 34 being recorded as having otter presence. As otter presence refers to spraints, footprints and fish remains, this indicates that otter are present in the area for foraging or commuting, rather than residing in the area. The estimated population of otter within the eastern survey area was 585 (95% Confidence Interval (CI) = 556 – 742). There are two otter survey sites identified to have otter presence near the cable AoS; these were at a bridge near Kilmullin (approximately 3km inland of the coastline adjacent to the cable AoS), and near the northern end of Brittas Bay beach (the cable AoS is approximately 2.3km offshore of the site, which is on the coastline) (Reid *et al.*, 2013).

The *Mammal Atlas of Ireland 2010-2015* (Lysaght & Marnell, 2016) shows that from 2010 to 2015, along the coastline adjacent to the cable AoS, there were a number of sightings of otter (**Figure 4**). A total of 11,208 records of otter were used to determine the location and number of otter in the periods of before 2010 (for all data obtained), and between 2010 and 2015. These are shown in 10km by 10km grid squares, with the number of 1km by 1km grid squares within each larger grid square, for which there are records of otter presence, shown as sightings, over the relevant time period shown.

An updated *Atlas of Mammals in Ireland* dataset shows an increased presence of otter in the vicinity of the proposed cable AoS compared to the data for 2010-2015, with a number of records of otter in the grid square covering the coastline from Greystones to Wicklow in the 2016-2025 dataset; this includes a sighting of an otter in Wicklow Harbour, Broadlands Lough, Newcastle, Kilcoole, The Breaches, and Roundwood. A total of 16 otters were reported in these sites[4], including two cubs. A number of these sites are adjacent to the cable AoS, along the coastline.

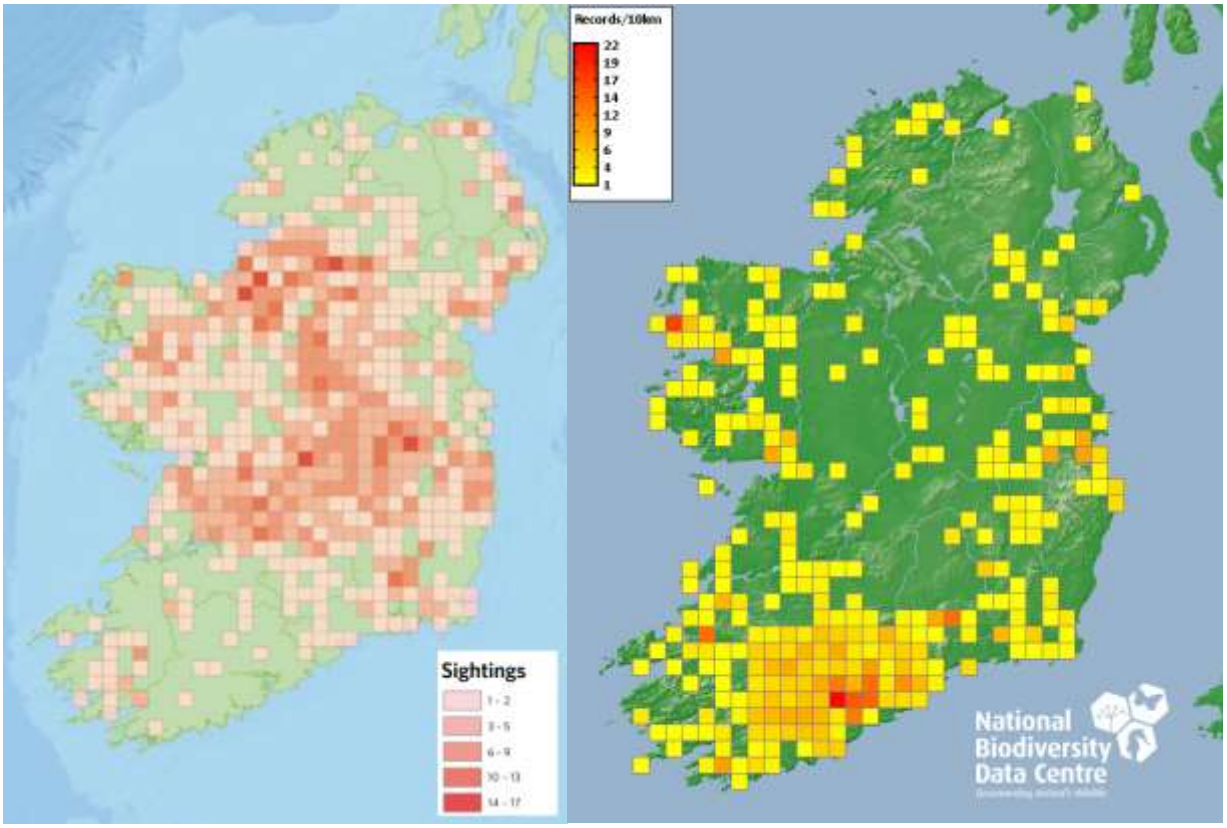


Figure 4 Left = otter sightings from 2010 to 2015, provided in the Mammal Atlas of Ireland (Lysaght & Marnell, 2016). Right = otter records within the Atlas of Mammals in Ireland dataset (collated by the National Biodiversity Data Centre)

The nearest designated sites for otter to the proposed cable AoS (to the closest point of the SAC) are;

- Wicklow Mountains SAC, at 12km from the cable AoS (over land);
- Slaney River Valley SAC, at 14km from the cable AoS (over land);
- River Barrow and River Nore SAC, at 49km from the cable AoS (over land);
- River Boyne and River Blackwater SAC, at 69km from the cable AoS (over land).

The distance of these sites, in combination with the low number of otter recorded to be foraging or commuting within close proximity to the nearshore area and land adjacent to the cable AoS, and absence

[4] *Reported as sightings of live animals.*

of indication of residing otter in the nearby area, indicates that there is no pathway for direct impact on any European sites for otter. Otter are therefore screened out of any further assessment.

5.4.2 Cetaceans

Ireland has recorded 25 species of cetacean, all of which are recognised as protected species under the Habitats Directive and the Irish Wildlife Act.

Over a two-year survey period from 2015 – 2016, the ObSERVE Programme recorded 19 cetacean species during aerial surveys of the Celtic and Irish Sea (Rogan *et al.,* 2018). In both years more cetacean sightings occurred in the winter period than in the summer period and cetacean species richness was higher in the winter months than in the summer months. Bottlenose dolphins, harbour porpoise and common dolphins were the most frequently sighted odontocete (toothed whale/dolphin) species, whereas minke whale was the most frequently sighted mysticete (baleen whale) species (Rogan *et al.,* 2018).

At the Dublin Array project, harbour porpoise was the most common recording, also observed were the minke whale and Risso's dolphin (Dublin Array, 2012).

Recent monthly aerial surveys were undertaken at Arklow Bank (2018-2020) located approximately 1.6km to the west of the cable AoS and include a 4km buffer covering part of the proposed cable AoS (Sure Partners Limited, 2020). Boat-based surveys were also undertaken during 1996-1997 with a 5km buffer around Arklow Bank offshore wind farm. The Arklow Bank Scoping Report also states that harbour porpoise was the most common recorded species, with low sightings of Risso's dolphin (Sure Partners Limited, 2020).

Two cetacean species are listed under Annex II of the Habitats Directive, requiring member states to designate areas of protection for those species. These species are harbour porpoise and bottlenose dolphin. Therefore, only these two cetacean species are included in the assessments.

5.4.2.1 Harbour porpoise

In the Irish Sea, the harbour porpoise is the most commonly observed odontocete. Harbour porpoise are widely distributed throughout the Celtic and Irish Seas during most months of the year (Reid *et al.,* 2003; Mackey *et al.,* 2004; Baines and Evans, 2012; Hammond *et al.,* 2013, 2021; Rogan *et al.,* 2018).

Harbour porpoise within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine *et al.,* 2007, 2014; Inter-Agency Marine Mammal Working Group (IAMMWG), 2021). However, for conservation and management purposes, it is necessary to consider this population as smaller Management Units (MUs). MUs provide an indication of the spatial scales at which effects of plans and projects alone, and in combination, need to be assessed for the key cetacean species (IAMMWG, 2021).

The IAMMWG defined three MUs for harbour porpoise: The North Sea; West Scotland, and the Celtic and Irish Sea (CIS) (comprising International Council for the Exploration of the Sea (ICES) area VI and VII, except VIId) (**Figure 5**). The cable AoS is located in the Celtic and Irish Seas MU, which has an estimated harbour porpoise abundance of 62,517 (Coefficient of Variation (CV) = 0.13; 95% CI = 48,324 – 80,877) (IAMMWG, 2021), based on the Small Cetaceans in the European Atlantic and North Sea (SCANS)-III survey (Hammond *et al.*, 2021) and ObSERVE surveys (Rogan *et al.,* 2018). For the assessments, the CIS MU has been used as the reference population. This is appropriate to take into account the wide range and distances covered by harbour porpoise.

SCANS-III, a large scale survey for cetaceans across European waters, was undertaken in the summer of 2016, and included areas from the Strait of Gibraltar in the south to 62°N in the north and extending west to

the 200 nautical miles (nm) limits of all EU Member States (Hammond *et al.,* 2021). For the entire SCANS-III survey area, harbour porpoise abundance in the summer of 2016 was estimated to be 466,569 with an overall estimated density of 0.381/ km^2 (Coefficient of Variation CV = 0.154; 95% Confidence Interval (CI) CI = 345,306-630,417; Hammond *et al.*, 2021).

Estimates for harbour porpoise in the CIS ICES Assessment Unit (partial coverage only, including survey Blocks B, C (half of the block only), D, E, F, and 9 (parts of the block only); **Figure 6**) during the SCANS-III survey was an abundance of 26,700 and density of 0.11/ km^2 (CV = 0.25; 95% CI = 16,055 – 42,128; Hammond *et al.*, 2021). The SCANS-III survey estimated that the abundance of harbour porpoise in survey Block E (surface area of 34,870 km^2; **Figure 6**), which is located in the Irish Sea and includes the cable AoS, was 8,320 individuals and the density was estimated to be 0.239 harbour porpoise per km^2, with a mean group size of 1.31 (CV = 0.28; 95% CI = 4,643 – 14,354; Hammond *et al.*, 2021).

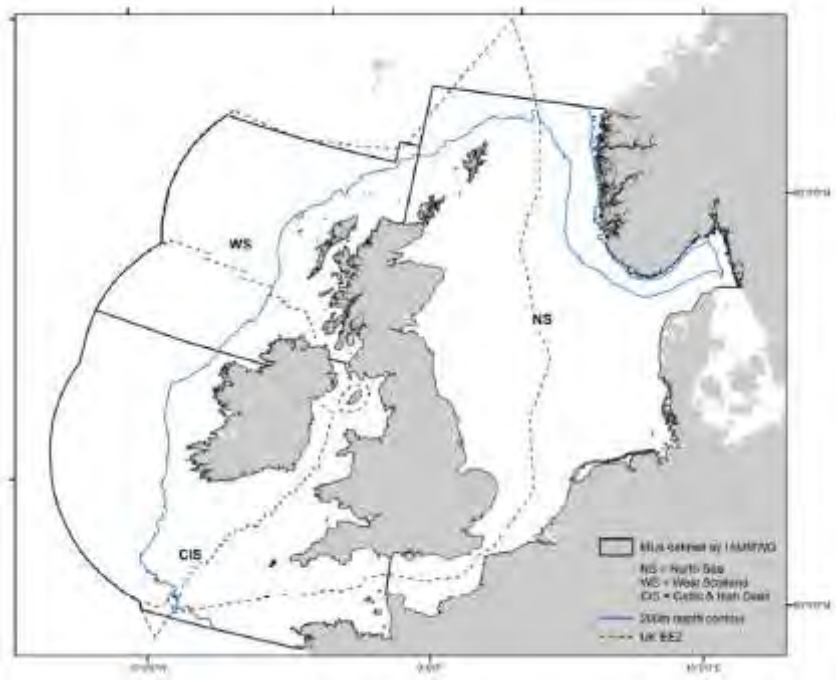


Figure 5 Harbour porpoise Management Units (IAMMWG, 2021)

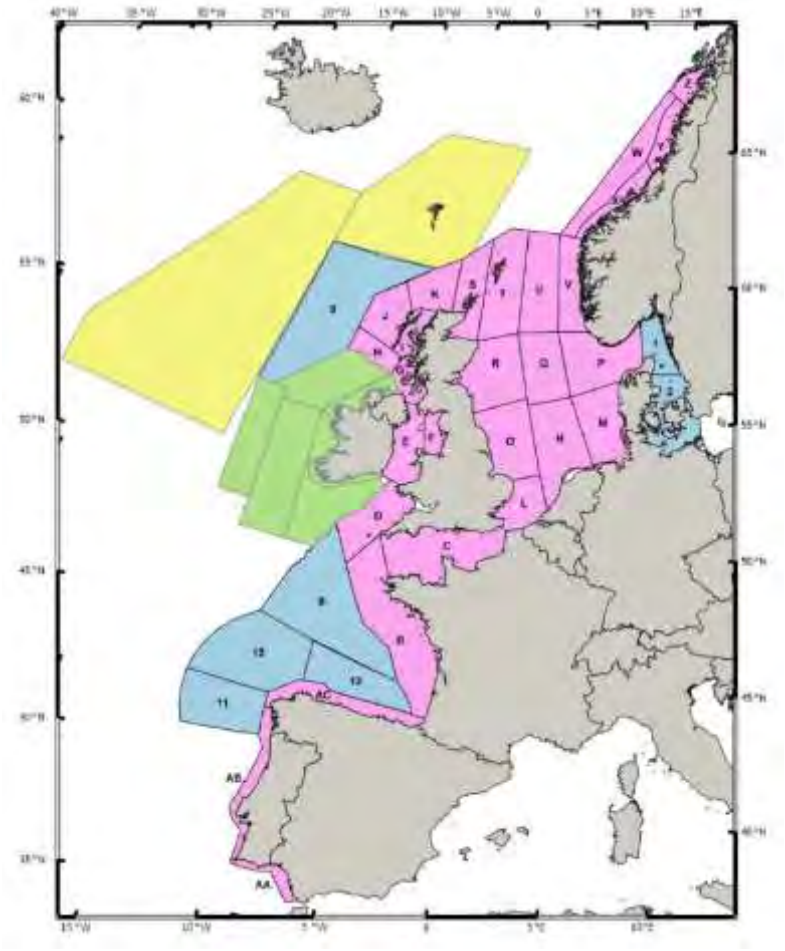


Figure 6 SCANS-III Survey Blocks (Hammond et al.,2017).

Extensive aerial surveys of Ireland's offshore waters (ObSERVE surveys) were conducted in the summer and winter of 2015 and 2016, with additional surveys conducted in inshore/coastal areas in the summer and winter of 2016 (Rogan *et al.,* 2018). The study area covered waters overlying and beyond Ireland's continental shelf and was divided into five survey strata in 2015, with three smaller inshore strata added in 2016 (**Figure 7**). The cable AoS is located within Stratum 5.

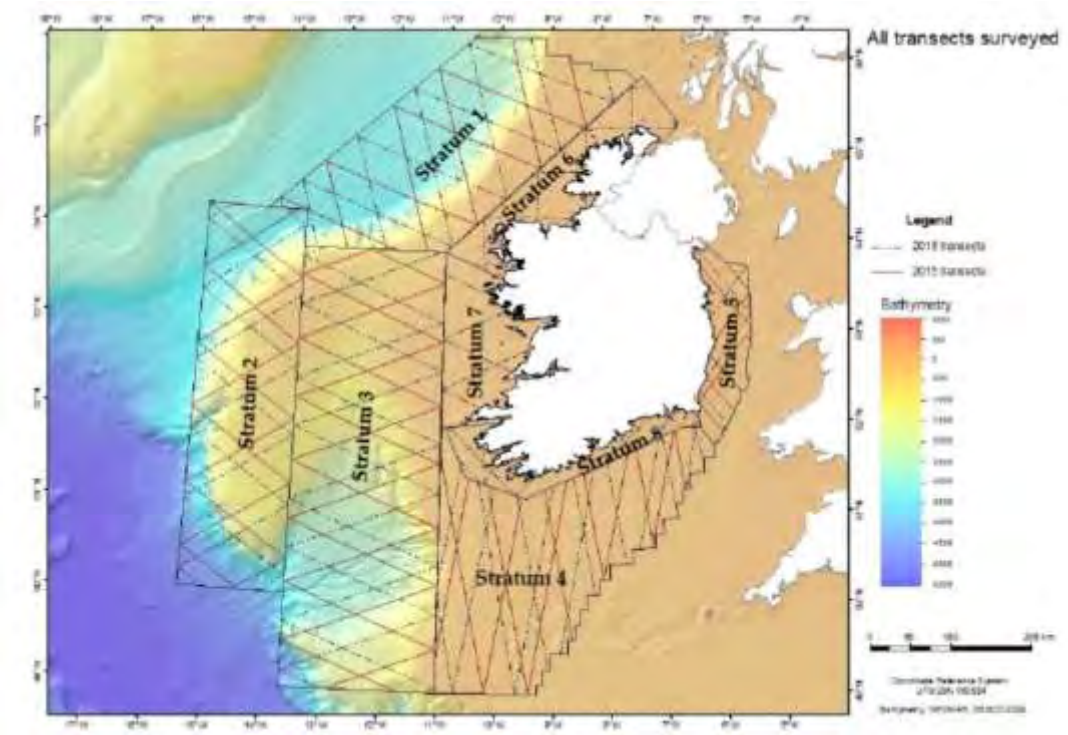


Figure 7 ObSERVE aerial transect lines flown in summer and winter (2015-2016)

During the surveys, harbour porpoise were recorded over a large spatial area during the summer months, but a more coastal distribution was indicated in winter. Harbour porpoises were more commonly sighted in summer, with overall harbour porpoise abundance estimates of 35,975 individuals in summer (CV: 0.09) and 20,571 in winter (CV: 0.23) (Rogan *et al.,* 2018).

The ObSERVE aerial surveys provide density estimates for the Irish Sea off the Irish Coast (Rogan *et al.,* 2018). For stratum 5 (**Figure 8**), which covered the east coast of Ireland (and the cable AoS), the density estimates were 0.696 and 1.046 harbour porpoise per km^2 during the summer 2015 and 2016 periods, respectively; and during the winter periods were 0.867 and 0.924 harbour porpoise per km^2 in 2015 and 2016, respectively.

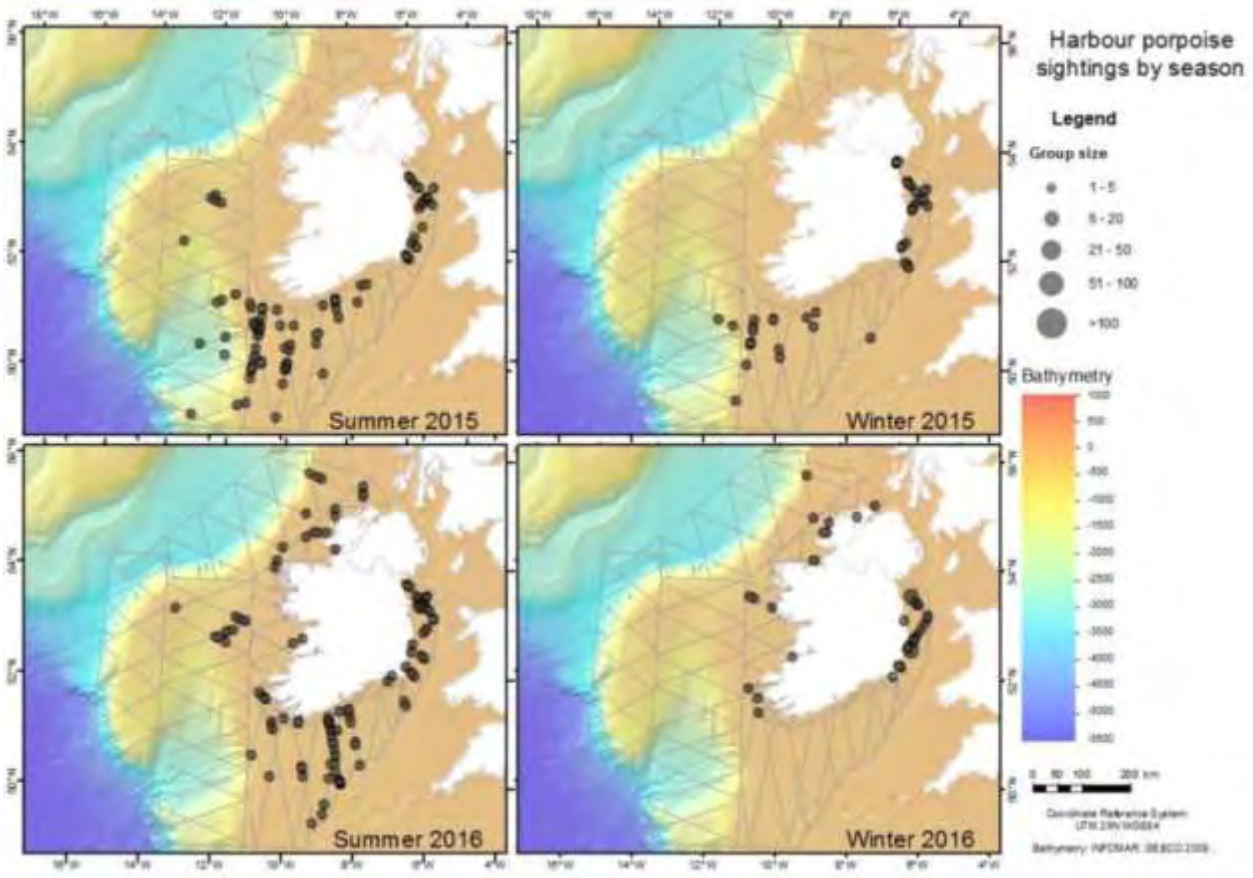


Figure 8 ObSERVE surveys sightings of harbour porpoise in each survey period

Conservation Status

The current conservation status of the harbour porpoise, as assessed in the 4th UK report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is 'Favourable' and 'Stable' (NPWS, 2019). **Designated Sites**

The closest SAC for harbour porpoise is the Rockabill and Dalkey SAC which is 16.5km away. Details for the site and the assessment for impacts for harbour porpoise designated sites considered are outlined in **Section 8.4.**

5.4.2.2 Bottlenose dolphin

In the Irish Sea, bottlenose dolphin have a predominantly coastal distribution, with higher concentrations off west Wales (particularly Cardigan Bay) and off the coast of Co. Wexford in southeast Ireland. They are also regularly sighted in summer off the Galloway coast of southwest Scotland and around the Isle of Man (Hammond *et al.,* 2005, Baines and Evans, 2012; DECC, 2016).

A number of inshore groups of bottlenose dolphin have been identified in UK and Irish waters and there appears to be limited interchange between these groups (Robinson *et al.*, 2012; Cheney *et al.*, 2013; ICES, 2014; IAMMWG, 2021). For the entire SCANS-III survey area, bottlenose dolphin abundance in the summer of 2016 was estimated to be 27,697 with an overall estimated density of 0.015/ km^2 (CV = 0.233; 95% CI = 17,662 – 43,432; Hammond *et al.*, 2021). The SCANS-III survey estimated that the abundance of bottlenose dolphin in survey block E (surface area of 34,870 km^2; **Figure 6**), which is located in the Irish Sea and

includes the cable AoS, was 288 individuals and the density was estimated to be 0.008 bottlenose dolphin per km^2, with a mean group size of 1.50 (CV = 0.57; 95% CI = 0-664; Hammond *et al.*, 2021).

The cable AoS is located in the Irish Sea (IS) MU (**Figure 9**), which has an estimated bottlenose dolphin abundance of 293 (CV = 0.23; 95% CI = 362-414; IAMMWG, 2021).

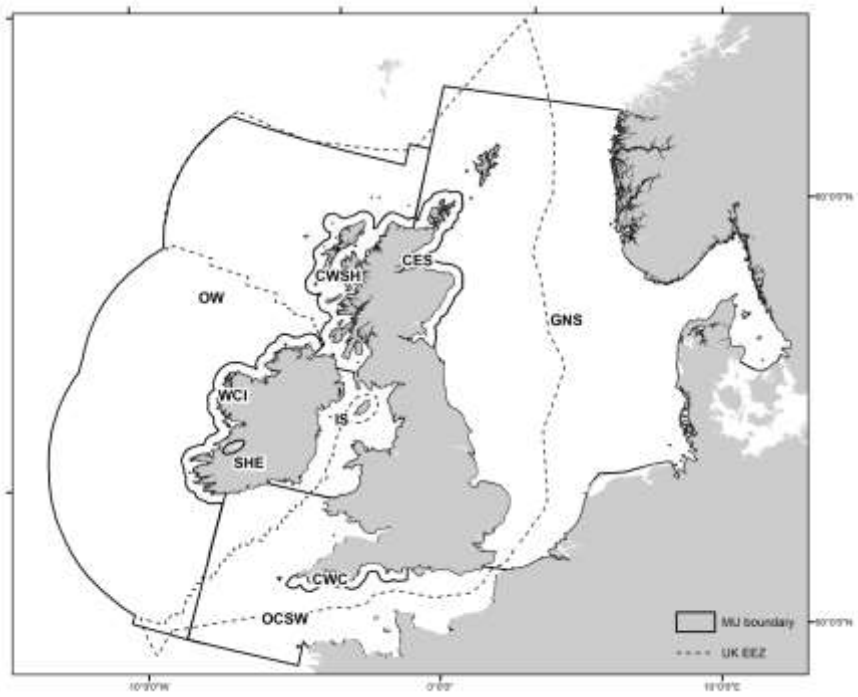


Figure 9 Bottlenose dolphin MUs (IAMMWG, 2015)

In the ObSERVE aerial surveys, only one sighting of five individuals in winter 2016 was made in stratum 5 (**Figure 10**), with a resultant density estimate of 0.036/km^2 (CV = 0.94) (Rogan *et al.,* 2018).

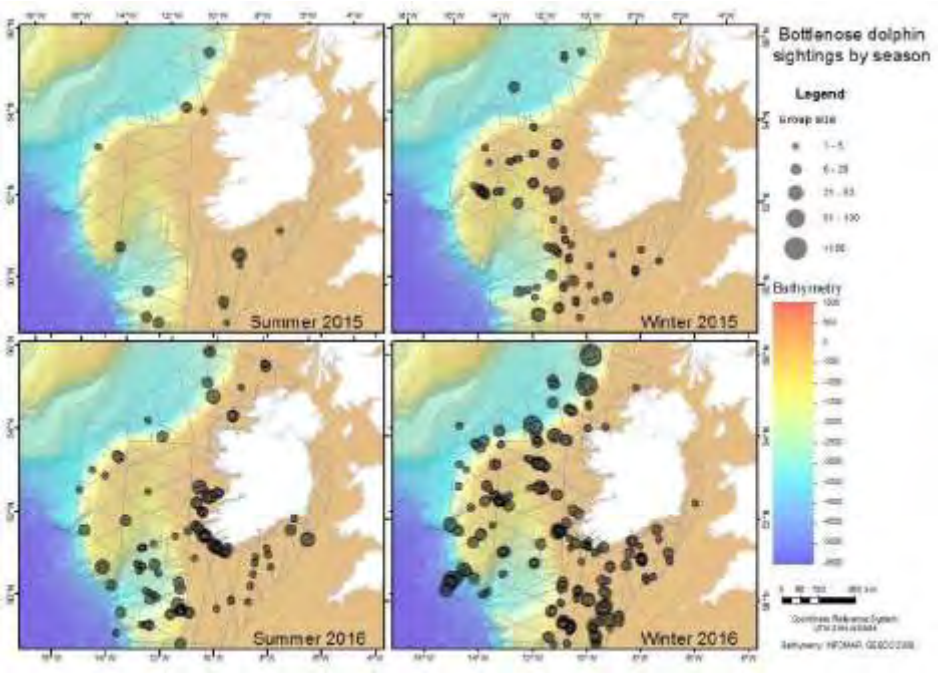


Figure 10 ObSERVE surveys sightings of bottlenose dolphin in each survey period.[5]

Conservation Status

The current conservation status of the bottlenose dolphin, as assessed in the 3rd Irish report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is 'Favourable' and 'Stable' (NPWS, 2019).

Designated Sites

The closest SAC for bottlenose dolphin is the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC which is 68km away. Details for the site and the assessment for impacts for bottlenose dolphin designated sites considered are outlined is **Section 8.4**.

5.4.3 Pinnipeds

The grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina* are observed throughout the Irish Sea. Both species are listed under Annex II of the Habitats Directive, requiring member states to designate areas of protection for them. Harbour and grey seals are both present on the east coast of Ireland and can be found using haul out sites and in offshore waters along the coast of Dublin, with grey seal usage of the area being higher than that of harbour seal. The Lambay Island SAC provides year-round haul-out habitat for both species and includes regionally significant breeding and moulting sites. Both seals are qualifying features of the Lambay Island SAC. The adjacent Rockabill and Dalkey SAC contains seal haul-out sites and although seals are listed as present, they are not a qualifying feature of the SAC.

5.4.3.1 Grey Seal

Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and the United States of America and in north-west Europe (Special Committee on Seals (SCOS), 2020). Grey seals are regularly recorded in and around the Irish Sea (Clarke *et al.,* 2018).

[5] *Grey lines indicate the survey tracklines along which sightings were made. Circles are proportional to the estimated number of bottlenose dolphin seen in each sighting.*

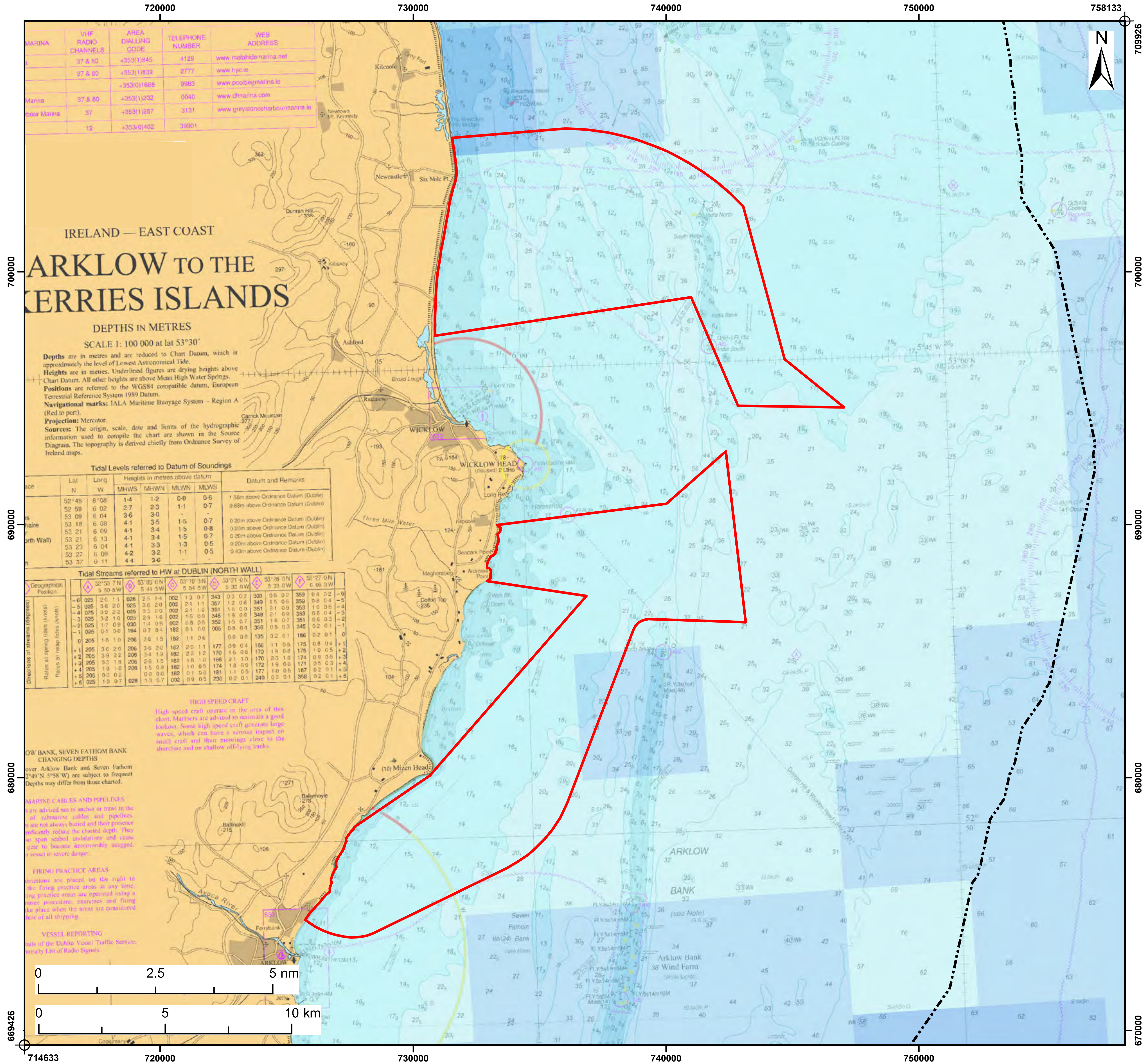
Grey seals are present year-round on both the Irish and Welsh coasts and are known to move between the two, for example between the southeast coast of Ireland and the southwest coast of Wales (Kiely *et al.,* 2000).

Marine Scotland commissioned the Sea Mammal Research Unit (SMRU) to produce maps of grey seal distribution (Carter *et al*., 2020). These maps were produced by combining information about the movement patterns of electronically tagged seals with survey counts of seals at haul-out sites. The resulting maps show estimates of relative mean seal usage (relative number of seals per 5km x 5km grid cell), which can be converted to absolute density estimates in particular areas using population scalars (Carter *et al*., 2020). The maps indicate relatively higher usage in some areas of the Celtic and Irish Sea along coastal locations of Ireland and Wales, for example, the waters surrounding Lambay Island and Llŷn Peninsula and West Hoyle Bank in Wales, as well as the south-east tip (Saltee Islands) of Ireland.

The seal at-sea usage maps produced by SMRU show that the relative grey seal density estimate is 0.041 individuals per km^2 for the cable AoS (calculated from the mean grey seal density (At-sea Usage) maps for the grid squares that overlap with the cable AoS) (**Figure 11**).

Grey seal surveys took place around Ireland between 2009 – 2012 across seven principal breeding areas, and the population was estimated at numbers of approximately 7,284 - 9,365 seals, of all ages (Ó Cadhla *et al.*, 2013). Lambay Island SAC is the closest designated site for grey seals to the cable AoS and supports the principal breeding colony of grey seal on the east coast of Ireland, numbering 196-252 seals, across all ages.

In the South and West England and Wales MU and the Northern Ireland MU, within which there are some European sites for grey seal with potential connectivity to the cable AoS, the grey seal pup production (autumn) was 1,900 with an estimated summer population size of 6,000, based on summer survey counts 1994-2003 and 2007 (SCOS, 2017; IAMMWG, 2013). In the Northern Ireland MU, the most recent grey seal summer survey count was 505 (SCOS, 2020). While there are no equivalent MUs for the Republic of Ireland, connectivity is possible between the Republic of Ireland with both Northern Ireland and Wales, and therefore these population estimates are used to consider the wider grey seal population.



Legend:

- Wicklow Cable Area of Search
- Ireland 12nm Limit

Mean Grey Seal At-Sea Usage (% per 25km²)

- 0 - 0.001
- 0.001 - 0.002
- 0.0021 - 0.0030
- 0.0031 - 0.0040

Data Sources: © UKHO, 2022. © Carter *et al*,. 2020. © HaskoningDHV UK Ltd. 2022.
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Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title:

Mean Grey Seal Density (At-Sea Usage)

Figure:	11	Drawing No:	PC3392-RHD-ZZ-XX-DR-Z-0071

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	10/06/2022	[redacted]		A3	1:150,000

Co-ordinate system: IRENET95 Irish Transverse Mercator

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Grey seal forage in the open sea. They may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2020). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2020). Tagging data of grey seals from haul-out sites in Liverpool Bay, Wales and southeast Ireland, indicates that most movement from these sites was contained within the Irish Sea (Hammond *et al.,* 2005).

Haul-out Sites

Grey seal typically spend longer hauled out during their annual moult between December and April, generally three and five months after the breeding season and during the breeding season between August and December (SCOS, 2019).

In August 2017 and August 2018, SMRU of the University of St Andrews, Scotland carried out a comprehensive aerial survey of harbour seals and grey seals over the entire coastline and offshore islands of Ireland. Within the eastern survey area (from Carlingford Lough to Cahore Point, including Lambay Island) a total of 418 grey seals were recorded in the 2017/2018 surveys, increasing significantly from 220 recorded in the 2011/2012 surveys (Morris & Duck, 2019).

The key grey seal haul-out sites on the east coast of Ireland include group sites to the north of Dublin at the Lambay Islands and Skerries, and to the south-east of Ireland, at Saltee Islands, Carnsore Point and Rosslare (**Figure 12**; Morris & Duck, 2019). The closest grey seal haul-out sites to the cable AoS are at Dalkey Islands (20km), with approximately four grey seals recorded in 2012 and approximately 50 in 2017/2018 (Duck *et al.*, 2013; Morris & Duck, 2019), Irelands Eye (32km from the cable AoS), with just 10 grey seals recorded in 2012 and up to 100 in 2017/2018 (Duck *et al.*, 2013; Morris & Duck, 2019), and Lambay Islands (44km) with 62 grey seals in 2012 and approximately 50 in 2017/2018 (Duck *et al.*, 2013; Morris & Duck, 2019) (**Figure 12**; Morris & Duck, 2019).

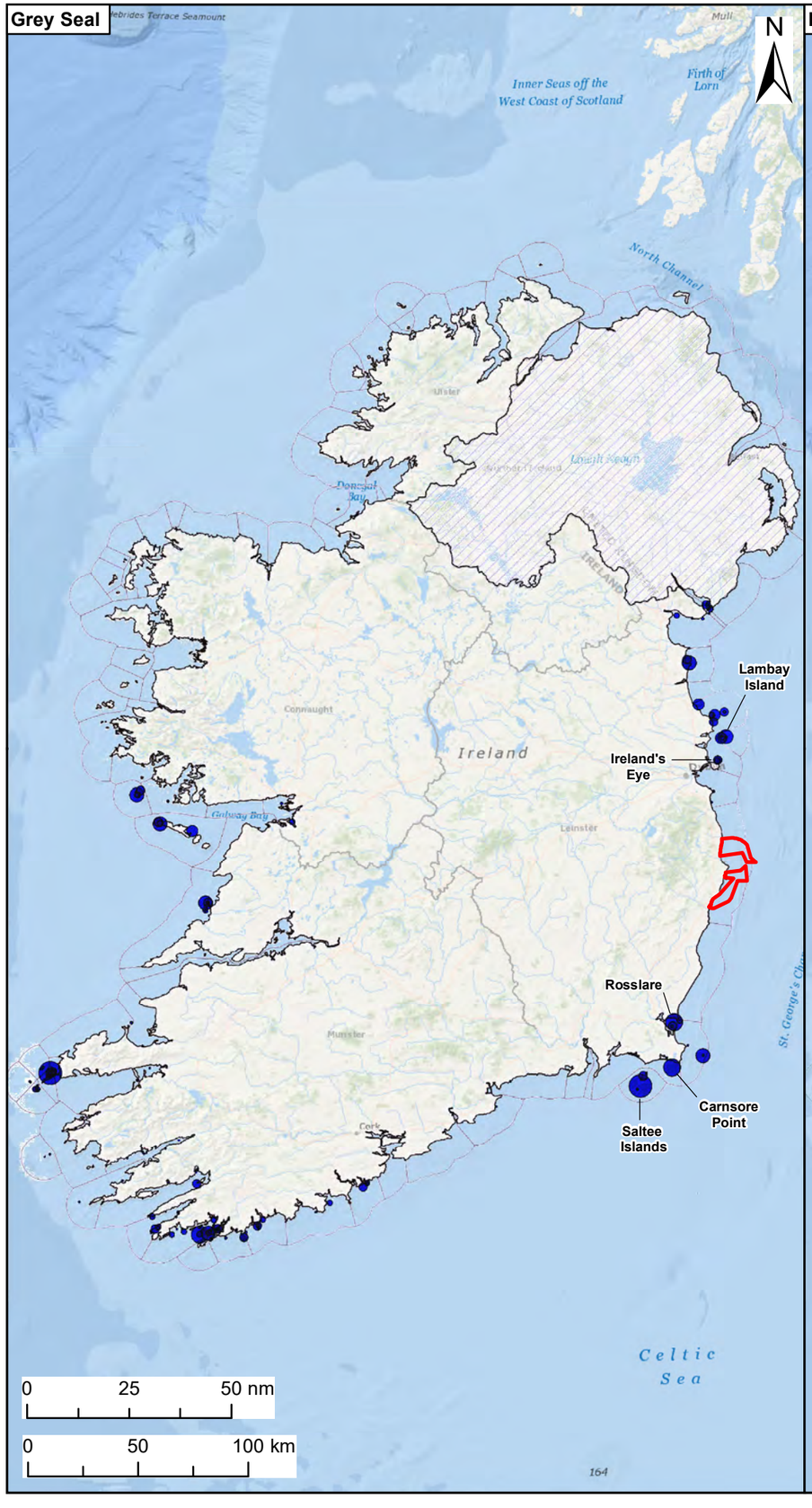
Conservation Status

The current conservation status of the grey seal, as assessed in the 3rd Irish report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is ‘Favourable’ and ‘Improving’ (NPWS, 2019).

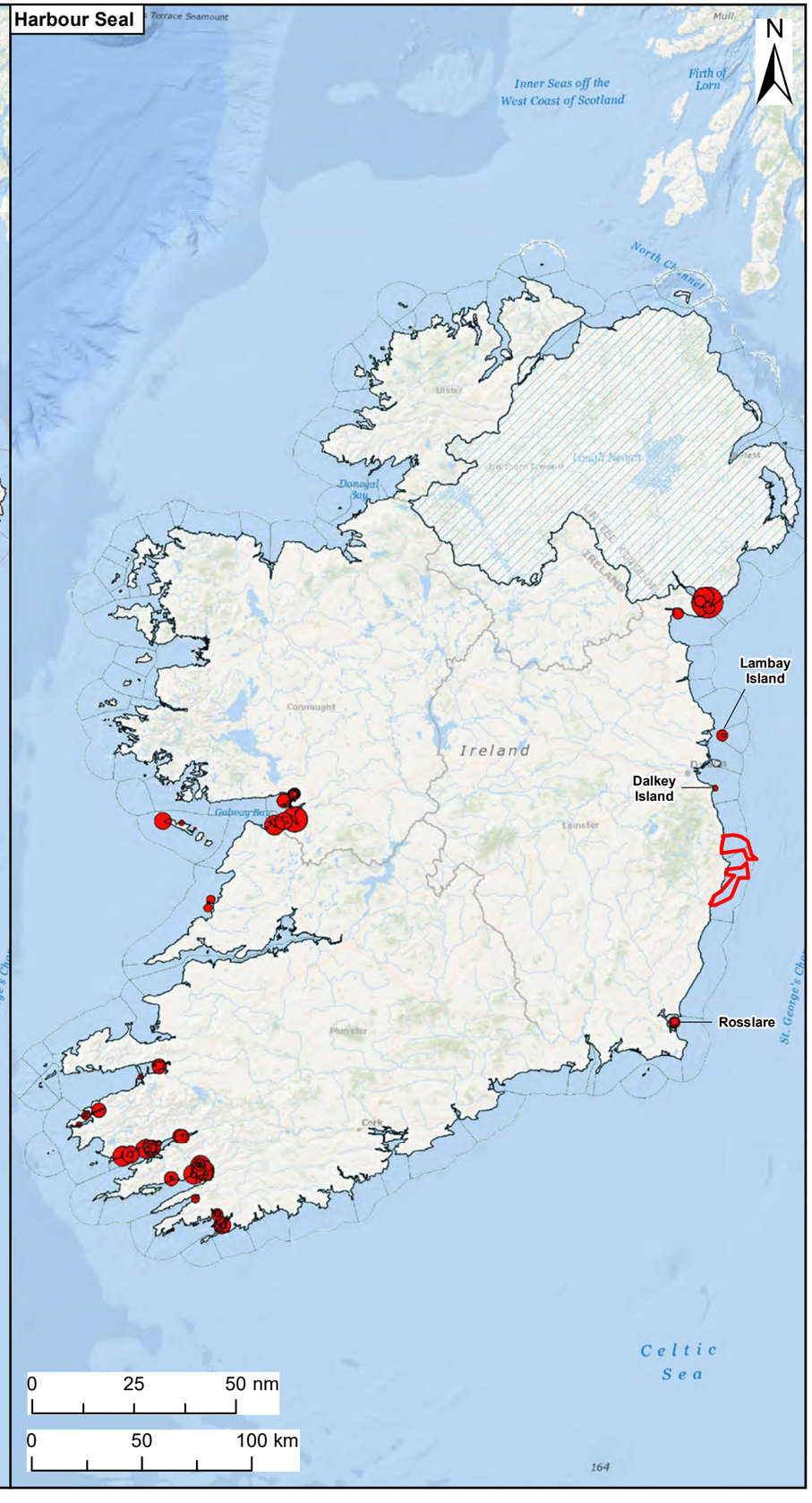
Designated Sites

The closest SAC designated for grey seal is the Lambay Island SAC which is 43km from the cable AoS. Details for the site and the assessment for impacts for grey seals designated sites considered are outlined is **Section 8.4**.

Grey Seal



Harbour Seal



Legend:

Wicklow Cable Area of Search

SMRU Subregion

Grey Seal (No. of Individuals)

- 1
- 5
- 10
- 25
- 50
- 100
- 250

Harbour Seal (No. of Individuals)

- 1
- 5
- 10
- 25
- 50
- 100
- 250

Data Sources: Data derived from Duck and Morris, 2013. © HaskoningDHV UK Ltd. 2022.
Basemap: Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors.

Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title:

The Number and Distribution of Grey and Harbour Seals Counted in the West, South-West, South and East of Ireland in August-September 2012 (Duck & Morris, 2013)

Figure:	Drawing No:
12	PC3392-RHD-ZZ-XX-DR-Z-0072

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	10/06/2022	[redacted]		A3	1:2,500,000

Co-ordinate system: IRENET95 Irish Transverse Mercator

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5.4.3.2 Harbour Seal

Harbour seals have a circumpolar distribution in the Northern Hemisphere and are divided into five sub-species. The population in European waters represents one sub-species *Phoca vitulina vitulina* (SCOS, 2020).

The estimated total population for the UK and Northern Ireland in 2018 was 45,800 (approximate 95% CI: 37,500-61,100). The most recent estimate of the harbour seal population in the Republic of Ireland MU for 2015-2018 is 4,007, based on the latest survey counts and modelled forward (SCOS, 2020).

In the Northern Ireland MU, within which there are some European sites for harbour seal with potential connectivity to the cable AoS, the most recent harbour seal summer survey count was 1,012, with approximately 80-85% of the population being recorded between Carlingford Loch and Copeland Islands (SCOS, 2019).

The at-sea seal usage maps produced by SMRU (Carter *et al.,* 2020) show that the relative harbour seal usage is low in and around the cable AoS, with an absolute harbour seal density estimate of 0.0006 individuals per km^2, based on the mean harbour seal density (At-sea Usage) maps for the gird squares that overlap with the cable AoS (Carter *et al*., 2020) (**Figure 13**).

Harbour seals normally feed within 40km and 50km around their haul out sites (SCOS, 2017). Tracking studies have shown that harbour seal typically travel between 50km and 100km offshore and can travel 200km between haul-out sites (Lowry *et al.,* 2001; Sharples *et al.,* 2012). Harbour seal exhibit relatively short foraging trips from their haul out sites.

Haul-out Sites

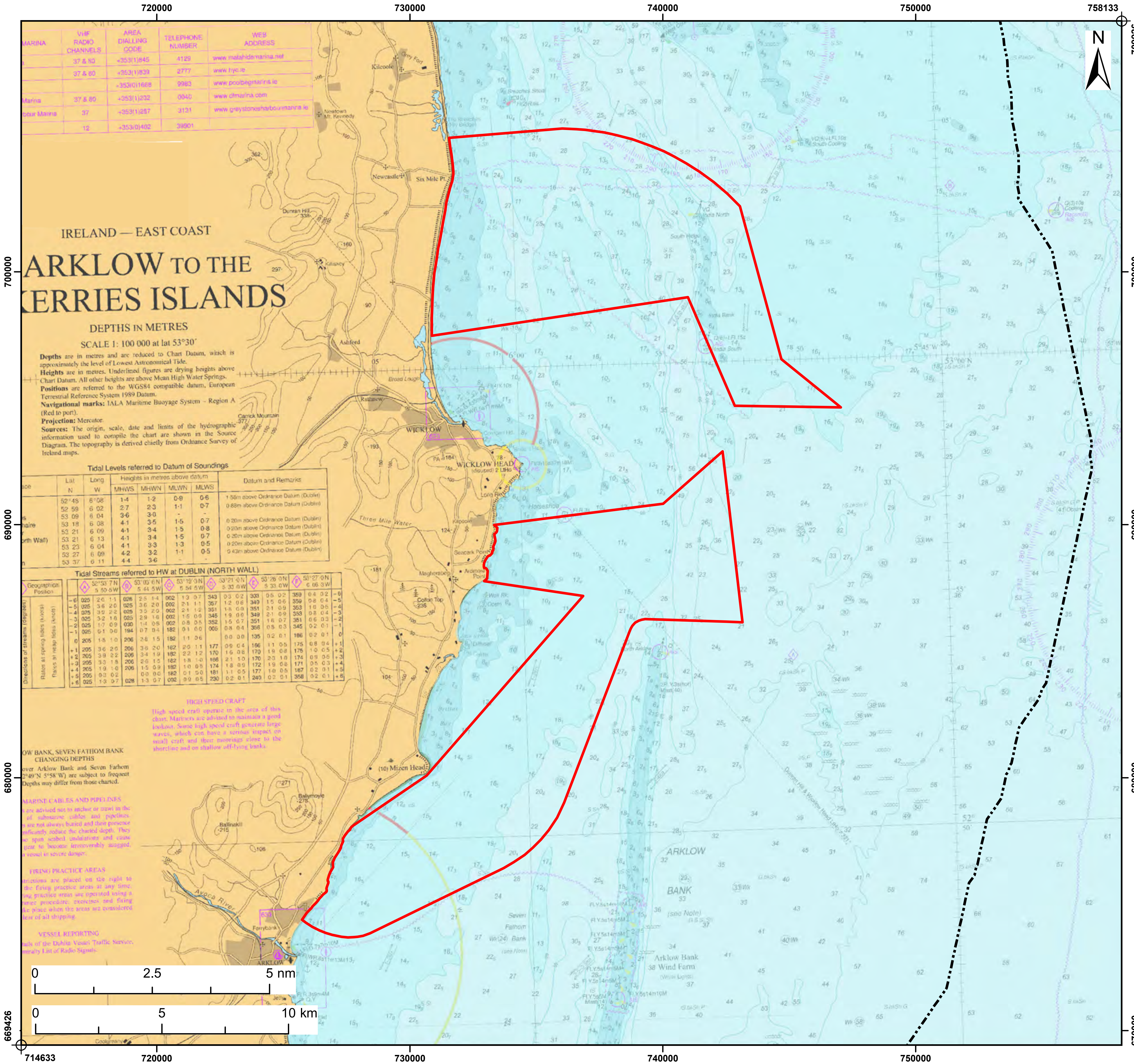
Harbour seal come ashore in sheltered waters, often on sandbanks and in estuaries, but also in rocky areas. Harbour seal haul out on land regularly in a pattern that is often related to the tidal cycle (SCOS, 2020). Harbour seal give birth to their pups in June and July and pups can swim almost immediately after birth (SCOS, 2020). Harbour seals moult in August and spend a higher proportion of their time on land during the moult than at other times (SCOS, 2020).

As described above, SMRU undertook aerial surveys of harbour seals and grey seals over the entire coastline and offshore islands of Ireland. Within the eastern survey area (from Carlingford Lough to Cahore Point, including Lambay Island), a total of 131 harbour seals were recorded in the 2017/2018 surveys, (with 60 recorded within the Lambay Island SAC), increasing from 90 recorded in the 2011/2012 surveys (Morris & Duck, 2019).

The main harbour seal haul-out site on the east coast of Ireland is at Lambay Island (approximately 44km from the cable AoS, with 23 harbour seal recorded in 2012 (Duck & Morris, 2012) and approximately 50 individuals in 2017/2018 (Morris & Duck, 2019). There are also other predominantly smaller harbour seal sites along the coast; at Dundalk, Carlingford Lough, Dalkey Island, and Rosslare (**Figure 13**). The closest minor harbour seal haul-out site to the cable AoS is Dalkey Island (6 harbour seal recorded in 2012 (Duck & Morris, 2012); estimated less than five individuals in 2017/2018 (Morris & Duck, 2019)) at 20km from the cable AoS.

Conservation Status

The current conservation status of the harbour seal, as assessed in the 3rd Irish report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is ‘Favourable’ and ‘Stable’ (NPWS, 2019).



Legend:

- Wicklow Cable Area of Search
- Ireland 12nm Limit

Mean Harbour Seal At-Sea Usage (% per 25km²)

- 0 - 0.001

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Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title:

Mean Harbour Seal Density (At-Sea Usage)

Figure: 13 Drawing No: PC3392-RHD-ZZ-XX-DR-Z-0073

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5.4.4 Summary of Abundance and Density Estimates

Abundance estimates of reference populations and density estimates for the species that will be used in the assessment are listed in **Table 1** below.

Table 1 Summary of marine mammal reference populations and density estimates used in the assessments

Area	Abundance Estimate	Density Estimate	Source
Harbour porpoise			
Celtic/Irish Seas (partial coverage only)	26,700 (95% CI =16,055-42,128)	0.381/ km^2 (CV = 0.154)	Hammond *et al.* (2021)
SCANS-III Block E	8,320 (95% CI = 4,643-14,354)	0.239/ km^2 (CV = 0.28)	Hammond *et al.* (2021)
Celtic and Irish Seas (CIS) MU	62,517 (CV = 0.13; 95% CI = 48,324 – 80,877)	-	IAMMWG (2021)
ObSERVE aerial surveys stratum 5	7,734-11,625 (summer) (95% CI = 5,248 – 11,398; 95% CI = 8,726 – 15,486) 9,636-10,264 (winter) (95% CI = 5,634 – 16,483; 95% CI = 7,555 – 13,943)	0.696-1.046/ km^2 (summer) 0.867-0.924/ km^2 (winter)	Rogan *et al.* (2018)
Bottlenose dolphin			
SCANS-III Block E	288 (95% CI = 0-664)	0.008/ km^2 (CV = 0.57)	Hammond *et al.* (2021)
Irish Sea (IS) MU	293 (CV = 0.23; 95%; CI = 362–414)	0.009/ km^2	IAMMWG (2021)
ObSERVE aerial surveys stratum 5	401 (95% CI = 76 – 2015) (winter)	0.036/ km^2 (CV=0.94) (winter)	Rogan *et al.* (2018)
Grey seal			
Republic of Ireland MU	7,284*	-	Ó Cadhla *et al.* (2013)
Cable AoS	-	0.041/ km^2	Carter *et al.* (2020)
Northern Ireland MU	505	-	SCOS, 2019
South and West England and Wales MU	6,000	-	SCOS, 2017; IAMMWG, 2013
Harbour seal			
Republic of Ireland MU	4,007	-	SCOS (2019)
Cable AoS	-	0.0006/ km^2	Carter *et al.* (2020)
Northern Ireland MU	1,012	-	SCOS, 2019

* *The smallest abundance estimate will be applied in the assessment to provide a conservative impact assessment*

5.4.4.1 Designated Sites

The closest designated sites for the identified species are provided in detail in **Section 6.3.**

5.5 Birds

The coastal sea cliffs, estuaries and offshore islands of Ireland are host to a number of nationally and internationally important bird species, with many areas designated as SPAs. Coastal habitats provide important breeding sites for many species of seabirds, a number of which are protected under national and European legislation.

At least 45 species of seabird (including divers and grebes) have been recorded during at-sea surveys in Irish waters, of which 23 species regularly breed around Ireland (Pollock et al., 2000, Mackey et al., 2004). In addition, a further 59 species of waterfowl and wader regularly occur at coastal sites such as estuaries around Ireland: including 5 grebe species, 2 heron species, 26 species of wildfowl and 26 wader species (Crowe 2005). Some of these species are migratory and are present only during migration periods in spring and autumn; others come to Ireland to breed or to spend the winter, while some are resident all year round.

5.5.1 Seabirds

5.5.1.1 Breeding seabirds

The breeding seabirds in the region are present at their colonies largely between the months of March and August. Colonies are predominantly located on islands, and also cliffs off the mainland, while gull colonies may be further inland on moors or loughs. Terns typically breed on low islands and shingle or sandy beaches. All breeding seabirds undertake foraging commutes into marine waters to forage for themselves and for their nestlings (predominantly between May and August). While many seabirds forage far offshore and have ranges of tens or hundreds of kilometres from their colonies, terns and gulls are more prone to foraging in coastal and inshore waters, as well as inland freshwater sites.

Conservation status

Breeding seabirds in the region receive legal protection largely through designation of many cliff and island sites as SPAs. At these sites, individual species may be qualifying features, in addition to the breeding seabird assemblage as a whole. Birds are protected while outside the boundaries of the SPA where they are breeding. For example, when foraging at sea the sites where they forage are regarded as supporting habitat.

5.5.1.2 Non-breeding seabirds

Most seabird species breeding in Irish waters are partial or fully migratory populations which spend the winter in open oceanic waters, or coastal waters at more southerly latitudes.

Many wintering seabirds in Irish waters are not closely associated with their colonies and related island and coastal habitats, instead foraging and resting in offshore or inshore waters, often depending on sea conditions. However, in winter the seabird assemblage includes seaducks, grebes and divers which rest and forage in inshore marine waters having bred in largely freshwater Arctic and sub-Arctic nesting sites.

Conservation status

Non-breeding seabirds receive protection at a number of SPAs as qualifying features in their own right, if the site supports a nationally or internationally significant number of individuals during one or more of the non-breeding seasons (passage, winter). Most commonly these features are gull or tern species. The

designation is typically based on the site providing habitat for one or more key activities such as foraging or roosting.

5.5.2 Waterbirds

5.5.2.1 Breeding waterbirds

While a range of waterfowl and wader species breed in Ireland, many are partial-migratory species whose numbers in Ireland peak in the non-breeding period following arrival of significant numbers of additional individuals from elsewhere in the species' breeding range. Other species are fully migratory and their populations are absent from Ireland during the breeding season (or present 'over-summering' in small numbers). Across both migratory strategies, many waterbird species occupy breeding season habitats which are relatively inland, freshwater or at higher altitude than their coastal wintering habitats.

Conservation status

Due to these factors, waterfowl and waders rarely constitute a breeding qualifying interest of coastal or marine SPAs in Ireland.

5.5.2.2 Non-breeding waterbirds

Waterfowl wintering in the region are a diversity of swans, geese and ducks, and while many species are associated with freshwater and terrestrial habitats, they also include species which routinely forage and rest within the intertidal and inshore marine environment. Waders present in their non-breeding periods (many overwintering but some species peaking in numbers on passage during autumn or spring migration seasons) are largely associated with intertidal estuarine and marine habitats. In species highly dependent on invertebrate food sources of intertidal mud and sand, their foraging and resting cycles closely follow those of the tide.

Conservation status

Wintering waterbirds in the region include species listed under the Bern Convention and Annex I of the EU Birds Directive, and they are subject to legal protection largely through designation of many sites, including inland freshwater bodies, estuaries, coastal wetlands and islands, as SPAs and Ramsar sites. At these sites, individual species may be qualifying features, in addition to the wintering waterbird assemblage as a whole.

5.5.3 Examples of designated supporting habitat

Examples of foreshore marine habitat use by birds at protected sites in the area are provided here.

The Murrough SPA is described as a coastal wetland complex which includes freshwater, brackish (partly tidal) and marine waterbodies within its boundary, interspersed with dry barrier habitats of shingle and stones and inland terrestrial habitats such as grassland. The marine foreshore includes a shingle ridge, part of which is used for nesting by little terns which are specialist breeders of gently sloping shoreline. The grassland habitats provide graze foraging for the migrant swan, duck and goose species which overwinter at the site. The intermixing of aquatic habitats of varying salinity provides diverse foraging, bathing and roosting waters for non-breeding waterbirds, and seabirds such as gulls and terns.

Also in close proximity is Wicklow Head SPA, a rocky headland used for nesting by seabirds off cliff-ledges – gulls, auks, fulmar and shag. The geology is "extensive exposures of mica-schist." Most of the breeding seabirds' nest on the length of headland where the cliffs are highest (approximately 60 m).

5.5.4 Relevant past baseline surveys

Site specific surveys at Arklow Bank and a 4km buffer were undertaken with boat-based surveys 2000 to 2009 and aerial surveys 2018-2020 (Sure Partners Limited, 2020). These surveys partially overlap the cable AoS. The 2000-2009 surveys found that kittiwake was the most abundant species. Whereas, although kittiwake was one of the highest recorded species in the 2018-2020 surveys, guillemot was the most abundant species recorded. During the 2018-2020 surveys, some summer months recorded over 1,000 individuals of guillemot in each survey (Sure Partners Limited, 2020).

Red-throated divers were recorded in most months during the site-specific surveys, although typically in low numbers except for mid-winter peaks. In December 2019, 95 red-throated divers were recorded by the aerial surveys (Sure Partners Limited, 2020).

The surveys also recorded razorbill, gannet, fulmar, Manx shearwater, gulls (black-headed gull, great black-backed gull, herring gull and lesser black-backed gull, common gull, little gull), great skua and Arctic skua and terns (common, sandwich and Arctic terns) (Sure Partners Limited, 2020). Lower numbers were recorded of common scoter, shag and puffin.

6 European Sites

The approach for each site feature of interest; benthic habitats, migratory fish, marine mammals, and birds are outlined below. As each receptor has a different range and therefore a different potential for connectivity, the approach for each receptor varies.

6.1 Special Areas of Conservation

DCCAE (2017) specify that the ZoI is dependent on the nature, scale and location of the project, the qualifying interests of each designated site, the sensitivities of receptors, the existence or absence of pathways and the potential for in combination effects.

We have included all SACs with potential pathways for a likely significant effect. The approach taken for inclusion of SACs in the AA screening differs depending on whether the SAC is designated for Annex I habitats or Annex II species. We have taken a precautionary approach throughout the considerations of identifying sites to include in the AA screening. We have included all SACs designated for Annex I habitats in the screening exercise within the deemed ZoI (see **Section 8.2**) of the cable AoS, if it is deemed that there is a potential pathway (DCCAE, 2017 and DEHLG, 2010).

Marine mammals (Annex II) are highly mobile and transitory in nature; therefore, it is necessary to examine species occurrence not only within the cable AoS, but also over the wider area used by each species. Adopting the precautionary principle and based upon expert judgement, all SACs where mobile species are a qualifying feature were included within their MUs. An exception to this is where there are known populations of resident nearshore bottlenose dolphins (rather than offshore populations), which are considered to be much more localised.

For harbour porpoise, potential connectivity was considered for all SACs with harbour porpoise listed as a designated feature within the Celtic and Irish Seas MU. For bottlenose dolphin, potential connectivity was considered for all SACs with bottlenose dolphin listed as a designated feature within the Irish Sea MU. For grey seal, potential connectivity was considered for all relevant designated SACs within the Republic of Ireland, as well as the Northern Ireland and Wales MUs, to ensure connectivity is considered for sites within Wales and Ireland that individuals may travel to and from. For harbour seal, due to their shorter foraging ranges, potential connectivity was considered for all designated SACs within the Republic of Ireland MU only.

Migratory fish (Annex II) are also highly mobile and transitory in nature. Annex II fish species that are known to either migrate through or spend part of their lifecycle on the east coast were identified and based upon expert judgement and considering the ZoI from the cable AoS, the pathways to SAC's designated for Annex II fish was assessed (see **Section 8.3**).

6.2 Special Protection Areas

Taking a precautionary approach, we have followed the Office of the Planning Regulator Practice Note PN01 - Appropriate Assessment Screening for Development Management guidance and used the Source-Pathway-Receptor model. Considering the sources, the ZoI (see **Section 8.5**) for displacement and disturbance effects are understood to be spatially confined within the order of a few kilometres of the cable AoS. For SPAs that have not been included in the AA screening, it is considered that a likely significant effect will not occur either alone or in combination with other projects and plans, due to the scope and scale of the surveys. i.e. the source and pathway.

The source/pathway/receptor approach was undertaken to identify the mechanisms used in the site investigation surveys that may potentially affect the birds that are qualifying interest features of SPAs.

All SPAs were identified considering the following criteria:

- Determining if the cable AoS overlaps with any SPAs;
- The distance between the cable AoS and a European site with a bird qualifying interest feature is within the range for which there could be an interaction i.e. the pathway is not too long. For seabirds in the breeding season this element of the screening process is informed by published information on mean-maximum foraging range (Woodward et al. 2019);
- Assessment of species-specific risk which informs the extent to which populations of particular species may be at risk of disturbance or displacement (Furness *et al.,* 2013, Fliessbach *et al.* 2019); and
- The likelihood that a migratory route occurs within the cable AoS for the qualifying interest features.

The cable AoS overlaps with **The Murrough SPA**. **Wicklow Head SPA** is within the ZoI of the cable AoS, being located 1 km from the cable AoS which encircles Wicklow Head SPA in all seaward directions.

Some species are sensitive to disturbance and displacement (Furness *et al.,* 2013, Fliessbach *et al.* 2019). The species considered most likely to be at risk of disturbance or displaced from habitats are:

- Black-throated diver *Gavia arctica*;
- Red-throated diver *Gavia stellata*;
- Great northern diver *Gavia immer*;
- Velvet scoter *Melanitta fusca*; and
- Common scoter *Melanitta nigra*.

SPAs designated for any of these five sensitive species within 20 km of the cable AoS are included in the screening. This consists of one site, **The Murrough SPA**.

Birds can have large foraging ranges (Woodward *et al*., 2019). The foraging ranges along with the specific seasons for the species designated were considered in identifying potential SPAs for the AA screening. **Table 3** displays the foraging ranges which overlap with the Wicklow cable AoS considering all seabird species.

Table 2 SPAs and seabird qualifying interests with overlapping published mean-maximum foraging ranges with Wicklow Project cable AoS

SPA	Breeding seabird features with overlapping mean-maximum foraging range[1]
The Murrough SPA	Little tern
Wicklow Head SPA	Kittiwake
Dalkey Islands SPA	Common tern Arctic tern
Howth Head Coast SPA	Kittiwake
Ireland's Eye SPA	Guillemot Razorbill Kittiwake

SPA	Breeding seabird features with overlapping mean-maximum foraging range[1]
	Herring gull
Lambay Island SPA	Guillemot Razorbill Puffin Kittiwake Herring gull Lesser black-backed gull
Saltee Islands SPA	Gannet Fulmar Puffin Kittiwake Lesser black-backed gull
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	Puffin Manx shearwater Storm petrel
Helvick Head to Ballyquin SPA	Kittiwake
Grassholm SPA	Gannet
Ailsa Craig SPA	Gannet
Isles of Scilly SPA	Storm petrel
Puffin Island SPA	Fulmar Manx shearwater
Cliffs of Moher SPA	Fulmar
Cruagh Island SPA	Manx shearwater
Deenish Island and Scariff Island SPA	Fulmar Manx shearwater Storm petrel
Skelligs SPA	Fulmar Manx shearwater
Blasket Islands SPA	Fulmar Manx shearwater
Horn Head to Fanad Head SPA	Fulmar
Kerry Head SPA	Fulmar
Tory Island SPA	Fulmar
West Donegal Coast SPA	Fulmar
High Island, Inishshark and Davillaun SPA	Fulmar
Dingle Peninsula SPA	Fulmar
Iveragh Peninsula SPA	Fulmar
Beara Peninsula SPA	Fulmar
Glannau Aberdaron ac Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	Manx shearwater
St Kilda SPA	Manx shearwater
Rum SPA	Manx shearwater
Copeland Islands SPA	Manx shearwater
Cap Sizun SPA	Fulmar
Tregor Goelo SPA	Fulmar
Camaret SPA	Fulmar
Ouessant-Molène SPA	Fulmar Manx shearwater
Côte de Granit Rose-Sept Iles SPA	Fulmar Manx shearwater
Iles Houat-Hoëdic SPA	Manx shearwater
per Woodward et al. (2019) (Woodward, I., Thaxter, C. B., Owen, E., & Cook, A. S. C. P. (2019). Desk-based revision of seabird foraging ranges used for HRA screening. BTO research report, 724.)	

It is considered that the survey activities, which will act over a small scale and a short and infrequent time duration, will act on **a negligible proportion** of the extremely large foraging areas of the majority of species

and sites listed above. Therefore, of the above seabird SPAs, only **The Murrough SPA**, **Wicklow Head SPA**, and **Dalkey Islands SPA**, which are located within 20 km of the cable AoS and/or designated for short-range foraging seabirds such as terns, were taken forward into the screening exercise on the basis of connectivity via seabird foraging range.

With regard to bird migration routes, a route to impact on migrating individuals was not considered to be likely due to the nature of the proposed survey work (sparse use of vessels and plant, resulting in little to no collision risk), and its temporary and localised nature dispersed across seasons in multiple years.

The features of the designated European sites included in Screening are listed in **Table 3** of **Section 6.3.**

6.3 European sites included in Screening

Table 3 European sites included in AA screening

European site	Country	Qualifying Interest	Distance (km)	Site Code
SPAs				
The Murrough SPA	Republic of Ireland	Red-throated Diver *Gavia stellata* [A001] - wintering Greylag Goose *Anser anser* [A043] - wintering Light-bellied Brent Goose *Branta bernicla hrota* [A046] - wintering Wigeon *Anas penelope* [A050] - wintering Teal *Anas crecca* [A052] - wintering Black-headed Gull *Chroicocephalus ridibundus* [A179] - wintering Herring Gull *Larus argentatus* [A184] - wintering Little Tern *Sterna albifrons* [A195] - breeding Wetland and Waterbirds [A999]	0	004186
Wicklow Head SPA	Republic of Ireland	Kittiwake *Rissa tridactyla* [A188] – breeding	1	004127
Dalkey Islands SPA	Republic of Ireland	Roseate Tern *Sterna dougallii* [A192] - breeding Common Tern *Sterna hirundo* [A193] - breeding Arctic Tern *Sterna paradisaea* [A194] - breeding	20	004172
SACs				
Wicklow Reef SAC	Republic of Ireland	Reefs [1170]	1	002274
Magherabeg Dunes SAC	Republic of Ireland	Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	0	001766

European site	Country	Qualifying Interest	Distance (km)	Site Code
		Petrifying springs with tufa formation (Cratoneurion) [7220]		
The Murrough Wetlands SAC	Republic of Ireland	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Mediterranean salt meadows *Juncetalia maritime* [1410] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	0	002249
Buckroney-Brittas Dunes And Fen SAC	Republic of Ireland	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows *Juncetalia maritimi* [1410] 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] Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Alkaline fens [7230]	0	000729
Rockabill and Dalkey SAC	Republic of Ireland	Reefs [1170] Harbour Porpoise *Phocoena phocoena* [1351]	17	003000
West Wales Marine / Gorllewin Cymru Forol SAC	Wales	Harbour porpoise *Phocoena phocoena* [1351]	60	UK0030397
North Anglesey Marine SAC	Wales	Harbour porpoise *Phocoena phocoena* [1351]	49	UK0030398
Lambay Island SAC	Republic of Ireland	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Grey Seal *Halichoerus grypus* [1364] Harbour Seal *Phoca vitulina* [1365]	43	000204
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau	Wales	Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330]	68	UK0013117

European site	Country	Qualifying Interest	Distance (km)	Site Code
		Submerged or partially submerged sea caves [1365] Otter *Lutra lutra* [1355] Bottlenose dolphin *Tursiops truncates* [1349] Grey seal *Halichoerus grypus* [1364]		
Slaney River Valley SAC	Republic of Ireland	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Mediterranean salt meadows *Juncetalia maritime* [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] *Alno-Padion, Alnion incanae, Salicion albae* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* [91E0] Freshwater Pearl Mussel *Margaritifera margaritifera* [1029] Sea Lamprey *Petromyzon marinus* [1095] Brook Lamprey *Lampetra planeri* [1096] River Lamprey *Lampetra fluviatilis* [1099] Twaite Shad *Alosa fallax fallax* [1103] Salmon *Salmo salar* [1106] Otter *Lutra lutra* [1355] Harbour Seal *Phoca vitulina* [1365]	54	000781
Cardigan Bay/ Bae Ceredigion SAC	Wales	Bottlenose dolphin *Tursiops truncatus* [1349] Grey Seal *Halichoerus grypus* [1364]	96	UK0012712
River Boyne and River Blackwater SAC	Republic of Ireland	Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae, Salicion albae*) [91E0] River Lamprey *Lampetra fluviatilis* [1099] Salmon *Salmo salar* [1106] Otter *Lutra lutra* [1355]	70	002299
Saltee Islands SAC	Republic of Ireland	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]	73	000707

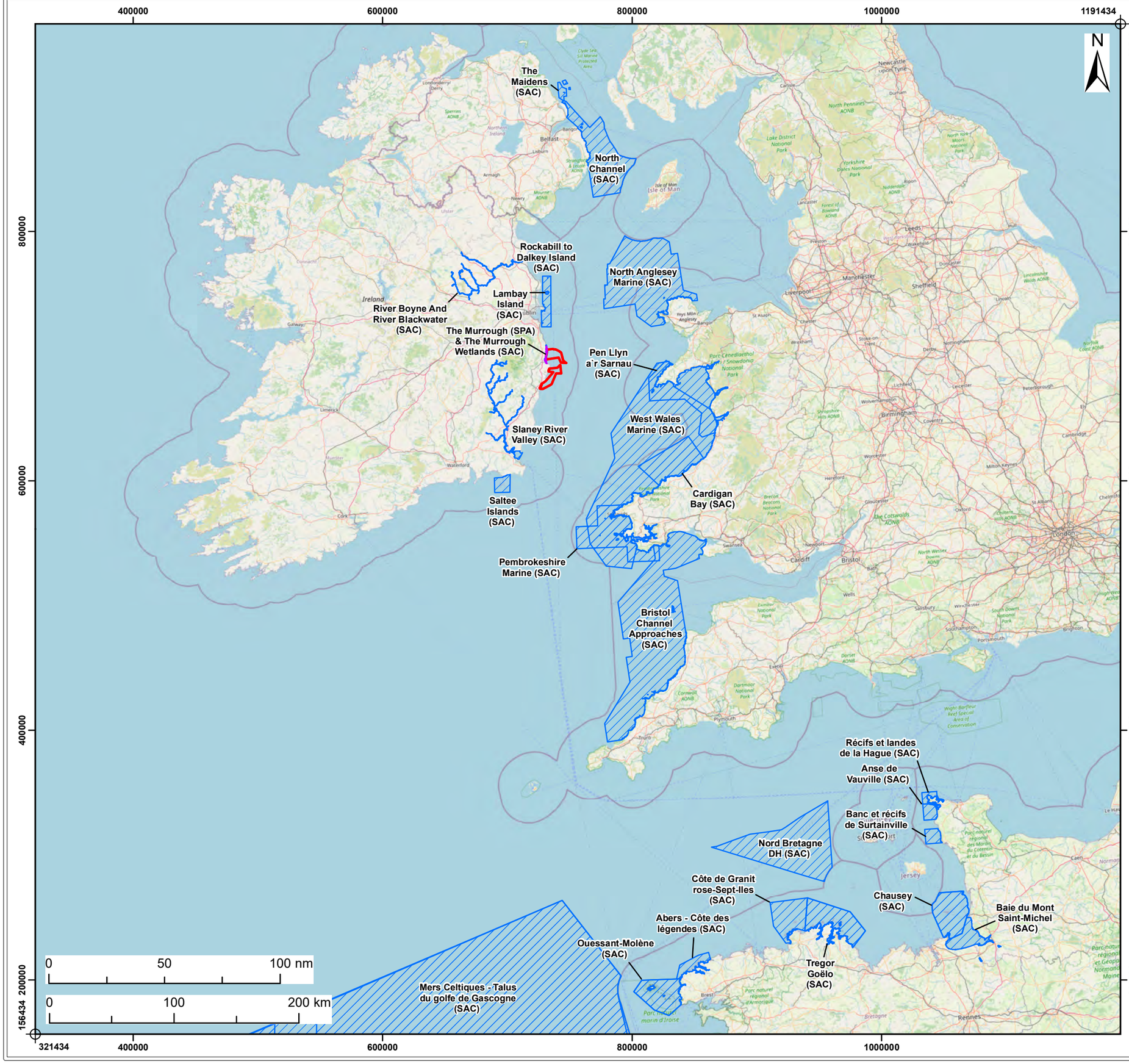
European site	Country	Qualifying Interest	Distance (km)	Site Code
		Submerged or partially submerged sea caves [8330] Grey Seal *Halichoerus grypus* [1364]		
Pembrokeshire Marine/ Sir Benfro Forol	Wales	Sandbanks which are slightly covered by sea water all the time [1110] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Submerged or partially submerged sea caves [8330] Shore dock *Rumex rupestris* [1441] Sea lamprey *Petromyzon marinus* [1095] River lamprey *Lampetra fluviatilis* [1099] Twaite Shad *Alosa fallax fallax* [1103] *Allis shad Alosa alosa [1102]* Otter *Lutra lutra* [1355] Grey Seal *Halichoerus grypus* [1364]	104	UK0013116
Murlough SAC	Republic of Ireland	Mudflats and sandflats not covered by seawater at low tide [1140] Sandbanks which are slightly covered by sea water all the time [1110] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Embryonic shifting dunes [2110] "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" [2110] Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*) [2170] Euphydryas (*Eurodryas, Hypodryas) aurinia* Marsh fritillary butterfly [1065] Harbour Seal *Phoca vitulina [*1365]	115	UK0016612
North Channel SAC	Wales	Harbour porpoise *Phocoena phocoena* [1351]	125	UK0030399
Strangford Lough SAC	Northern Ireland	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150]	139	UK0016618

European site	Country	Qualifying Interest	Distance (km)	Site Code
		Large shallow inlets and bays [1160] Reefs [1170] Harbour Seal *Phoca vitulina* [1365]		
The Maidens SAC	Northern Ireland	Sandbanks which are slightly covered by sea water all the time [1110] Reefs [1170] Grey Seal *Halichoerus grypus* [1364]	198	UK0030384
Mers Celtiques - Talus du golfe de Gascogne SAC	France	Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349]	410	FR5302015
Ouessant-Molène SAC	France	Grey Seal *Halichoerus grypus* [1364] Otter *Lutra lutra* [1355] Harbour Porpoise *Phocoena phocoena* [1351] Shore dock *Rumex rupestris* [1441] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Killarney Fern *Trichomanes speciosum* [1421]	481	FR5300018
Abers - Côte des legends SAC	France	Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Grey Seal *Halichoerus grypus* [1364] Otter *Lutra lutra* [1355] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304] Atlantic salmon *Salmo salar* [1106] Common seal *Phoca vitulina* [1365] Quimper snail *Elona quimperiana* [1007] Liparis *Liparis Loeselii* [1903] Western barbastelle *Barbastella barbastellus* [1308] Southern Coenagrion *Coenagrion mercuriale* [1044]	471	FR5300017
Nord Bretagne DH SAC	France	Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349]	391	FR2502022
Côte de Granit rose-Sept-Iles SAC	France	Twaite Shad *Alosa fallax fallax* [1103] Allis shad *Alosa alosa [1102]* Atlantic salmon *Salmo salar* [1106] Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304]	450	FR5300009

European site	Country	Qualifying Interest	Distance (km)	Site Code
		Sea Lamprey *Petromyzon marinus* [1095] Killarney Fern *Trichomanes speciosum* [1421] Grey Seal *Halichoerus grypus* [1364] Quimper snail *Elona quimperiana* [1007] Stag beetle *Lucanus cervus* [1083] Common seal *Phoca vitulina* [1365] Shore dock *Rumex rupestris* [1441]		
Tregor Goelo SAC	France	Twaite Shad *Alosa fallax fallax* [1103] Allis shad *Alosa alosa [1102]* Western barbastelle *Barbastella barbastellus* [1308] European bullhead *Cottus gobio* [1163] Coenagrion mercurial *Coenagrion mercurial* [1044] Atlantic salmon *Salmo salar* [1106] Otter *Lutra lutra* [1355] Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304] Sea Lamprey *Petromyzon marinus* [1095] Greater mouse-eared bat *Myotis myotis* [1324] Killarney Fern *Trichomanes speciosum* [1421] Shore dock *Rumex rupestris* [1441] Lesser Horseshoe Bat *Rhinolophus hipposideros* [1303] Grey Seal *Halichoerus grypus* [1364] Brook Lamprey *Lampetra planeri* [1096] Quimper snail *Elona quimperiana* [1007] Cottus perifretum *Cottus perifretum* [5315] Stag beetle *Lucanus cervus* [1083] Bechstein's bat *Myotis bechsteinii* [1323] Geoffroy's bat *Myotis emarginatus* [1321]	460	FR5300010
Baie du Mont Saint-Michel SAC	France	Twaite Shad *Alosa fallax fallax* [1103] Allis shad *Alosa alosa [1102]* Western barbastelle *Barbastella barbastellus* [1308] Grey Seal *Halichoerus grypus* [1364] River Lamprey *Lampetra fluviatilis* [1099] Otter *Lutra lutra* [1355]	542	FR2500077

European site	Country	Qualifying Interest	Distance (km)	Site Code
		Harbour Seal *Phoca vitulina* [1365] Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304] Lesser horeshoe bat *Rhinolophus hipposideros* [1303] Shore dock *Rumex rupestris* [1441] Atlantic salmon *Salmo salar* [1106] Northern crested newt *Triturus cristatus* [1166] Sea Lamprey *Petromyzon marinus* [1095] Greater mouse-eared bat *Myotis myotis* [1324] Geoffroy's bat *Myotis emarginatus* [1321] Bechstein's bat *Myotis bechsteinii* [1323] Floating water-plantain *Luronium natans* [1831] Stag beetle *Lucanus cervus* [1083] Brook Lamprey *Lampetra planeri* [1096] European bullhead *Cottus gobio* [1163] Jersey Tiger *Euplagia quadripunctaria* [6199]		
Chausey SAC	France	Twaite Shad *Alosa fallax fallax* [1103] Grey Seal *Halichoerus grypus* [1364] River Lamprey *Lampetra fluviatilis* [1099] Allis shad *Alosa alosa [1102]* Sea Lamprey *Petromyzon marinus* [1095] Harbour Seal *Phoca vitulina* [1365] Harbour Porpoise *Phocoena phocoena* [1351] Atlantic salmon *Salmo salar* [1106] Common Bottlenose Dolphin *Tursiops truncatus* [1349] Shore dock *Rumex rupestris* [1441] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304] Stag beetle *Lucanus cervus* [1083]	513	FR2500079
Récifs et landes de la Hague SAC	France	Common Bottlenose Dolphin *Tursiops truncatus* [1349] Harbour Porpoise *Phocoena phocoena* [1351] Harbour Seal *Phoca vitulina* [1365] Grey Seal *Halichoerus grypus* [1364] Jersey Tiger *Euplagia quadripunctaria* [6199] Bechstein's bat *Myotis bechsteinii*	412	FR2500084

European site	Country	Qualifying Interest	Distance (km)	Site Code
		[1323] Geoffroy's bat *Myotis emarginatus* [1321] Greater mouse-eared bat *Myotis myotis* [1324] Greater horseshoe bat *Rhinolophus ferrumequinum* [1304] Shore dock *Rumex rupestris* [1441] Killarney Fern *Trichomanes speciosum* [1421]		
Anse de Vauville SAC	France	Grey Seal *Halichoerus grypus* [1364] Harbour Seal *Phoca vitulina* [1365] Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349]	449	FR2502019
Banc et récifs de Surtainville SAC	France	Grey Seal *Halichoerus grypus* [1364] Harbour Seal *Phoca vitulina* [1365] Harbour Porpoise *Phocoena phocoena* [1351] Common Bottlenose Dolphin *Tursiops truncatus* [1349]	466	FR2502018



Legend:

- Wicklow Cable Area of Search
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title:

European Sites Considered in the Screening Exercise for Wicklow Cable Area of Search

Figure:	Drawing No:
14	PC3392-RHD-ZZ-XX-DR-Z-0074

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	17/10/2022	[redacted]		A3	1:3,000,000
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Co-ordinate system: IRENET95 Irish Transverse Mercator

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6.4 Conservation Objectives

The AA screening assessment is based upon whether the project or plan, alone or in combination with other projects or plans could have significant effects on the conservation objective of the European site. The 'Source-Pathway-Receptor' approach has been taken as described in **Section 3.2**. After establishing whether a pathway exists, the conservation objectives, including the feature specific attributes and targets, are considered in the AA screening and any further assessment to determine whether the proposed surveys will have an adverse effect on a European site.

An example of a European site conservation objective is:

> *Favourable conservation status of a habitat is achieved when:*
>
> > *its natural range, and area it covers within that range, are stable or increasing, and the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable.*
>
> *The favourable conservation status of a species is achieved when:*
>
> > *population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*
>
> *Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected.*

NPWS have prepared site specific conservation objectives including attributes, measures and targets for each feature of interest for which a European site has been designated and these have been considered in the AA screening and NIS assessments. Where site-specific conservation objectives are not available the site's generic conservation objectives (together with site-specific targets and attributes assigned for those features where site-specific conservation objectives are available) have been considered.

7 In Combination

Other plans and projects are considered during AA Screening. To determine the potential for any in combination effects we have used the best available information, including but not limited to, Foreshore Licence Application Forms and supporting information, Planning and Scoping Reports and the Foreshore Applications and Determinations website[6].

A detailed search of projects and plans across the Irish Sea has been undertaken to reflect the potential for in combination effects for mobile and wide-ranging species, however given the scale of works only projects within the ZoI of the Wicklow Project are considered to have the potential for cumulative effects.

Given the short-term nature of the proposed surveys, and that potential effects are temporary and relate to the marine environment only, it is considered that there is no potential for the site investigation surveys to act in combination with any terrestrial projects or plans.

Shipping noise is a key characteristic of the ambient underwater noise in the area. The noise produced by survey vessels described in Section 1.2 of the Schedule of Works (Royal HaskoningDHV, 2022b – document reference UB1019-RHD-ZZ-XX-RP-Z-0011) during the implementation of the site investigation surveys, when considered cumulatively with existing shipping, shall not increase background underwater noise to levels that could disrupt communication due to masking or alter behaviour patterns of marine mammals, fish or birds in combination with the proposed works.

From a review of potential plans and projects including project programmes (where known), plans and projects with potential to have in combination effects have been identified. Those identified as having the potential for in combination effects due to the spatial nature of the works are listed below:

- Leinster - Site investigation geophysical survey proposed Q2 2023 approximately 3 months duration (dependant of approval of foreshore licence) (FS007162);
- Codling Bank - Geophysical survey ran from June to August 2021 and geotechnical campaign ran from June to July 2022. The duration of the foreshore licence requested is for 5 years (FS007045);
- Arklow Bank Wind Park Phase 2 – Geophysical campaign ran in Summer 2021 and geotechnical campaign ran from May to July 2022 (FS007339);
- Dublin Port - Maintenance dredging commencing 2022 – 2029 (FS007132);
- Arklow Bank Wind Park Phase 1 – Dredging of accumulated sediment at Arklow Bank to allow maintenance vessel access. The client is applying for a multi-year Dumping at Sea Permit for a maximum period of eight years and maximum tonnage of 99,999 wet tonnes (FS007049);
- Dublin Array Offshore Wind Farm - Site Investigations including geophysical and geotechnical surveys, the Licence is requested for a duration of 5 years. Subject to award of licence the works were anticipated to commence during Summer 2022. However on July 1st a progress update was released confirming the need for Appropriate Assessment and therefore survey commencement dates have not been confirmed[7] (FS007188);

[6] *https://www.housing.gov.ie/planning/foreshore/applications/overview*

[7] *https://dublinarray.com/2022/07/01/progress-update-on-foreshore-licence-for-surveys/*

- Sunrise Offshore Wind Farm – Geophysical survey (including archaeology and benthic) and benthic sampling programme, preliminary geotechnical surveys (including benthic) in association with the benthic sampling programme, wind resource monitoring, metocean surveys and environmental surveys including bird and marine mammal surveys. Surveys are expected to begin early spring 2022 and be phased over 5 years.

- Banba Wind Offshore Wind Farm – Geotechnical surveys, geophysical surveys (including archaeology and UXO), benthic survey programme on the basis of geophysical data, wind resource monitoring, metocean surveys and bird and marine mammal surveys. Surveys are expected to begin early spring 2022 and be phased over 5 years.

There are a number of foreshore applications that have been submitted, however these may not, at the time of writing, be in the public domain or the timings of survey work may not be fully known. The Schedule of Works outlined for this project is considered representative of other site investigation works that have the potential to occur but are unknown at this time. Therefore, as a worst-case scenario, two projects conducting site investigation works at the same time and in the same ZoI as the Wicklow Project will be assessed to determine the potential for in combination effects on the European sites identified as having a likely significant effect in the NIS. Availability of survey vessels and the timings of the allocation of foreshore licences is such that it is considered unlikely that more than three survey vessels would be undertaking site investigation works at any one time. A full description of any potential in combination effects with European sites screened into the NIS are described in Royal HaskoningDHV, 2022a – document reference: UB1019-RHD-ZZ-XX-RP-Z-0010.

8 Appropriate Assessment Screening

This section identifies and considers potential effects; direct and indirect, on the conservation status of the qualifying interests of the SAC's and SPA's listed in **Table 3** of **Section 6.3,** that were identified as having a potential pathway using the "Source-Pathway-Receptor" approach.

The consideration of whether there is a potential pathway was based upon the judgement of the competent experts who prepared this report, considering the scale and scope of the surveys including the localised range of potential effects, corridors of connectivity and potential in combination effects during the proposed export cable corridor investigation surveys. In combination effects have been considered throughout the screening process. Specific projects and plans, and an assumption in relation to other potential projects and plans, taken into consideration in the AA Screening are listed in **Section 1.**

8.1 Site investigation survey effects

The investigation methods proposed (as outlined in Schedule of Works (Royal HaskoningDHV, 2022b – document reference UB1019-RHD-ZZ-XX-RP-Z-0011)) are considered to be non-destructive as described below and all the vessels associated with the surveys are included in the assessment (as a source of potential disturbance).

8.1.1 Geophysical (including archaeological)

Both Multi beam echo sounders (MBES) and Side Scan Sonar (SSS) have a short duration output and limited acoustic footprint. SSS transmits an acoustic signal from directly below as it is towed behind the vessel. MBES transmit sound energy from directly beneath the vessel hull in a limited zone.

Sub-bottom profiling (SBP) uses an acoustic signal to determine the sediment of the area under consideration and is characterised by a limited acoustic footprint due to the signal being directional under the boat, and the short duration output which is attenuated with distance from source.

8.1.2 Geotechnical

Cone Penetration Tests (CPT) testing rods are pushed into the seabed using direct hydraulic force so will produce no significant acoustic signal and localised seabed disturbance. Vibrocores produce no significant acoustic signal and localised seabed disturbance.

8.1.3 Ecological (benthic)

There is no appreciable sound signal produced from using the Day Grab and/or a Hamon grab for ecological sampling. This technique removes small amounts of sediment so disturbance and/or removal of infaunal communities is considered negligible and does not affect the structure or function of the seabed.

8.1.4 Intertidal (including archaeological walkover survey)

The Phase 1 intertidal walkover survey will be undertaken by foot and will be of short duration (up to 1 day per survey location). There is no appreciable sound produced from walkover surveys, sediment/ecological sampling or using a metal detector. Any small areas of sediment dug-over in the intertidal area will be quickly infilled following cessation of the activity. No samples will be removed from either rocky or sediment shores.

8.2 Connectivity with benthic habitats connected to an SAC

The source/pathway/receptor approach was used to identify the potential for the proposed surveys to have a likely significant effect (LSE) on the habitats that are qualifying interest features of European sites.

For benthic habitats, European sites were included in the screening exercise if:

- The proposed surveys directly interact with a European site whose features of interest include an Annex I habitat; and
- The distance between the cable AoS and the feature of interest is within a range for which there could be indirect interaction (i.e. within a zone of influence for a physical process change resulting from the proposed sediment sampling).

The site investigation surveys (source) have the potential for effect on benthic habitats (receptor) through the following:

- Physical damage, disturbance and sediment removal from sampling (pathway) leading to physical damage and disturbance;
- Increased suspended sediments and sediment re-deposition (pathway) leading to smothering;
- Accidental pollution (pathway) event leading to toxic contamination; and
- Introduction of invasive species from the vessels hull (pathway) leading to non-toxic contamination.

Consideration for European sites is based on the sensitivities of site-specific features of interest (receptors) and whether there is a potential pathway for habitats to receive direct or indirect effects from the proposed surveys (source). The small scale of the potential changes from the proposed surveys such as physical disturbance to the seabed, or effects on physical processes mean that the effects are localised.

The cable AoS partially overlaps three SACs designated for benthic features along the Wicklow coastline (Magherabeg Dunes SAC, Buckroney-Brittas Dunes & Fen SAC and The Murrough Wetlands SAC). Their designated features are outlined in **Table 3**, but are mostly limited to dunes and dune vegetation. The 'perennial vegetation of stony banks' and 'annual vegetation of drift lines' features could potentially be found on the intertidal. As noted in **Section 8.1.4**, no samples will be removed during the survey and any small areas of sediment dug-over in the intertidal area will be quickly infilled following cessation of the activity. Any effect will be localised and temporary and in the immediate vicinity of the sampling location.

Indirect effects on benthic, intertidal and coastal features of Natura 2000 sites have also been considered. The surveys will not affect sediment supply, any disturbance to the sediment from grab samples and CPT will be filled in naturally with only temporary minor impressions in the seabed visible. Bedload sediment transport changes are typically restricted to areas local to each grab and there is very little effect at distance.

No effects are expected as a result of suspended sediment dispersion and smothering, due to the small scale of the sediment disturbance from benthic sampling. Any smothering would be a very small thin layer within the vicinity of the sample locations due to the small volumes of sediment removed during sampling. Even for the construction of offshore wind farms, the majority of disturbed sand will typically settle within short distances, for example 500m with very small levels of smothering (Ørsted, 2018). The sediment

displaced from the proposed surveys will be negligible in comparison to the sediment transport in the area and will be within levels of natural variability.

The potential for accidental discharge and spillage of oils, fuels and materials would be managed through compliance with MARPOL.

No likely significant effect for the project alone or in combination with other projects and plans (see **Section 1** for details of other projects considered) on any site designated for benthic, intertidal and coastal features. It is concluded and no further assessment is required.

8.3 Connectivity with migratory fish associated with a SAC

The Source/Pathway/Receptor approach was undertaken to identify the mechanisms that the proposed site investigation surveys may potentially affect the fish that are qualifying features of interest of European sites.

The European sites that have fish species as features of interest were identified, this included:

- Determining if the cable AoS overlaps with any European sites for fish species;
- Identifying a list of sites for each species that has potential connectivity for potential effects relevant to fish based on:
    - the distance between the cable AoS and a SAC with a fish interest feature that is within the range for which there could be an interaction e.g. the distance of the SAC from the source of underwater noise that is within the range of sound transmission; and
    - the likelihood that a foraging area or a migratory route occurs within the cable AoS for the different qualifying features of interest.

European sites were identified for features of interest of Annex II fish species, including sea lamprey, river lamprey, twaite shad, allis shad (UK SACs) and Atlantic salmon within the Irish Sea. The following section outlines the potential for the site investigation surveys to have a LSE on the features of interest of the sites either alone or in combination with other plans and projects.

The site investigation surveys (source) have the potential for effect on migratory fish (receptor) through the following pathways:

- Physical damage, disturbance and Sediment removal from sampling (pathway) leading to physical damage and disturbance;
- Increased suspended sediments and sediment re-deposition (pathway) leading to gill damage or barrier effects;
- Accidental pollution (pathway) event leading to toxic contamination; and
- Introduction of invasive species from the vessels hull (pathway) leading to non-toxic contamination; and
- Underwater noise from the vessels leading to auditory damage.

Annex II fish species that that are known to either migrate through or spend part of their lifecycle in the Irish Sea were identified (pathway). European sites designated for Annex II fish species were considered in the screening exercise.

The closest SAC designated for fish is the Slaney River Valley SAC which is approximately 54km away from the cable AoS. The Slaney River Valley SAC designated species known to be migratory species are sea lamprey, river lamprey, twaite shad, and Atlantic salmon.

Disturbance to supporting habitats and removal of sediment from sampling surveys will be localised to the immediate vicinity of the sediment sampling location. Suspended sediment plumes and changes to seabed characteristics are expected to be localised and negligible in comparison to natural sediment transport (see **Section 8.2**). The Slaney River Valley SAC is significantly beyond the potential distance for effects from sediment removal and disturbance. There is the potential for changes in water quality as a result of accidental discharge and spillage of oils, fuels and materials. If any such substances were accidentally released / leaked, quantities would likely be small due to relatively small amounts being present on the vessel. In addition, the survey vessels will be operating a considerable distance from rivers that are used as migratory routes for fish. Therefore potential effects to water quality which could act as a chemical barrier and prevent the successful passage of migratory fish are not predicted. In addition, the impacts on migratory fish egg survival rate for such fish as salmonids is also not predicted in response to eggs and young fry being associated with the freshwater environment of rivers.

Furthermore, given the behavioural traits of migratory fish, who have no designated offshore congregation grounds like marine fish, such as herring, and thus would not be susceptible to direct local mortality or fish kills from potential offshore accidental spills and leaks.

Of the four fish species designated in the Slaney River Valley SAC, only Atlantic salmon and twaite shad are known to be sensitive to noise[8].

The site investigation surveys from the vessel and geophysical survey could cause underwater noise within the immediate vicinity of the survey vessel. Nedwell *et al.* (2012) estimated that seismic surveys could cause potential impacts to Atlantic herring (a noise sensitive species) up to 4km. Atlantic Herring is more sensitive to sound than salmon and is thought to be comparable with twaite shad, as for both species hearing involves the swim bladder and both are from the order of Clupeiformes (Nedwell *et al.*, 2008; Popper & Hawkins, 2019). Levels of sensitivity for designated species are listed in **Table 4.**

*Table 4 Levels of hearing sensitivity for designated species of fish**

Category	Mortality/potential mortal injury	Recoverable injury	TTS	Designated species	Sensitivity to noise
Fish with a swim bladder or other air cavities to aid hearing	207 dB SEL_{cum} or >207 dB SPL_{peak}	203 dB SEL_{cum} or >207 dB SPL_{peak}	186 dB SEL_{cum}	Twaite shad	High (Hearing specialist)
Fish with a swim bladder than does not aid hearing	210 dB SEL_{cum} or >207 dB SPL_{peak}	203 dB SEL_{cum} or >207 dB SPL_{peak}	>186 dB SEL_{cum}	Atlantic salmon	Medium (Hearing generalist)
Fish without a swim bladder	219 dB SEL_{cum} or >213 dB SPL_{peak}	216 dB SEL_{cum} or >213 dB SPL_{peak}	>>186 dB SEL_{cum}	River and sea Lamprey	Low

[8] *Although allis shad is also sensitive to noise, no designations have been made in regard to the species in Ireland. The closest site designated for allis shad is the Pembrokeshire Marine/ Sir Benfro SAC located 103.8km from the foreshore licence survey area which is considered too far to have any impact on the species*

(Popper et al. 2014) (TTS is defined as short or long-term changes in hearing sensitivity that may or may not reduce fitness)

The underwater noise generated by the works are identified in **Section 1.2** of Schedule of Works (Royal HaskoningDHV, 2022b – document reference UB1019-RHD-ZZ-XX-RP-Z-0011). This underwater noise could potentially affect fish sensitive to noise and act as a barrier that could impede migration pathways. Due to the distance of the Slaney River Valley SAC to the cable AoS, it is highly unlikely that the survey noise would act as a barrier to migration. There is therefore considered to be no pathway for effect. In addition, the surveys would be temporary.

The potential for accidental discharge and spillage of oils, fuels and materials would be managed through compliance with MARPOL.

Considering the zone of influence of survey activities, **no likely significant effect is predicted** for the Slaney River Valley SAC. Given that the Slaney River Valley SAC includes all species of relevance and other European sites designated for fish species are located at further distances from the zone of influence, it can be concluded that **no likely significant effect is predicted for the project alone or in combination with other projects and plans** (see **Section 1** for details of other projects considered).

8.4 Connectivity with marine mammals associated with a SAC

A Source-Pathway-Receptor approach was adopted to understand the mechanisms by which the project might affect qualifying features of interest of European sites where marine mammals are a qualifying feature.

For marine mammals, the European sites applicable for each species were identified, this included:

- Determining if the cable AoS overlaps with any European sites for marine mammal species; and
- Identifying a list of sites for each species that has potential connectivity for potential effects relevant to marine mammals based on:
  - qualifying interest features identified as being present in the area; and
  - the foraging ranges of the different qualifying interest features.

European sites were identified for harbour porpoise, bottlenose dolphin, grey seal and harbour seal by their relevant MUs as noted in **Section 6.1**. The following sections outline the potential for the proposed surveys to have a LSE on the interest features of the European sites either alone or in combination with other plans and projects.

All European sites are included where the species is a grade A, B or C[9] feature. Grade D[10] indicates a non-significant population and does not require management for their conservation (European Commission, 2011) and these European sites were not considered further.

8.4.1 Activities that have the potential to affect marine mammals

The range of proposed surveys to be undertaken at the cable AoS are outlined in the Schedule of Works (Royal HaskoningDHV, 2022b – document reference: UB1019-RHD-ZZ-XX-RP-Z-0011). With regard to marine mammals, effects from marine works could include the following, each of which is described in further detail below:

[9] *Grade A refers to the population within the SAC representing more than 15% of the national population of that species, Grade B refers to a site population representing between 2 and 15% of the national population, and Grade C is for a site population of less than 2% of the national population, as described on page 198/62 of European Commission, 2011*

[10] *Grade D is defined as where a species is rarely observed in the site, for example vagrant species, and therefore not considered to be a significant population. Where a species is given a population Grade of D within a site assessment, no other indication is required for other site evaluation criteria, as described on page 198/62 of European Commission, 2011*

- Underwater noise disturbance;
- Potential collision risk with vessels;
- Potential barrier effects;
- Potential disturbance at haul out sites (for grey seal and harbour seal only);
- Potential changes in water quality, including from accidental spills and leaks;
- Potential effects on in prey species; and
- In combination effects.

8.4.1.1 Underwater Noise Disturbance

Underwater noise can cause both physiological (e.g. lethal, physical injury and auditory injury) and behavioural (e.g. disturbance and masking of communication) effects on marine mammals (e.g. Bailey *et al.*, 2010; Madsen *et al.*, 2006; Thomsen *et al.*, 2006, Thompson *et al.*, 2010).

High exposure levels from underwater noise sources can cause auditory injury or hearing impairment taking the form of a permanent loss of hearing sensitivity / change in hearing sensitivity (Permanent Threshold Shift (PTS)) or a temporary loss in hearing sensitivity / change in hearing sensitivity (Temporary Threshold Shift (TTS)). The potential for auditory injury is not just related to the level of the underwater sound and its frequency relative to the hearing bandwidth of the animal but is also influenced by the duration of exposure. The level of effect on an individual is a function of the Sound Exposure Level (SEL) that an individual receives as a result of underwater noise.

Marine mammals may exhibit varying intensities of behavioural response at different noise levels. These include orientation or attraction to a noise source, increased alertness, modification of characteristics of their own sounds, cessation of feeding or social interaction, alteration of movement / diving behaviour, temporary or permanent habitat abandonment, and in severe cases, panic, flight stampede or stranding, sometimes resulting in injury or death. The response can vary due to exposure level, the hearing sensitivity of the individual, context, previous exposure history or habituation, motivation and ambient noise levels (Southall *et al.*, 2007[11]).

Vessel Noise

All required surveys (including for any boat-based ecological surveys undertaken for sea birds and marine mammals) at the cable AoS could increase the number of vessels in the area, which would produce underwater noise, although at relatively small levels. Acoustic broadband source levels typically increase with increasing vessel size, with smaller vessels (<50m) having source levels 160-175 dB (re 1µPa), medium sized vessel (50-100) 165-180 dB (re 1µPa) and large vessels (>100m) 180-190 dB (re 1µPa) (Richardson, *et al.* 1995). Noise levels reported by Malme *et al.* (1989) and Richardson *et al.* (1995) for large surface vessels indicate that physiological damage to auditory sensitive marine mammals is unlikely, and a study of the noise source levels from several different vessels (Jones *et al.*, 2017) shows that for a cargo vessel of 126m in length (on average), travelling at a speed of 11 knots (on average) would generate a mean sound level of 160 dB re 1 µPa @ 1m (with a maximum sound level recorded of 187 dB re 1 µPa @ 1m). However, the levels could be sufficient to cause local disturbance to sensitive marine mammals in the immediate vicinity of the vessel, depending on ambient noise levels.

Underwater noise generated by vessels would not be sufficient to cause PTS, and the potential for TTS is only likely if the animal remains in very close proximity to a vessel for a prolonged period of time, which is highly unlikely (see **Appendix 1** of the **Schedule of Works** for specification of example survey vessels

[11] *While the DAHG (2014) guidance refers to the Southall et al., (2007) thresholds for noise impacts, it is considered the assessment in this report (using the NMFS (2018) and Southall et al., (2019) thresholds) indicates that the proposed measures, in line with the guidance, is appropriate, however the most recent guidance will be used at the time of the surveys will be used.*

which are likely to be small or medium sized vessels). Disturbance is therefore the only potential effect associated with the presence and underwater noise of vessels.

Modelling by Heinänen and Skov (2015) indicates that the number of ships represents a relatively important factor determining the density of harbour porpoise in the Celtic and Irish MU during summer, with markedly lower densities with increasing levels of traffic. A threshold level in terms of effect is approximately 15,000 ships per year (approximately 50 vessels per day within a 5km^2 area).

Current traffic density is very high in the cable AoS, due to the proximity to Wicklow Port and traffic travelling from Dublin Port. Dublin Port has just under 8,000 vessel arrivals a year, or 22 vessels per day (7,898 recorded arrivals in 2019; Dublin Port Company, 2020).

Taking into account that not all proposed surveys would be taking place at the same time, and the relatively high number of vessels already using the cable AoS, the potential for significant disturbance to marine mammals is unlikely as the increase in the number of vessels present as a result of the surveys would be small. The number of vessels in the area per day would be unlikely to exceed the Heinänen and Skov (2015) threshold level of 50 vessels within a 5km^2 area.

In addition, the survey vessels (including for boat-based seabird and marine mammal surveys) would be slow moving (or stationary) and most noise emitted is likely to be of a lower frequency, associated with large, slow moving vessels and the use of dynamic positioning systems. Therefore, it is **not considered that there would be LSE for marine mammal species as a result of vessel noise**, and therefore all other vessel noise have been screened out of further assessment.

Survey Noise Sources

There will be no significant underwater acoustic signal result from the operation of CPT, or from vibrocores, benthic video or grab surveys. Data indicates that sound pressure levels are not at a level that is thought to cause a disturbance or injury to marine mammals (e.g. Erbe & McPherson, 2017).

Therefore, of the surveys to be undertaken, only geophysical surveys have the potential to emit significant levels of underwater noise (potential noise levels identified in **Section 1.2** of the **Schedule of Works** (Royal HaskoningDHV, 2022b - document reference: UB1019-RHD-ZZ-XX-RP-Z-0011). As such, there potential for LSE from underwater noise as a result of the geophysical surveys for all cetacean and pinniped species, and therefore **this effect will be considered further**.

8.4.1.2 Potential collision risk with vessels

Marine mammals are able to detect and avoid vessels. However, vessel strikes are still known to occur, possibly due to distraction whilst foraging and socially interacting, or due to the marine mammals' inquisitive nature (Wilson *et al.,* 2007). Therefore, increased vessel movements, especially those outside recognised vessel routes, can pose an increased risk of vessel collision to harbour porpoise, bottlenose dolphin, grey seal and harbour seal.

Studies have shown that larger vessels are more likely to cause the most severe or lethal injuries, with vessels over 80m in length causing the most damage to marine mammals (Laist *et al.,* 2001). Vessels travelling at high speeds are considered to be more likely to collide with marine mammals, and those travelling at speeds below 10 knots would rarely cause any serious injury (Laist *et al.,* 2001). Given that all vessels will be slow moving, that the majority would be less than 80m in length (with the geotechnical survey vessels having the potential to reach 55-90m in length), and that the area is relatively busy in nature with regards to vessels, it is considered **unlikely for there to be the potential for LSE for any marine mammal species are a result of collision risk**.

8.4.1.3 Potential barrier effects

There is no potential for barrier effects to marine mammals as a result of the proposed surveys, preventing movement of marine mammals between important feeding and / or breeding areas, or potentially increasing swimming distances if marine mammals avoid the cable AoS and go around it. The potential for underwater noise disturbance is considered above. Therefore, there is **no potential for LSE as a result of barrier effects from the presence of the proposed surveys themselves.**

8.4.1.4 Potential disturbance at haul-out sites

Hauled-out seals are sensitive to disturbance, particularly if they are in their breeding or moult periods. As outlined in **Sections 5.4.3.1** and **5.4.3.2**, the nearest grey seal and harbour seal haul-out sites are at a sufficient distance that there would be no disturbance effect at the haul-out sites themselves (20km to the nearest grey seal and harbour seal haul-out site).

Studies on the distance of disturbance, on land or in the water, from hauled-out seals have found that the closer the disturbance, the more likely seals are to move into the water. For the grey seal, mothers responded by moving into the water more due to boat speed rather than as a result of the distance, although movement into the water was generally observed to occur at distances of between 20m and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey seals have also been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014).

A study of the reactions of harbour seal from cruise ships found that, if a cruise ship was less than 100m from a harbour seal haul-out site, individuals were 25 times more likely to flee into the water than if the cruise ship was at a distance of 500m from the haul-out site (Jansen *et al.,* 2010). At distances of less than 100m, 89% of individuals would flee into the water, at 300m this would fall to 44% of individuals, and at 500m, only 6% of individuals would flee into the water (Jansen *et al.,* 2010). Beyond 600m, there was no discernible effect on the behaviour of harbour seal.

There is the potential for underwater noise disturbance of seals at the cable AoS, however this is considered in the underwater noise assessment as described above. The distance between the cable AoS and the nearest grey and harbour seal haul-out sites (20km) is considerably more than the reported disturbance distances for both species. In addition, any vessels travelling between the cable AoS and Dublin Port would use existing shipping channels and routes, and considering the already busy nature of the area with regard to shipping, it is **not considered that there would be any potential for LSE for seals as a result of disturbance at seal haul-out sites**.

8.4.1.5 Potential changes in water quality

During the surveys, marine sediment sampling within the geotechnical surveys is a potential pathway for disturbance of the seabed, and re-suspension of sediments, either directly from the seabed, or from sub-seabed drill cuttings and for these re-suspended sediments to be dispersed through the water. As survey samples are small and localised the re-suspension of sediments will be a small volume and will disperse quickly.

There is the potential for changes in water quality as a result of accidental discharge and spillage of oils, fuels and materials (which could also impact upon marine mammal prey species). If any such substances were accidentally released / leaked, quantities would likely be small due to relatively small amounts being present on the vessel.

The short duration and type of survey works proposed and the small scale of sediment disturbance, along with the distance from European sites would only have short term and localised effects on water quality.

Therefore, it is not considered that there is any risk to marine mammals due to changes in water quality, and it **is not considered that there is any potential for LSE**.

The potential for accidental discharge and spillage of oils, fuels and materials would be managed through compliance with MARPOL.

8.4.1.6 Potential effects on prey species

Potential effects on marine mammal prey species include:

- Underwater noise (that could lead to mortality, physical injury, auditory injury or behavioural responses);
- Physical disturbance and temporary loss of seabed habitat; and
- Increased suspended sediment concentrations and sediment re-deposition.

The diet of the harbour porpoise consists of a wide variety of prey species and varies geographically and seasonally, reflecting changes in available food resources. Harbour porpoise have relatively high daily energy demands and need to capture enough prey to meet its daily energy requirements. It has been estimated that, depending on the conditions, harbour porpoise can rely on stored energy (primarily blubber) for three to five days, depending on body condition (Kastelein *et al.*, 1997). Harbour porpoise are therefore considered to have low to medium sensitivity to changes in prey resources.

Bottlenose dolphin are opportunistic feeders that have large foraging ranges (Santos *et al.*, 2001; Reid *et al.*, 2003; Dencer-Brown, 2012) and are therefore considered to have low sensitivity to changes in prey resources.

Grey and harbour seal feed on a variety of prey species. Both species are considered to be opportunistic feeders that are able to forage in other areas and have relatively large foraging ranges. Grey seal and harbour seal are therefore considered to have low sensitivity to changes in prey resources.

As outlined above, the potential for any physical disturbance and temporary loss of seabed habitat or increased suspended sediment concentrations and sediment re-deposition is unlikely and will only affect a small area for a very short period of time, therefore there are unlikely to be any effects on marine mammal prey species.

The effects of underwater noise on prey species will be less than the potential impacts on marine mammal species, i.e. the impact ranges for fish will be less than those for marine mammals. As the potential effects of underwater noise assessed for marine mammals, as outlined above, are greater than those predicted for their prey, there would be no further effect as marine mammals would already be disturbed from the area of potential prey displacement.

Given the potential for temporary and insignificant effects on fish species and the ability of marine mammals to feed on a wide range of prey, and to move to other locations for foraging in the event that there is a change in prey availability in the cable AoS, it is **not considered that there is the potential for LSE for any marine mammal species**.

8.4.1.7 In combination effects

There is the **potential for in combination effects on all marine mammal species**, as a result of underwater noise. As shown in **Section 1**, there is the potential for other geophysical surveys to be undertaken at the same time as the Wicklow surveys, with the same potential for underwater noise effects. There is therefore the potential for LSE, and this will be assessed further in the NIS (Royal HaskoningDHV, 2022a – document reference UB1019-RHD-ZZ-XX-RP-Z-0011).

8.4.1.8 Summary of Potential for LSE for Marine Mammals

Table 5 shows the effect pathways that have been screened in or out of the potential for LSE on European sites. For those sites screened in for assessment, based on their location in relation to each species' relevant MU, the effects with potential for LSE will be further assessed.

Table 5 Summary of Potential Effects for Marine Mammals

Effect Pathway	Screened in for potential LSE	Screened out for potential LSE
Underwater noise from surveys	✓	
Underwater noise from vessels		✓
Potential for collision risk with vessels		✓
Potential barrier effects		✓
Potential disturbance at haul out sites		✓
Potential changes in water quality		✓
Potential effects on prey species (due to changes in water quality only)		✓
In combination effects	✓	

8.4.2 Screening of designated sites for marine mammals

8.4.2.1 Harbour porpoise

For harbour porpoise, initially connectivity was determined to be possible between the project and any European site within the Irish Sea. The closest designation to the cable AoS is the Rockabill and Dalkey SAC (16.5km from the cable AoS).

Rockabill to Dalkey SAC

The Rockabill and Dalkey SAC represents a key habitat for harbour porpoise within the Irish Sea. The species occurs year-round within the SAC and comparatively high group sizes (more than five individuals) have been recorded to the east of Ireland. Porpoises with calves are generally observed in Irish waters between May and June, although the calving period can extend into the later summer and autumn (O'Brien and Berrow, 2016). Casual and effort-related sighting rates from coastal observation stations are significant for the east coast of Ireland and the latter appear to be relatively stable across all seasons (DAHG, 2014).

Surveys in the summer and autumn of 2008 indicate an estimated density of 0.54-6.93 individuals per km^2 in the northern part of the SAC, and 0.48-2.05 individuals per km^2 in the southern part of the SAC (closest to the cable AoS) (O'Brien and Berrow, 2016). A more recent survey was carried out at the SAC in 2016, which resulted in estimated density estimates of 1.55 (±0.17) individuals per km^2 (with a range of 1.37 – 1.87 per km^2), with an abundance of an estimated 424 (±46) (range of 374 to 511) (O'Brien & Berrow, 2016). While these survey results indicate a certain level of abundance of harbour porpoise within the Rockabill to Dalkey SAC, there is no detailed information currently available on individual or group movements by harbour porpoise within or into and out of the SAC, and no known information on whether individuals or groups of the species demonstrate any faithfulness to the SAC (i.e. site fidelity or residency).

As the number of harbour porpoise within the SAC is not known, and as the number within the site would naturally vary, it is not considered appropriate to assess potential effects against a specific number of individuals within the SAC. As harbour porpoise are considered part of a wider population (within the MU),

and due to the highly mobile nature of the species, it is more appropriate to consider potential effects against that wider MU population.

The Rockabill and Dalkey SAC contains a wide array of habitats believed to be important for harbour porpoise. The conservation objective for the Rockabill and Dalkey SAC *"To maintain the favourable conservation condition of Harbour porpoise in Rockabill and Dalkey SAC"* which is defined by the attributes and targets as set out in **Table 6.**

Table 6 Attributes and targets for harbour porpoise at Rockabill and Dalkey SAC

Target	Attribute
Access to suitable habitat	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 harbour porpoise 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.
Disturbance	Human activities should occur at levels that do not adversely affect the harbour porpoise population at the site. 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 community of harbour porpoise within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to proposed activities or operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour porpoises 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. Proposed activities or operations should not cause death or injury to individuals to an extent that may ultimately affect the harbour porpoise community at the site.

Other Harbour Porpoise Designated SACs

Other European sites designated for the harbour porpoise within the screening area are the North Anglesey Marine / Gogledd Môn Forol SAC, West Wales Marine / Gorllewin Cymru Forol SAC, and the North Channel SAC. The North Anglesey Marine / Gogledd Môn Forol SAC is the closest at 49km from the cable AoS.

For harbour porpoise, initially connectivity was determined to be possible between the cable AoS and any European site within the Irish Sea. As the harbour porpoise population present within the cable AoS are most likely from the Irish Sea MU, and potential effects have a limited range, European sites beyond the MU were not considered further.

8.4.2.2 Summary of Screening for Harbour Porpoise

The SACs designated for harbour porpoise with potential for LSE for harbour porpoise, due to the potential effects of underwater noise and in combination effects are:

- Rockabill and Dalkey SAC;
- North Anglesey Marine / Gogledd Môn Forol SAC;
- West Wales Marine / Gorllewin Cymru Forol SAC;
- North Channel SAC;

- Mers Celtiques - Talus du golfe de Gascogne SAC;
- Ouessant-Molène SAC;
- Abers - Côte des legends SAC;
- Nord Bretagne DH SAC;
- Côte de Granit rose-Sept-Iles SAC;
- Tregor Goelo SAC;
- Baie du Mont Saint-Michel SAC;
- Chausey SAC;
- Récifs et landes de la Hague SAC;
- Anse de Vauville SAC; and
- Banc et récifs de Surtainville SAC.

All other potential effects from the surveys as outlined in **Section 8.4.1** are considered to have no potential for LSE for all SACs designated for harbour porpoise. LSE that have been determined are those potential effects that cannot be discounted without further assessment. Potential impacts and results of the screening exercise are detailed in **Table 9.**

8.4.2.3 Bottlenose Dolphin

For bottlenose dolphin, connectivity was considered possible between the proposed survey work and any European site within the Irish Sea. The closest designated site to the cable AoS is the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC (68km from the cable AoS).

The Pen Llyn a'r Sarnau / Lleyn Peninsula Sarnau SAC
The Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC is designated for primarily Annex I habitats, (NRW, 2018). Bottlenose dolphin and grey seal are Annex II species present at this site as a qualifying feature, but not a primary reason for site designation.

Bottlenose dolphins are considered to be of significant importance within the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC, however, they do not form a resident population but should be considered as part of the wider Wales population, including those of Cardigan Bay. Photo-identification studies have revealed that the dolphins present in this site travel between the Pen Llŷn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and Bae Ceredigion/Cardigan Bay SAC. Both these sites are within Cardigan Bay and their population should be considered together. It was estimated in 2007 that there were 397 individuals within the Bae Ceredigion/Cardigan Bay SAC for the period 2001-2007 (CCW, 2009a). More recent population estimates for the wider Cardigan Bay vary between 254 and 330 animals (CV = 0.25 – 0.28) for the years 2011 and 2013 inclusive (Feingold and Evans, 2014).

The conservation objectives for bottlenose dolphin are that the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC will:

> "*continue to provide a productive and supportive marine area for bottlenose dolphin. Bottlenose dolphin will continue to be widespread within the waters of the SAC and those frequenting the SAC*

will reflect a healthy population structure including immature and adult male and female dolphins. The bottlenose dolphins in the SAC will form an important component a larger population of this species present in Cardigan Bay and in the wider sea area around Wales and the north east Atlantic. The animals using the SAC will reflect good physiological health. The bottlenose dolphins will have access to and sufficient availability of prey, and they will have widespread availability and access to good quality essential habitats free from excessive disturbance. The quality and distribution of essential habitats (such as for feeding, calving, resting and travelling) within the site will be maintained or improved through appropriate management".

The Conservation Objectives for bottlenose dolphin at the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC are summarised in **Table 7.**

Table 7 Attributes and targets for bottlenose dolphin at Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

Target	Attribute
Population	The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include: Population size; Structure; Production; and Condition of the species within the site. As part of this objective it should be noted that: Contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression.
Range	The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future: Their range within the SAC and adjacent inter-connected areas is not constrained or hindered. There are appropriate and sufficient food resources within the SAC and beyond. The sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.
Supporting Habitats and Species	The presence, abundance, condition and diversity of habitats and species required to support these species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include: Distribution; Extent; Structure; Function and quality of habitat; and Prey availability and quality. As part of this objective it should be noted that: The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term. The management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term. Contamination of potential prey species should be below concentrations potentially harmful to their physiological health. Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour
Restoration and recovery	As part of this objective it should be noted that for the bottlenose dolphin populations should be increasing.

Other Bottlenose Dolphin Designated SACs

Other European sites designated for bottlenose dolphin within the screening area is the Cardigan Bay/ Bae Ceredigion SAC. For bottlenose dolphin, initially connectivity was determined to be possible between the cable AoS and any European Designated Site within the Irish Sea. The bottlenose dolphin population in the Irish Sea is the most likely population to interact with the cable AoS. Therefore, European sites outside this MU were not considered further.

8.4.2.4 Summary of Screening for Bottlenose Dolphin

The SACs designated for bottlenose dolphin with potential for LSE for bottlenose dolphin, due to the potential effects of underwater noise and in combination effects are:

- The Pen Llyn a'r Sarnau / Lleyn Peninsula Sarnau SAC; and
- Cardigan Bay/ Bae Ceredigion SAC.

All other potential effects from the surveys as outlined in **Section 8.4.1** are considered to have no potential for a LSE for all SACs designated for bottlenose dolphin. LSE that have been determined are those potential effects that cannot be discounted without further assessment. Potential impacts and results of the screening exercise are detailed in **Table 10**

8.4.2.5 Grey Seal

For grey seal, initially connectivity was determined to be possible between the cable AoS and any European site within the Irish Sea. The closest designated site is the Lambay Island SAC which is 43km from the cable AoS.

Lambay Island SAC

The Lambay Island SAC is primarily designated for the Annex I habitats of reefs and vegetated sea cliffs, and the Annex II species of both grey and harbour seal (NPWS, 2013b). Lambay Island supports the main breeding colony of grey seal along the east coast of Ireland, with an estimated overall population of 270-347, and a recorded minimum pup production of 58 (based on aerial surveys undertaken in 2009, 2011 and 2012) (O'Cadhla *et al.*, 2013). Grey seal occur year-round at the site, along the intertidal coasts, coves and caves (NPWS, 2013b).

The Conservation Objectives for grey seal and harbour seal at the Lambay Island SAC (NPWS, 2013b) are:

> *"to maintain the favourable conservation condition of grey seal and harbour seal in Lambay Island SAC, which is defined by the following list of attributes and targets"* (**Table 8**).

Table 8 Attributes and targets for grey seal and harbour seal at Lambay Island SAC

Target	Attribute
Access to suitable habitat	Species range within the site should not be restricted by artificial barriers to site use.
Breeding behaviour	The breeding sites should be maintained in a natural condition.
Moulting behaviour	The moult haul-out sites should be maintained in a natural condition.
Resting behaviour	The resting haul-out sites should be maintained in a natural condition.
Disturbance	Human activities should occur at levels that do not adversely affect the grey seal population at the site.

Other Grey Seal Designated SACs
Other European sites designated for grey seal within the screening area are the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC, Cardigan Bay/ Bae Ceredigion SAC, Saltee Islands SAC, Pembrokeshire Marine/ Sir Benfro Forol SAC, and The Maidens SAC. For grey seal, initially connectivity was determined to be possible between the cable AoS and any European site within the Irish Sea. The grey seal population in the Irish Sea is the most likely population to interact with the cable AoS. Therefore, European sites outside this area were not considered further.

8.4.2.6 Summary of Screening for Grey Seal

The SACs designated for grey seal with potential for LSE for grey seal, due to the potential effects of underwater noise and in combination effects are:

- Lambay Island SAC;
- Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC;
- Cardigan Bay/ Bae Ceredigion SAC;
- Saltee Islands SAC;
- Pembrokeshire Marine/ Sir Benfro Forol SAC; and
- The Maidens SAC.

All other potential effects from the surveys as outlined in **Section 8.4.1** are considered to have no potential for a LSE for all SACs designated for grey seal. LSEs that have been determined are those potential effects that cannot be discounted without further assessment. Potential impacts and results of the screening exercise are detailed in **Table 9.**

8.4.2.7 Harbour Seal

For harbour seal, initially connectivity was determined to be possible between the project and any European Designated Site within the Irish Sea. As for grey seal, the closest designated site to the cable AoS is the Lambay Island SAC (43km from the cable AoS).

Lambay Island SAC

Lambay Island has a regionally significant number of harbour seal, of which up to 60 individuals have been counted at the site (Duck & Morris, 2019), which occur year-round, along the intertidal and in coves and caves (NPWS, 2013b).

The Conservation Objectives for harbour seal are outlined in **Table 8**.

Other Harbour Seal Designated SACs
Other European sites designated for harbour seal within the screening area are the Murlough SAC, Slaney River Valley SAC, Strangford Lough SAC, and The Maidens SAC. For harbour seal, initially connectivity was determined to be possible between the proposed survey work and any European Designated Site within the Irish Sea. The harbour seal population in the Irish Sea is the most likely population to interact with the cable AoS. Therefore, European sites outside this area were not considered further.

8.4.2.8 Summary of Screening for Harbour Seal

The SACs designated for harbour seal with potential for LSE for harbour seal, due to the potential effects of underwater noise and in combination effects are:

- Lambay Island SAC;
- Murlough SAC;
- Slaney River Valley SAC;
- Strangford Lough SAC; and
- The Maidens SAC.

All other potential effects from the surveys as outlined in **Section 8.4.1** are considered to have no potential for a LSE for all SACs designated for harbour seal. LSE that have been determined are those potential effects that cannot be discounted without further assessment. Potential impacts and results of the screening exercise are detailed in **Table 9.**

8.5 Connectivity with bird species associated with SPAs

8.5.1 Activities that have the potential to affect birds

The Source-Pathway-Receptor approach was undertaken to identify the mechanisms that the site investigation surveys may potentially affect the birds that are qualifying interest features of SPAs.

The potential routes to impact from activities associated with surveys in the foreshore licence area primarily relate to direct impacts on birds via disturbance and/or displacement and indirect impacts on prey and/or habitats.

The proposed site investigation surveys that involve the presence of a vessel are: sub-bottom profiling, geotechnical site investigations, SSS and MBES. Surveys may be scheduled in any month or season of the year and will involve vessel movements (including some use of jack-up barges); surveying of currents and waves using instruments placed on surface or seabed-mounted buoys; mapping and surveying of seabed using sonar and magnetometer technology; vibrocore (up to 8 m) and core sampling of solid seabed; and grab sampling (typically 0.1m^2) of benthic macrofauna and sediment. Surveys are expected to use a maximum of one vessel and this is adopted as the worst-case scenario for ornithological assessment.

The impacts identified below are as summarised by the statutory body in England based on the history of offshore renewables surveying and cabling in UK waters (Natural England 2022). These impacts are expected to apply equally in Irish waters.

The medium to high-risk sources of potential direct impact to birds from survey activities are considered to be:

- disturbance/displacement/barrier to birds from survey activities, presence of vessels and associated equipment (visual disturbance, noise (above-water and underwater)),
- changes in suspension of sediments and other solid material (affecting water clarity).

The medium to high-risk sources of potential indirect impact to birds via prey and/or supporting habitats, across survey activities, are considered to be:

- disturbance/displacement effects on birds' prey populations e.g. fish and invertebrates, from vibration, noise or physical disturbance to the seabed and its substrata,
- changes in suspension of sediments and other solid material.

An additional range of sources of impact are cited as low risk (Natural England 2022), and typically require consideration in assessment when site-specific factors are present that elevate the risk, or create uncertainty regarding the level of pressure on the receptor. These include impacts for which there is limited scientific evidence of their prevalence or severity such as:

- introduction of light, invasive and non-indigenous species, nutrients, or organic matter,
- deoxygenation,
- contamination from litter, hydrocarbons, synthetic compounds, transition elements or organometals.

8.5.1.1 Underwater noise disturbance

Birds vary in their sensitivity and response to noise. While noise impacts are central to assessment for fish and marine mammals, underwater noise is not considered a similar risk factor for birds. Among diving birds, there are further divergences in foraging method such as the key sensory pathway by which the bird detects prey (visual above or below water, potentially sound or touch), the position from which the bird submerges (plunging or from at rest on surface), the depth of its dives, the amount of time the bird is underwater, and whether the bird continues to actively sense and pursue its prey once submerged. While few underwater foraging and hunting methods appear to involve auditory detection of prey, there is the question of whether diving birds' auditory sense remains acute in water and whether the bird is therefore vulnerable to noise disturbance during foraging. Dooling and Therrien (2012) suggest that birds do not hear well underwater. Their anatomical studies of ear structures of diving birds suggested that adaptations to protect the skull from pressure changes during diving, may reduce hearing acuity underwater therefore protecting the ear from damage in presence of excessive underwater noise (Dooling & Thierren 2012). However, Zeyl *et al.* (2022), assessing aquatic bird anatomy noted that taxa with underwater pursuit foraging style and deep diving capability had adaptations which likely facilitate both underwater hearing and protection from pressure change, potentially at the expense of hearing acuity in air. As a potential indication of hearing in active pursuit-hunting diving birds, Hansen *et al.* (2017) demonstrated the hearing sensitivity of cormorants during diving, indicating such species which spend much of their foraging time underwater actively pursuing their prey are likely to have similar hearing sensitivity (and therefore potentially vulnerability to anthropogenic subsea noise) to marine mammals such as seals and toothed whales.

There is a lack of studies on the effects of underwater noise on water column feeders, however one study by Mardik and Camphuysen (2009) concluded that seismic air gun emissions caused no fatalities or affected bird abundance.

8.5.1.2 Above-water noise disturbance

Analysis on seabird vulnerability in the vicinity of offshore wind (Furness *et al*. 2013) and shipping (Fliessbach *et al.* 2019) indicate that all diver species, velvet scoter and common scoter are the species most likely at risk of disturbance or displacement from anthropogenic activities and structures at sea. The risks to divers and scoters from the proposed site investigation works would primarily be survey vessel movement. Based on reported disturbance levels (Burger *et al.* 2019; Mendel *et al.* 2019; Fliessbach *et al.* 2019) and using the precautionary principle, a 5 km ZoI from the cable AoS for divers is used. Fliessbach *et al.* (2019) ranked the terns and gulls as the lowest vulnerability to ship traffic disturbance. Commonly within EIA for offshore wind, above water noise disturbance from construction activities is not considered in isolation as a risk factor for birds; but rather, combined with the presence of vessels, man-made structures,

and human activity, part of the overall disturbance stimulus that causes birds to avoid boats and other structures.

8.5.1.3 Visual disturbance

The presence of the vessels could potentially displace some birds from the survey site whilst the survey is underway, further reducing any noise disturbance to diving birds. Vessels are likely to be slow moving, and the area already experiences regular vessel traffic and, therefore, seabirds are likely to be habituated to this activity.

8.5.1.4 Changes to seabed and substrata

Vibro-coring and other physical seabed and benthic sampling can make highly localised disturbance and structural change to benthic and seabed habitat. However, changes to seabed, benthic community or substrata structure at a scale of significance to seabirds or their prey would likely require repeated or intensive sampling uncharacteristic of a single project's programme of surveys. This impact has more potential to occur in combination with other projects; however, locations subject to invasive exploration and surveys are likely to vary with the location of each project's proposed overall footprint e.g. array area in the case of offshore wind.

8.5.1.5 Potential changes in water quality

Vibro-coring and other physical seabed and benthic sampling disturbs the seabed substrate, potentially causing reduced water clarity through resuspension of sediment. However, a single sampling event is not likely to alter sediment suspension more than what occurs during natural processes, nor is a typical sampling programme given the low intensity of sampling. This impact has more potential to occur in combination with other projects. However, suspension of sediments and other materials caused by offshore projects and surveying is generally short-term temporary. Therefore in combination effects are only likely where survey vessels from multiple projects are operating in close proximity in both time and space. The probability of this scenario is low. Contamination from litter, hydrocarbons, synthetic compounds, transition elements or organometals are routes to impact on birds in the event of accidental spillage or discharge of oils, fuels or other materials. Severity of impact is dependent on the volume of these materials involved in such events, and potential for spillages can be limited through best-practice commitments.

8.5.1.6 Potential effects on prey species

It is possible that any fish near the survey will be temporarily displaced by the noise, thus also displacing the food resource for seabirds. This is an area already busy with regular vessel traffic and fish in waters with regular vessel traffic are likely to be habituated to vessel noise. However, some fish (particularly species whose swim bladder is linked to auditory sense) are sensitive to high noise levels, especially the very high levels associated with acoustic devices used in seismic surveys. The most sensitive species are liable to disturbance at multiple kilometres from the source device (see **Section 8.3**). In the majority of cases, the survey noise impacts will be temporary and over a relatively small proportion of most seabirds' foraging radii and therefore will be unlikely to affect the prey biomass available.

8.5.2 Screening of designated sites for birds

All SPAs with potential connectivity to the cable AoS were identified considering the following criteria:

- Determining if the cable AoS overlaps with any SPAs;
- Assessment of species-specific risk which informs the extent to which populations of particular species may be at risk of disturbance or displacement (Furness *et al.,* 2013, Fliessbach *et al.* 2019); and

- The distance between the cable AoS and a site with a bird interest feature is within the range for which there could be an interaction i.e. the pathway is not too long. For seabirds in the breeding season this element of the screening process is informed by published information on maximum foraging range; and outside the breeding season the likelihood that a foraging area or a migratory route occurs within the cable AoS for the qualifying interest features.

- The likelihood that a foraging area or a migratory route occurs within the cable AoS for the qualifying interest features.

8.5.2.1 The Murrough SPA

The Murrough SPA overlaps with the north portion of the cable AoS (Area A). This site has an approximate total area of 9.6 km^2. It lies along approximately 13 km of the coastline between Wicklow and Kilcoole and extends to 200 m below the low water mark and up to 1 km inland. Existing vessel traffic from the port of Wicklow passes along the coast on which the SPA is situated, with nearest distance of navigation from shore observed to be within 0.6 nautical miles (1.1 km). The cable AoS meets with approximately 8 km of the coastline within the 13 km length of the SPA and extends from offshore to approximately 30 m below the high-water mark. The total overlap area is approximately 1.8 km^2 or 19% of the SPA, comprising entirely marine (intertidal and subtidal) habitat. The SPA is designated for:

- a breeding little tern *Sternula albifrons* population of national importance,
- a wintering red-throated diver population of national importance,
- several wintering waterbird species (many in nationally important numbers; but internationally important numbers of light-bellied brent goose *Branta bernicla hrota*) which use the site for both feeding and roosting:
    - Greylag goose *Anser anser*,
    - Light-bellied brent goose,
    - Wigeon *Mareca penelope*,
    - Teal *Anas crecca*,
    - Black-headed gull *Chroicocephalus ridibundus*,
    - Herring gull *Larus argentatus*, and
    - a Wetland and Waterbirds assemblage exceeding 20,000 individuals.

The conservation objectives for all species which are features of The Murrough SPA are, "*to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA*" where 'favourable conservation status' of a species is achieved under the following criteria:

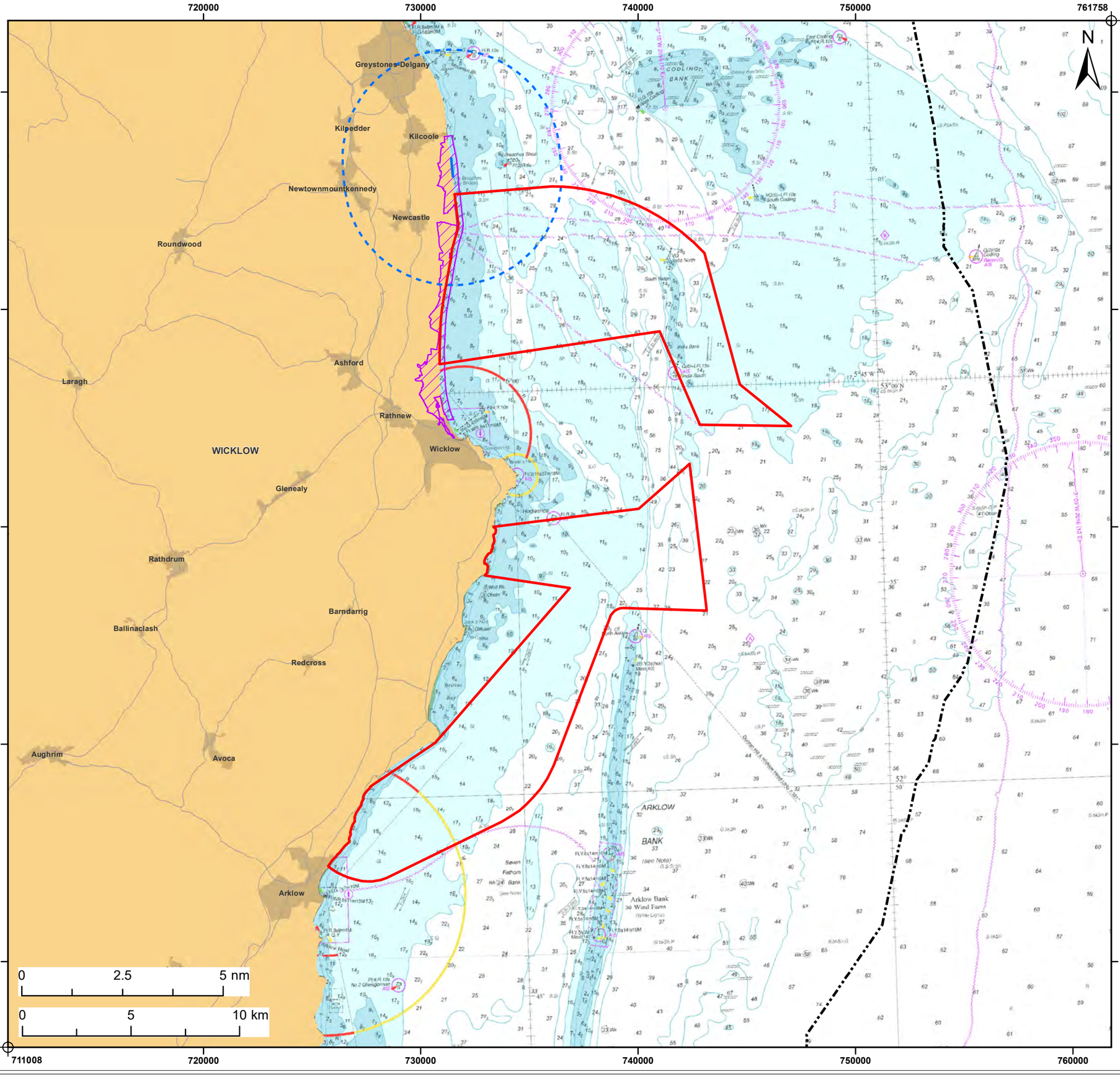
- population dynamics data on the species indicates that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis (NPWS 2022).

Little tern

The little tern is a small seabird listed under Annex I of the EU Birds Directive and is the only breeding qualifying feature of The Murrough SPA. The Murrough SPA nesting colony is located on the shingle ridge near The Breaches at approximate global co-ordinates 53.09062, -6.03709. The species is a summer visitor to Europe, spending the northern winter in equatorial west Africa (Birdlife International 2022). The breeding season of little tern in Irish waters is likely to be similar to that documented for UK waters (May to early August, Furness 2015). Across 368 sightings of little tern recorded for County Wicklow via the eBird database (Cornell Lab of Ornithology, Ithaca NY, USA), little tern occurs between April and August,

which coincides with published UK breeding season plus inbound and outbound migration periods (Furness 2015). The Murrough SPA is considered, *"probably the most important site in the country for nesting little tern*," (NPWS 2015a). The reported population size was 36 pairs (or 72 breeding individuals) in 1995 and 106 pairs were recorded in 2006 (212 breeding individuals) (NPWS 2015a). Breeding success is reported to vary annually, predominantly due to predation (NPWS 2015a).

The mean-maximum foraging range of little tern, based on two studies of one colony totalling 40 tracked individuals, is 5 km (Woodward et al. 2019). The Murrough SPA colony near The Breaches lies within approximately 40 m of the cable AoS boundary as initially drafted. Following identification of the little tern colony location and the proximity of the colony to the initial survey area, the cable AoS boundary was amended to create a buffer of approximately 800 m between the little tern colony and the cable AoS. Applying a semi-circular (seaward) zone of 5 km radius around the nesting colony location near The Breaches as a predicted foraging area, the revised cable AoS overlaps with approximately 40% of this area (**Figure 15**).



Legend:

- Wicklow Cable Area of Search
- The Murrough Special Protection Area (SPA)
- Little Tern Colony
- Little Tern Colny 5km Buffer

Client:	Project:
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

Title: Wicklow Cable Area of Search and the Predicted Foraging Area of Little Tern from the Colony Adjacent to The Breaches within The Murrough SPA, County Wicklow (Based on 5km Maximum Foraging Range across Tracking Studies, Woodward *et al*. 2019)

Figure: 15 | Drawing No: PC3392-RHD-ZZ-XX-DR-Z-0094

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	07/07/2022	[redacted]		A3	1:175,000

Co-ordinate system: IRENET95 Irish Transverse Mercator

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The little tern has a plunge-diving foraging method, reaching depths of up to 80 cm (Cabot & Nisbet 2013, pp27). Among terns, it is the most adherent to inshore waters (Green 2017). Their key prey during the breeding season is fish of approximately 8 cm length for adults, and smaller fish and marine invertebrates such as crustaceans for nestlings (Green 2017). Fish species of importance include, variously, clupeids such as herring or sprat, and sandeels. Key prey invertebrates include *Natantia* genus prawns (Green 2017).

Underwater noise disturbance – Little tern detect their prey visually from above water before they plunge dive and it is considered unlikely that terns (of any species) actively pursue their prey using any senses or cues once submerged, based on the short duration of dives (Cabot & Nisbet 2013, pp27). Little tern therefore have relatively brief exposure time to underwater noise to be a receptor for direct noise disturbance, or for the underwater segments of their foraging dives to be disrupted by noise. While evidence is limited for understanding underwater noise impact on little tern and other tern species, the very limited window for exposure indicates that underwater noise is extremely unlikely to have a direct adverse effect on the little tern feature of the SPA. Underwater noise impact on little tern is screened out of subsequent assessment.

Above-water noise and visual disturbance – due to the proximity of the initial cable AoS boundary to the little tern colony near The Breaches, the cable AoS boundary was amended to give a buffer distance of 800 m to the colony. The resulting 800 m nearest distance between the nesting colony and potentially surveyed inshore areas far exceeds recommended setback distances of 100 m published for related common tern *Sterna hirundo* colonies (Burger 1998). There is considered to be no route to direct impact on nesting terns from survey activities at 800 m distance or more from the colony. Although a relatively large proportion of the colony's foraging area is within the cable AoS, terns at sea are considered to have low sensitivity to disturbance displacement from marine vessel traffic (Fliessbach *et al.* 2019). As a result, an above-water noise and visual disturbance impact on little tern is screened out of subsequent assessment.

Potential effects on prey – The little tern diet comprises prey that vary greatly in sensitivity to underwater noise (Green 2017). Herring (as an example of clupeids) have a threshold sound pressure level of less than 80 dB in the 50-1000 Hz range and 80-140 dB in the 1-5 kHz range (Enger 1967, Nedwell & Mason 2012). They are sensitive to disturbance and displacement from vessel noise, and disturbance, injury or mortality from sound emitted during sub-bottom profiling. However, the number of herring likely to be exposed to injury or mortality is likely to be greatly reduced by the displacement effect of the vessel on which instruments are mounted. In comparison, sandeels, another major fish component of the little tern diet, have low sensitivity to underwater sound (Suga *et al.* 2005, Nedwell & Mason 2012), and are not likely to be affected by vessel or instrument sound emissions. On the basis that alternative prey which are less sensitive to underwater noise are available and already prominent within the little tern diet at many colonies in the biogeographic region (Green 2017), and that the boat-based, temporary, and localised nature of the surveys mean that the majority of effects on herring will be temporary and reversible, it is considered that an effect of surveys on little tern prey availability is unlikely. As a result, this impact is screened out of subsequent assessment.

Changes to water quality – changes in water clarity through sedimentation are not considered to occur at levels significantly different from natural processes. There is a potential risk of contamination effects on water quality from pollution events or spills. Therefore, this effect will be considered further.

Overall, a Likely Significant Effect on the little tern qualifying feature of The Murrough SPA from the project, alone or in combination with other projects, cannot be ruled out, and **The Murrough SPA is screened in for Appropriate Assessment** regarding this species.

Red-throated diver

The red-throated diver is a migratory waterbird of the family Gaviidae listed under Annex I of the Birds Directive. The species has a Holarctic breeding range nesting at freshwater lakes and pools at high latitude, but a strongly marine habitat association at lower latitudes during the non-breeding period (Birdlife International 2022). The Murrough SPA features a nationally important wintering population of red-throated diver, given as 32 individuals (mean of peak count for years 1995/6 to 1999/2000) at designation. Red-throated diver are likely to be present at The Murrough SPA in migration and wintering months, outlined for UK waters (Furness 2015) to overall comprise **September to the following April**:

- September to November (post-breeding migration)
- December to January (winter)
- February to April (return migration)

These seasons are largely reflected within the database of sightings recorded for County Wicklow in eBird (356 observations), with the vast majority of records occurring between September and the final week of the following April. The red-throated diver uses inshore waters of sheltered coasts for all non-breeding activities (foraging, roosting) while present in waters at this latitude during migration and wintering periods. The species has a surface-diving pursuit foraging strategy and the marine diet is composed of fish, crustaceans, molluscs and annelid worms (Birdlife International 2022).

The ZoI of the cable AoS regarding divers and other sensitive diving birds is outlined in **Section 8.5.1.2** to be 5 km. Applying this ZoI as a radius around the overlap area between the SPA and the cable AoS, the entire marine extent of The Murrough SPA lies within the ZoI, or approximately 100% of red-throated diver habitat of the SPA.

Underwater noise disturbance – due to the proportional overlap of the predicted red-throated diver range within the SPA with the cable AoS, effects from underwater noise on red-throated diver in the SPA, either through direct disturbance or disturbance and displacement of prey species, cannot be ruled out.

Above-water noise and visual disturbance – the overlap of the cable AoS with the marine habitat of The Murrough SPA used by red-throated diver, and the documented sensitivity of red-throated diver to disturbance and displacement by vessels, means that an impact of above-water noise and visual disturbance cannot be ruled out.

Potential effects on prey – Red-throated diver are considered to have moderate sensitivity to indirect effects of vessel noise and seabed disturbance on fish and benthic communities (Cook & Burton 2010, accessible in MMO 2018). Fish species including those within the red-throated diver diet vary in their sensitivity to survey activities as reported in **Section 8.3**. Both direct post-mortem study and molecular DNA study of red-throated diver diet in key European wintering areas show the winter diet includes fish of a range of species and taxonomic families (Guse *et al.* 2009, Kleinschmidt *et al*. 2019). Clupeids such as herring and sprat are frequent in the diet. As assessed for little tern effects above, the thresholds and frequency range of auditory systems in herring suggest this species and those with similar hearing systems are sensitive to disturbance and displacement from vessel noise, and disturbance, injury or mortality from sound emitted during sub-bottom profiling. However, the number of individuals likely to be exposed to injury or mortality is likely to be greatly reduced by a (temporary, reversible) displacement effect on these fish species of the vessel on which instruments are mounted. Furthermore, red-throated diver diet includes a diversity of fish taxa of lower sensitivity to noise. On the basis that alternative prey which are less sensitive to underwater noise are available, and that the boat-based, temporary, and localised nature of the surveys mean that the majority of effects on sensitive species such as herring will

be temporary and reversible, it is considered that an effect of surveys on red-throated diver prey availability is unlikely, and this impact is screened out of subsequent assessment.

Changes to water quality – red-throated diver are water column foragers, therefore, any impact on water clarity e.g. due to sediment suspension could potentially impact on their foraging. There is also a potential risk of contamination effects on water quality from pollution events or spills. Therefore, changes to water quality will be considered further.

Overall, a Likely Significant Effect on the red-throated diver qualifying feature of The Murrough SPA from the project, alone or in combination with other projects, cannot be ruled out, and **The Murrough SPA is screened in for Appropriate Assessment** regarding this species.

Wintering waterbirds

In addition to red-throated diver, the Murrough SPA has several wintering waterbirds listed as qualifying features, specifically greylag goose, light-bellied brent goose, wigeon, teal, black-headed gull and herring gull. There is not considered to be a Likely Significant Effect on these qualifying interests of the SPA, as outlined below.

Underwater noise disturbance – The route to impact from underwater noise disturbance to waterbirds requires potential for exposure to underwater noise by birds spending time with their head or entire body in the water column where noise is emitted. Among wintering waterbird qualifying interests of the SPA, wigeon and teal are species which undertake limited feeding by dabbling (with heads below water and foraging primarily by tactile sense) in the nearshore marine water column, and black-headed gull and herring gull are species which undertake limited plunge-diving for prey detected visually from above the water (among a diverse range of feeding approaches which also include terrestrial, freshwater and intertidal visual foraging, scavenging, and klepto-parasitism from other individuals and other species). These species are also likely to forage, roost and bathe in freshwater or terrestrial habitats of the SPA. In addition to dabbling, wigeon often graze on terrestrial and waterside vegetation. Based on the range of habitats used by these species outside the marine environment, and furthermore the additional forms of foraging undertaken outside the water column, exposure time to underwater noise is considered to be very low. For greylag goose and light-bellied brent goose, exposure time is expected to be negligible or zero.

Above-water noise and visual disturbance – Visual and noise disturbance above water originating from vessels could affect birds within sightline or hearing distance of survey vessel movements. In the context of the cable AoS and The Murrough SPA, this route to impact is likely for birds strongly associated with the marine waters or foreshore, as the vast majority of non-marine habitats of the SPA have no sightline with the marine habitat due to the presence of a shingle ridge and stony barrier habitat (NPWS 2015a). This habitat association is considered to apply to breeding little tern and wintering red-throated diver in their respective screening exercises. However, none of the other wintering waterbirds listed as qualifying interests of the SPA are considered more likely to use the foreshore or marine habitats than other habitats of the SPA. None are considered likely to be exposed to sufficient noise levels to be disturbed by noise alone when out of sightline. Following Cutts et al. (2013), example noise levels associated with disturbance of waterfowl are:

- 110-115 dB at source (assumed to be >100 m from bird) for brent goose,
- 115-120 dB at source (assumed to be >150 m from bird) for shelduck *Tadorna tadorna* and
- 105-110 dB at source (assumed to be >50 m from bird) for mallard *Anas platyrhynchos*.

These noise levels are not expected to occur as a result of survey activities. Overall, as a result of their available habitat, the diversity of their habitat use and foraging strategies; and the temporary, localised and largely offshore nature of survey activities, the wintering waterfowl and gulls of the SPA are not considered likely to be sufficiently exposed to visual or noise stimuli from survey activities to be disturbed.

Potential effects on prey – No route to impact is considered likely between survey activities and the prey of wintering waterfowl and gulls of the SPA. Greylag goose, brent goose, teal and wigeon forage entirely or predominantly on vegetation, availability of which in the marine environment is predicted to be unaffected by survey activities. This is variously achieved due to compliance with MARPOL and the localised temporary nature of works resulting in no sedimentation and smothering of marine vegetation (see **Section 8.2**). There is no route to impact on vegetation in the non-marine habitats due to the barrier habitat of shingle and stone. Black-headed gull and herring gull have extremely broad diets of which marine prey in the water column are but one component, and survey activities are considered to have no significant effect on any of the relevant animal prey of these species.

Changes to water quality – Survey activities are not expected to cause changes to water clarity through resuspension of sediments or other solids above natural levels of variation, due to the localised temporary nature of sampling and surveying, as outlined in **Section 8.2**. Other changes to water quality in the marine habitats, such as introduction of chemicals, are considered highly unlikely due to compliance with MARPOL. No route to impact on quality of water in non-marine habitats is considered possible due to the barrier habitat of shingle and stone.

Overall, there is not considered to be potential for Likely Significant Effect by any route on greylag goose, light-bellied brent goose, wigeon, teal, black-headed gull or herring gull as qualifying interests of The Murrough SPA, as a result of the project alone or in combination with other projects or plans, and these species are screened out for Appropriate Assessment.

Wetland and Waterbirds feature

The conservation objective concerning the Wetland and Waterbirds feature is, "to *maintain or restore the favourable conservation condition of the wetland habitat at The Murrough SPA as a resource for the regularly-occurring migratory waterbirds that utilise it,*" where favourable conservation status of a habitat is achieved through meeting the following criteria:

- the habitat's natural range, and area it covers within that range, are stable or increasing,
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable (NPWS 2022).

The foreshore licence survey activities will not impact on the natural range or area of marine habitat, or any non-marine wetland habitat of the SPA, based on the localised and temporary nature of activities within the marine habitats; the level of sediment suspension not exceeding levels caused by natural processes; and the presence of barrier habitats of shingle and stone which rule out a route to impact on non-marine habitats of the SPA.

Survey activities will also not impact the structure and functions underlying the maintenance of the marine habitat of the SPA due to the localised and temporary nature of activities: i.e., no permanent changes will be made, or structures installed, associated with the seabed, intertidal zone or water column. The presence of barrier habitats of shingle and stone mean impacts of survey activities in the marine habitats on non-marine wetland habitat structure and functions can be ruled out.

Survey activities will not affect the favourable status of waterbird species of the SPA. This is detailed in this screening document and in Appropriate Assessment for select species in the NIS (Royal HaskoningDHV, 2022a – document reference UB1019-RHD-ZZ-XX-RP-Z-0010).

Therefore, there is considered to be no potential for Likely Significant Effect on the Wetland and Waterbirds feature of The Murrough SPA and this feature is screened out for Appropriate Assessment.

8.5.2.2 Wicklow Head SPA

Wicklow Head SPA comprises the rocky headland Wicklow Head and the marine area to 500 m from the cliffs. The SPA is surrounded in all sea-going directions by the cable AoS, with a nearest distance of 1 km from the SPA to the cable AoS. Existing vessel traffic from the port of Wicklow passes along the coast on which the SPA is situated, with nearest distance of navigation from the cliffs observed to be within 0.75 nautical miles (1.4 km). The site is designated for a breeding (black-legged) kittiwake *Rissa tridactyla* population of national importance (956 pairs in 2002, NPWS 2012).

Kittiwake

The kittiwake is a small gull species with a close marine habitat association in all seasons which nests on vertical or near vertical cliffs and artificial structures including offshore platforms and coastal buildings. They are surface feeders on fish, predominantly sandeels *Ammodytes sp.* The breeding kittiwake as a qualifying feature of the SPA are likely to be present between March and August based on the published breeding season of the species (Furness 2015) in UK waters. Outside of this period the species migrates into offshore and oceanic waters for the non-breeding period. The nearest distance of kittiwake cliff-nesting habitat of the SPA to the cable AoS is 1.5 km.

The mean-maximum foraging range of kittiwake based on 19 studies across 37 colonies totalling 1452 tracked individuals is 156.1 km (± standard deviation (SD) 144.5 km) (Woodward et al. 2019). The available marine area within the mean-maximum foraging radius of 156.1 km from Wicklow Head SPA is approximately 35,600 km^2. The cable AoS in its entirety lies within this range and has total area of approximately 217 km^2, which is approximately 0.6% of the predicted available foraging area which results from applying this foraging radius for kittiwake, or around 0.3% of the predicted area if mean-maximum + 1 SD is applied.

There is considered to be no potential for Likely Significant Effect on the breeding kittiwake feature of Wicklow Head SPA. The nearest potential distance of a survey vessel to the suitable nesting cliff habitat of kittiwake within the SPA is 1.5 km which is equal to the nearest recorded passing distance of vessel traffic to and from the port of Wicklow. Above-water visual and noise sources associated with survey vessel movements will therefore not introduce novel above-water visual or noise stimuli capable of causing disturbance to kittiwakes at the nesting colony or resting on the sea within the SPA. The cable AoS occupies a very small proportion of the predicted foraging range of kittiwakes during the breeding season, and vessels themselves will occupy a yet smaller proportion of area, such that their presence is likely to be negligible within the kittiwake foraging range. Survey activities are therefore considered incapable of impacting foraging kittiwakes via above-water noise or visual disturbance, below-water disturbance, disturbance to prey or changes to water clarity, as these effects if present will occur at a negligible scale. Furthermore, Fliessbach et al. (2019) scored kittiwake to have low vulnerability to disturbance by ship traffic. Based on the above considerations Wicklow Head SPA is screened out for Appropriate Assessment.

8.5.2.3 Dalkey Islands SPA

Dalkey Islands SPA comprises three low-lying islands, plus intervening rocks and reefs, and sea to 200 m around the islands. The SPA lies 20 km north of the cable AoS and is designated for breeding populations of:

- Roseate tern *Sterna dougallii*
- Common tern *Sterna hirundo*
- Arctic tern *Sterna paradisaea*

These species are delicate migratory seabirds present in spring and summer in Irish waters, and all are listed under Annex I of the EU Birds Directive. The site is reported to be important for tern species for the activities of breeding and staging (NPWS 2015b). **There is considered to be no potential for foreshore licence survey activities to impact on staging terns** as, by nature of the behaviour as a non-breeding activity focused at and around the islands, staging birds are protected when present within the boundary of the SPA, and all survey activities will be too distant from the SPA for there to be a route to impact. All three species of tern are likely to be present as breeding species at Dalkey Islands SPA in the period May to August based on published seasonality for the species in UK waters (Furness 2015).

Breeding terns

The mean-maximum foraging range of **roseate tern** based on three studies across three colonies totalling 63 tracked individuals is 12.6 km (± SD 10.6 km) (Woodward et al. 2019). The cable AoS at 20 km distance is therefore within the upper limits of this range. However, applying a semi-circular (seaward) zone around the Dalkey Islands SPA of radius equal to mean-maximum foraging range + 1 SD (23.2 km), the area of overlap with the cable AoS is 29 km^2, which is approximately 3% of the semi-circular predicted foraging area of 845 km^2 which results from applying this foraging radius for roseate tern.

The mean-maximum foraging range of **common tern** based on nine studies across 16 colonies totalling 577 tracked individuals is 18.0 km (± SD 8.9 km) (Woodward et al. 2019). The cable AoS at 20 km distance is therefore within the upper limits of this range. However, applying a semi-circular (seaward) zone around the Dalkey Islands SPA of radius equal to mean-maximum foraging range + 1 SD (26.8 km), the area of overlap with the cable AoS is 56 km^2, which is approximately 5% of the semi-circular predicted foraging area of 1,145 km^2 which results from applying this foraging radius for common tern. Common tern also forage in freshwater inland habitats, therefore a circular radius around the colony may better reflect the reality of common tern foraging distribution. In this scenario, the cable AoS overlaps with approximately 2.5% of their foraging distribution.

The mean-maximum foraging range of **Arctic tern** based on five studies across nine colonies totalling 160 tracked individuals is 25.7 km (± SD 14.8 km) (Woodward et al. 2019). The cable AoS at 20 km distance is therefore within this range. However, applying a semi-circular (seaward) zone around the Dalkey Islands SPA equal to mean-maximum foraging range + 1 SD (40.5 km), the area of overlap with the cable AoS is 140 km^2, which is approximately 6% of the semi-circular predicted foraging area of 2,512 km^2 which results from applying this foraging radius for Arctic tern.

There is considered to be no potential for Likely Significant Effect on breeding terns of Dalkey Islands SPA from foreshore licence survey activities. Foremost, the cable AoS overlies a small proportion (6% or less) of all species' predicted foraging ranges, and as a result, for all tern species assessed, only a very small proportion of the SPA population is expected to have potential for coming into proximity with survey activities. The area of sea where the cable AoS overlaps with predicted tern foraging ranges, is an area with existing vessel traffic associated with the port of Wicklow. The one to two vessels expected to be in use for foreshore licence surveys will therefore not introduce novel visual or above-water

noise stimuli above background levels, and visual or above-water noise disturbance is not expected to occur. Furthermore, Fliessbach et al. (2019) scored *Sterna* terns as having the lowest vulnerability to disturbance from ship traffic among seabird species.

Underwater noise exposure is very limited in terns, whose shallow plunge-diving foraging strategy results in their auditory systems being only briefly underwater (see little tern account in **section 8.5.2.1**).

While common, Arctic and roseate tern do feed on Clupeiformes, assessed **in Section 8.3**, to be sensitive to underwater noise, any effect of vessel or survey instrument noise on tern prey species will occur on a short-term temporary basis within a small proportion of foraging range. If a maximum 4 km radius of sensitivity to seismic survey in clupeids is assumed (Nedwell et al. 2012), the percentage of tern foraging range where fish are sensitive to a disturbance is up to 6% for roseate tern, and less for other terns. Additionally, only some surveys within the programme will involve seismic surveys with acoustic devices.

Changes to water clarity as a result of sediment suspension are not expected to occur above natural variation as a result of survey activities, and pollutant effects on water quality will be prevented through compliance with MARPOL.

Based on the limited scale of potential routes to impact, and limited predicted effects when routes to impact exist, it is considered that a Likely Significant Effect can be ruled out for breeding terns of Dalkey Islands SPA, and this site is screened out for Appropriate Assessment.

8.5.2.4 Summary of Screening for bird species

Given the proposed site investigation surveys, the size of the cable AoS and its location in open offshore waters, Likely Significant Effects on breeding little tern and wintering red-throated diver through disturbance or displacement of birds or their prey, either due to the project alone or in combination with other projects, cannot be ruled out, and The Murrough SPA is screened in for Appropriate Assessment regarding these species.

Given the additional distance of survey activities from other SPA features or sites in the region, combined with the infrequency and short duration of individual survey tasks, no Likely Significant Effect on the conservation objectives of any other SPA feature or SPA site, alone and in combination with other plans and projects, is predicted (See **Section 7** for other plans and projects considered).

8.6 Appropriate Assessment Screening for all European sites Summary

A detailed summary of potential effects on the European sites and their qualifying features and the conclusion of whether a likely significant effect is predicted or cannot be excluded, is provided in **Table 9**.

Table 9 Relevant European sites and relevant qualifying interests and summary of potential effects

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
Wicklow Reef SAC	Reefs [1170]	There is no potential for effect on the qualifying features of interest of this SAC due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. All operations will be a minimum of 2.68 km from the SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out
Magherabeg Dunes SAC	Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Petrifying springs with tufa formation (Cratoneurion) [7220]	There is no potential for effect on the qualifying features of interest of this SAC from intertidal works, due to the limited nature of the works in both area and temporal extent. Any works proposed in this SAC are not significant in nature and would not cause material resuspension of sediments or impacts that would cause significant effects to the features of interest of this SAC. There is no potential for effect on the qualifying features of interest of this SAC from offshore works due to the limited nature of the works in both area and temporal extent. The features of interest represent coastal habitats and habitats at or above the mean high water spring tides. The site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
Rockabill to Dalkey Island SAC	Reefs [1170]	There is no potential for direct effect on reef habitats due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out
	Harbour Porpoise *Phocoena phocoena* [1351]	The harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers (boomers, sparkers, pingers, chirps) and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss (e.g. Crocker & Fratantonio 2016, Crocker *et al.* 2019). JNCC guidance (in the UK) recommends a precautionary 5km Effective Deterrence Range (EDR) from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour porpoise if present in the area prior to start-up and therefore likely significant effect cannot be discounted. The presence of an additional vessel at the site will also not be significant as vessels currently fish or transit in proximity of the cable AoS.	LSE not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
The Murrough Wetlands SAC	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220]	There is no potential for effect on the qualifying features of interest of this SAC from intertidal works, due to the limited nature of the works in both area and temporal extent. Any works proposed in this SAC are not significant in nature and would not cause material resuspension of sediments or impacts that would cause significant effects to the features of interest of this SAC.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Mediterranean salt meadows *Juncetalia maritime* [1410] Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230]	There is no potential for effect on the qualifying features of interest of this SAC from offshore works due to the limited nature of the works in both area and temporal extent. The features of interest represent coastal habitats and habitats at or above the mean high water spring tides. The site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.		
Buckroney-Brittas Dunes And Fen SAC	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110]	There is no potential for effect on the qualifying features of interest of this SAC from intertidal works, due to the limited nature of the works in both area and temporal extent. Any works proposed in this SAC are not significant in nature and would not cause material resuspension of sediments or impacts that would cause significant effects to the features of interest of this SAC. There is no potential for effect on the qualifying features of interest of this SAC from offshore works due to the limited nature of the works in both area and temporal extent. The features of interest represent coastal habitats and habitats at or above the mean high water spring tides. The site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	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] Dunes with *Salix* repens ssp. *argentea* (*Salicion arenariae*) [2170] Humid dune slacks [2190] Alkaline fens [7230]			
Lambay Island SAC	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Grey Seal *Halichoerus grypus* [1364] Harbour Seal *Phoca vitulina* [1365]	Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up. Harbour seal exhibit relatively short foraging trips from their haul out sites. The range of these trips varies depending on the location and surrounding marine habitat. For example, 25km on the west of Scotland (Cunningham *et al.*, 2009) and 30 km-45 km in the Moray Firth (Thompson *et al.*, 1996). Data from telemetry studies in The Wash (2003- 2005) suggest that harbour seal travel further, and repeatedly forage between 75 km and 120 km offshore, with one seal travelling 220 km (Sharples *et al.*, 2008; 2012). Information on harbour seal at-sea movements and habitat use in southwest Ireland suggests a limited range, generally staying within 20 km of their haul-out site (Cronin *et al.*, 2008). Although occasional longer trips do occur, these are often associated with young animals dispersing from sites. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
North Anglesey Marine SAC	Harbour porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers (boomers, sparkers, pingers, chirps) and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss (e.g. Crocker & Fratantonio 2016, Crocker *et al.* 2019). JNCC guidance (in the UK) recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary	LSE are not considered likely, however, cannot be discounted without further assessment.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		disturbance to Harbour Porpoise if present in the area prior to start-up and therefore likely significant effect cannot be discounted. The presence of an additional vessel at the site will also not be significant as vessels currently fish or transit in proximity of the cable AoS.	Potential effect possible.	
Slaney River Valley SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Mediterranean salt meadows *Juncetalia maritime* [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	There is no potential for effect on the habitat and fish/shellfish features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impact to the features of interest of this SAC. No offshore operations would overlap the SAC, and given the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible. Of the migratory fish species designated at this SAC only Atlantic Salmon and twaite shad are known to be sensitive to noise and as such sea lamprey and river lamprey were immediately screened out of further assessment. Although Atlantic salmon and twaite shad are sensitive to noise, due to the distance of the SAC from the survey site it is highly unlikely that the surveys would act as a barrier to migration. In addition, the surveys would be temporary, and no likely significant effect is predicted, therefore fish will not be assessed any further. For otters although the maximum potential home range for otters can be up to 40km on land (Green *et al.*, 1984; Roche *et al.*, 1995), as the survey site is offshore this study focused on those marine European sites within the potential area of effect. While coastal otters can hunt as far as 100m offshore in water over 10m deep, most feeding is done close to the shore in water less than 3m deep (NRW, 2017). There is no pathway for impact from the Slaney River Valley SAC for otter and therefore otters were screened out from further assessment.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Alno-Padion, Alnion incanae, Salicion albae Alluvial forests with Alnus glutinosa and Fraxinus excelsior [91E0] Freshwater Pearl Mussel *Margaritifera margaritifera* [1029] Sea Lamprey *Petromyzon marinus* [1095] Brook Lamprey *Lampetra planeri* [1096] River Lamprey *Lampetra fluviatilis* [1099] Twaite Shad *Alosa fallax fallax* [1103] Salmon *Salmo salar* [1106] Otter *Lutra lutra* [1355]			
	Harbour Seal *Phoca vitulina* [1365]	Harbour seal exhibit relatively short foraging trips from their haul out sites. The range of these trips varies depending on the location and surrounding marine habitat. For example, 25km on the west of Scotland (Cunningham *et al.*, 2009) and 30 km-45 km in the Moray Firth (Thompson *et al.*, 1996). Data from telemetry studies in The Wash (2003- 2005) suggest that	LSE are not considered likely, however, cannot	LSE cannot be excluded

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		harbour seal travel further, and repeatedly forage between 75 km and 120 km offshore, with one seal travelling 220 km (Sharples *et al.*, 2008; 2012). Information on harbour seal at-sea movements and habitat use in southwest Ireland suggests a limited range, generally staying within 20 km of their haul-out site (Cronin *et al.*, 2008). Although occasional longer trips do occur, these are often associated with young animals dispersing from sites. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour seals if present in the area prior to start-up.	be discounted without further assessment. Potential effect possible.	Screened In
River Boyne and River Blackwater SAC	Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)* [91E0] River Lamprey *Lampetra fluviatilis* [1099] Salmon *Salmo salar* [1106] Otter *Lutra lutra* [1355]	There is no potential for effect on the habitat and fish features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. This SAC is approximately 68km from the cable AoS, and as a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible. Of the migratory fish species designated at this SAC only Atlantic Salmon are known to be sensitive to noise and as such river lamprey were immediately screened out of further assessment. Although Atlantic salmon are sensitive to noise, no offshore operations will overlap the SAC and so to it is highly unlikely that the surveys would act as a barrier to migration. In addition, the surveys would be temporary, and no likely significant effect is predicted, therefore fish will not be assessed any further. For otters although the maximum potential home range for otters can be up to 40km on land (Green *et al.*, 1984; Roche *et al.*, 1995), as the survey site is offshore this study focused on those marine European sites within the potential area of effect. While coastal otters can hunt as far as 100m offshore in water over 10m deep, most feeding is done close to the shore in water less than 3m deep (NRW, 2017). There is no pathway for impact from the River Boyne and River Blackwater SAC for otter and therefore otters were screened out from further assessment.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
West Wales Marine / Gorllewin Cymru Forol SAC	Harbour porpoise *Phocoena phocoena* [1351]	The harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers (boomers, sparkers, pingers, chirps) and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss (e.g. Crocker & Fratantonio 2016, Crocker *et al.* 2019). JNCC guidance (in the UK) recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour porpoise if present in the area prior to start-up and therefore likely significant effect cannot be discounted. The presence of an additional vessel at the site will also not be significant as vessels currently fish or transit in proximity of the cable AoS.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible. For otters although the maximum potential home range for otters can be up to 40km on land (Green *et al.*, 1984; Roche *et al.*, 1995), as the survey site is offshore this study focused on those marine European sites within the potential area of effect. While coastal otters can hunt as far as 100m offshore in water over 10m deep, most feeding is done close to the shore in water less than 3m deep (NRW, 2017). There is no pathway for impact from the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC for Otter and therefore otters were screened out from further assessment.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Submerged or partially submerged sea caves [1365] Otter *Lutra lutra* [1355]			
	Bottlenose dolphin *Tursiops truncates* [1349] Grey seal *Halichoerus grypus* [1364]	Bottlenose dolphins are wide-ranging. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to common bottlenose dolphin if present in the area prior to start-up. Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
North Channel SAC	Harbour porpoise *Phocoena phocoena* [1351]	The harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers (boomers, sparkers, pingers, chirps) and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss (e.g. Crocker & Fratantonio 2016, Crocker *et al.* 2019). JNCC guidance (in the UK) recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary	LSE are not considered likely, however, cannot be discounted without further assessment.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		disturbance to harbour porpoise if present in the area prior to start-up and therefore likely significant effect cannot be discounted. The presence of an additional vessel at the site will also not be significant as vessels currently fish or transit in proximity of the cable AoS.	Potential effect possible.	
Saltee Islands SAC	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]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out
	Grey Seal *Halichoerus grypus* [1364]	Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due	LSE are not considered likely, however, cannot be discounted	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up.	without further assessment. Potential effect possible.	
Cardigan Bay/ Bae Ceredigion SAC	Bottlenose dolphin *Tursiops truncatus* [1349] Grey Seal *Halichoerus grypus* [1364]	Bottlenose dolphins are wide-ranging. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to common bottlenose dolphin if present in the area prior to start-up. Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). Any disturbance due to sound generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible	LSE cannot be excluded Screened In
	Sea lamprey *Petromyzon marinus* [1095] River lamprey *Lampetra fluviatilis* [1099] Sandbanks which are slightly covered by sea water all the time [1110]	Of the migratory fish species designated at this SAC only Atlantic Salmon and twaite shad are known to be sensitive to noise and as such sea lamprey and river lamprey were immediately screened out of further assessment. Although Atlantic salmon and twaite shad are sensitive to noise, due to the distance of the SAC from the survey site it is highly unlikely that the surveys would act as a barrier to migration. In addition, the surveys would be temporary, and no likely significant effect is predicted, therefore fish will not be assessed any further. There is no potential for effect on the habitat and fish features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Reefs [1170] Submerged or partially submerged sea caves [8330]	interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.		
Murlough SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Sandbanks which are slightly covered by sea water all the time [1110] Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"") [2110] Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*) [2170]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Euphydryas (*Eurodryas, Hypodryas) aurinia* Marsh fritillary butterfly [1065]			
	Harbour Seal *Phoca vitulina* [1365]	Harbour seal exhibit relatively short foraging trips from their haul out sites. The range of these trips varies depending on the location and surrounding marine habitat. For example, 25km on the west of Scotland (Cunningham *et al.*, 2009) and 30km-45km in the Moray Firth (Thompson *et al.*, 1996). Data from telemetry studies in The Wash (2003- 2005) suggest that harbour seal travel further, and repeatedly forage between 75km and 120km offshore, with one seal travelling 220km (Sharples *et al.*, 2008; 2012). Information on harbour seal at-sea movements and habitat use in southwest Ireland suggests a limited range, generally staying within 20km of their haul-out site (Cronin *et al.*, 2008). Although occasional longer trips do occur, these are often associated with young animals dispersing from sites. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Pembrokeshire Marine/ Sir Benfro Forol SAC	Sandbanks which are slightly covered by sea water all the time [1110] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150]	There is no potential for effect on the habitat and fish features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible. Of the migratory fish species designated at this SAC only Atlantic Salmon and twaite shad are known to be sensitive to noise and as such sea lamprey and river lamprey were immediately screened out of further assessment. Although Atlantic salmon and twaite shad are sensitive to noise, due to the distance of the SAC from the survey site it is highly unlikely that the surveys would act as a barrier to migration. In addition, the surveys would be temporary, and no likely significant effect is predicted, therefore these fish will not be assessed any further.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Atlantic salt meadows *Glauco-Puccinellietalia maritimae* [1330] Submerged or partially submerged sea caves [8330] Shore dock *Rumex rupestris* [1441] Sea lamprey *Petromyzon marinus* [1095] River lamprey *Lampetra fluviatilis* [1099] Twaite Shad *Alosa fallax fallax* [1103] Allis shad *Alosa alosa [1102]* Otter *Lutra lutra* Otter [1355]	For otters although the maximum potential home range for otters can be up to 40km on land (Green *et al.*, 1984; Roche *et al.*, 1995), as the survey site is offshore this study focused on those marine European sites within the potential area of effect. While coastal otters can hunt as far as 100m offshore in water over 10m deep, most feeding is done close to the shore in water less than 3m deep (NRW, 2017). There is no pathway for impact from Pembrokeshire Marine/ Sir Benfro Forol SAC for Otter and therefore otters were screened out from further assessment.		

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Grey Seal *Halichoerus grypus* [1364]	Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Strangford Lough SAC	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Salicornia and other annuals colonizing mud and sand [1310] Atlantic salt meadows *Glauco-Puccinellietalia maritimae*) [1330] Mudflats and sandflats not covered by seawater at low tide [1140]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170]			
	Harbour Seal *Phoca vitulina* [1365]	Harbour seal exhibit relatively short foraging trips from their haul out sites. The range of these trips varies depending on the location and surrounding marine habitat. For example, 25km on the west of Scotland (Cunningham *et al.*, 2009) and 30km-45km in the Moray Firth (Thompson *et al.*, 1996). Data from telemetry studies in The Wash (2003- 2005) suggest that harbour seal travel further, and repeatedly forage between 75km and 120km offshore, with one seal travelling 220km (Sharples *et al.*, 2008; 2012). Information on harbour seal at-sea movements and habitat use in southwest Ireland suggests a limited range, generally staying within 20km of their haul-out site (Cronin *et al.*, 2008). Although occasional longer trips do occur, these are often associated with young animals dispersing from sites. Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to harbour seals if present in the area prior to start-up.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
The Maidens SAC	Sandbanks which are slightly covered by sea water all the time [1110] Reefs [1170]	There is no potential for effect on the habitat features of interest of this SAC, due to the limited nature of the works in both area and temporal extent. No works are proposed in this SAC and the site investigation surveys are not significant in nature and would not cause significant resuspension of sediments or effects that would cause impacts to the features of interest of this SAC. As a result of the distance, the small scale of the works in the subtidal environments, the minor and localised nature of perceived impacts and the dilution of materials /mixing in within the marine environment any sediment or toxic and non-toxic contamination generated from the surveys materials would be negligible.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
	Grey Seal *Halichoerus grypus* [1364]	Grey seals forage in the open sea and they may range widely to forage and frequently travel over 100km between haul-out sites (SCOS, 2017). Foraging trips can last anywhere between one and 30 days. Tracking of individual grey seals has shown that most foraging probably occurs within 100km of a haul-out site, although they can feed up to several hundred kilometres offshore (SCOS, 2017). Any disturbance due to underwater noise generated by site investigation surveys, especially sub-bottom profiling, side scan sonar and multi beam will be very local and temporary. However, with due consideration to the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to grey seals if present in the area prior to start-up	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
The Murrough SPA	Little Tern *Sternula albifrons* [A195] - breeding	Little tern are sensitive to direct disturbance at the nesting colony. They are visual foragers of inshore shallow waters and have a breeding season maximum foraging radius of approximately 5 km based on past tracking studies (Woodward et al. 2019). Having recognised the location and proximity of the little tern colony of The Murrough SPA, the boundary of the cable AoS was altered by applying a precautionary 800 m buffer around the colony location and ensuring the cable AoS lies outside this buffer zone. We consider the resulting nearest distance of 800 m between the cable AoS and the little tern colony to eliminate the route to impact of disturbance to little tern while nesting. There is also reduced overlap (as a result of the boundary relocation) between the cable AoS and the predicted little tern foraging waters (both within and outside the SPA), and the published information on little tern (and related species), and their prey species, indicates that above-water noise, visual or underwater noise disturbance to foraging terns, and reduction in prey availability are extremely unlikely to occur as a result of survey activities. Impacts on water quality from sediment resuspension are unlikely as levels are not expected to exceed natural variation but other effects on water quality such as pollution from accidental spills could be significant in absence of any mitigation measures. This means that Likely Significant Effects cannot be ruled out without further assessment.	LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
The Murrough SPA	Red-throated Diver *Gavia stellata* [A001] - wintering	Red-throated diver are strongly associated with marine habitats in winter and are considered to be among the most sensitive marine bird species to disturbance and displacement by vessel traffic and marine construction work. Displacement could occur as a result of direct noise or visual disturbance or displacement of prey. Applying an advised Zone of Influence of 5 km	LSE cannot be discounted without further assessment.	LSE cannot be excluded

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		around the cable AoS, all marine habitat of the SPA is predicted to lie within the cable AoS or this Zone of Influence on at least one occasion, and as red-throated diver are strongly marine associated in winter this area of habitat is expected to contain 100% of red-throated divers of the SPA. Likely significant effects (in absence of any mitigation measures) cannot be ruled out without further assessment.	Potential effect possible.	Screened In
The Murrough SPA	Greylag Goose *Anser anser* [A043] - wintering Light-bellied Brent Goose *Branta bernicla hrota* [A046] - wintering Wigeon *Mareca penelope* [A050] - wintering Teal *Anas crecca* [A052] - wintering Black-headed Gull *Chroicocephalus ridibundus* [A179] - wintering Herring Gull *Larus argentatus* [A184] - wintering Wetland and Waterbirds [A999] - wintering	As outlined in the assessment for The Murrough Wetlands SPA, the site investigation surveys will occur at a distance, localised scale and intensity that are incompatible with causing resuspension of sediments above natural levels or other potential forms of impact on coastal wetland habitats supporting these wintering waterbird qualifying features of the SPA. The presence of a barrier habitat of shingle and stone is expected to limit potential impact on inland wetland habitats to negligible or zero levels. These barrier habitats and the extensive use of inland habitats by the listed wintering waterbirds for all daily activities (resting, foraging, bathing) are also expected to limit risk of above-water noise and visual disturbance to negligible or zero levels. Underwater noise exposure is likely to be extremely low in all listed species due to their foraging strategies and frequent use of inland habitats. These factors are also likely to strongly limit potential for survey activities to affect availability of animal prey or non-animal food (seeds, leaves, algae, etc.) to birds.	No effect predicted	No Likely Significant Effect predicted Screened Out

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
Wicklow Head SPA (004127)	Kittiwake *Rissa tridactyla* [A188] - breeding	Survey activities will occur at similar distance from nesting kittiwakes as existing vessel traffic associated with the Port of Wicklow, and will require only one vessel, therefore potential for vessel-based visual or noise disturbance is unlikely to be different from baseline levels. The cable AoS will occupy a negligible percentage of the predicted foraging range of kittiwake breeding at Wicklow Head SPA. Therefore, direct impact on foraging birds through noise above or below the water surface, or on kittiwake prey, can only occur at a scale which is insignificant in the context of the area of habitat and resource available to kittiwakes breeding at Wicklow Head SPA.	No effect predicted	No Likely Significant Effect predicted Screened Out
Dalkey Islands SPA	Roseate Tern *Sterna dougallii* [A192] - breeding Common Tern *Sterna hirundo* [A193] - breeding Arctic Tern *Sterna paradisaea* [A194] – breeding	Survey activities will occur 20 km from the breeding islands within the SPA, and within an area of the terns' predicted foraging range where there is existing vessel traffic associated with the Port of Wicklow. Therefore, potential for vessel-based visual or noise disturbance is unlikely to differ from baseline levels. The cable AoS will occupy a very small proportion (<6%) of the predicted foraging range of the terns breeding at the Dalkey Islands SPA. Therefore, direct impact on foraging birds through noise above or below the water surface, or on tern prey, can only occur at a scale which is very small in the context of the area of habitat and resource available to terns breeding at Dalkey Islands SPA.	No effect predicted	No Likely Significant Effect predicted Screened Out
Récifs et landes de la Hague SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
Anse de Vauville SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Banc et récifs de Surtainville SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Chausey SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Potential effect possible.	
Baie du Mont Saint-Michel SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Tregor Goelo SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Côte de Granit rose-Sept-Iles SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
		frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Potential effect possible.	
Nord Bretagne DH SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Abers - Côte des legends SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In

European site	Qualifying interests	Potential Impacts	Assessment of Impact	LSE Decision
Ouessant-Molène SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In
Mers Celtiques - Talus du golfe de Gascogne SAC	Harbour Porpoise *Phocoena phocoena* [1351]	The Harbour porpoise is wide ranging. Any disturbance due to the underwater noise generated by the site investigation surveys, especially sub-bottom profiling, multi beam and side scan sonar, will be very local and temporary. Evidence currently suggests that underwater noise impacts for some types of sub-bottom profilers boomers, sparkers, pingers, chirps and multi-beam echosounders used in geophysical surveys activities can be relatively loud at source with high duty cycles but, on the whole, these are highly directional sources with expected low levels of horizontal sound propagation; many operating at high frequencies and therefore subject to high transmission loss e.g. Crocker & Fratantonio 2016, Crocker et al. 2019. JNCC guidance in the UK recommends a precautionary 5km EDR from the source. However, due to the consideration of the precautionary principle, it is recognised that start-up of acoustic equipment may lead to temporary disturbance to Harbour Porpoise if present in the area prior to start-up and therefore LSE cannot be discounted.	Harbour porpoise - LSE are not considered likely, however, cannot be discounted without further assessment. Potential effect possible.	LSE cannot be excluded Screened In

9 Appropriate Assessment Screening Conclusions

AA screening of the proposed works, using the precautionary principle and the Source-Pathway-Receptor links between the proposed survey works and European sites with the potential to result in significant adverse effects on the conservation objectives and features of interest of the European sites was carried out (**Table 9**).

All European Sites were included in screening whereby a pathway of effect was identified. Based on the screening results the potential for LSE (alone or in combination with other plans and projects) caused by the proposed survey was excluded for the following European sites:

- Wicklow Reef SAC;
- Magherabeg Dunes SAC;
- The Murrough Wetlands SAC;
- Buckroney-Brittas Dunes and Fen SAC;
- Wicklow Head SPA;
- Dalkey Islands SPA; and
- River Boyne and River Blackwater SAC.

Considering the precautionary principle, LSE cannot be ruled out (without the use of mitigation measures) to cetaceans, pinnipeds or birds through noise disturbance and changes to prey availability for the following European sites which will be taken forward into the NIS assessment (**Table 10**) (Royal HaskoningDHV, 2022a – document reference UB1019-RHD-ZZ-XX-RP-Z-0010):

Table 10 European Sites and Designated Species taken forward into the NIS

European Sites	Species
Rockabill to Dalkey Island SAC	Screened in for harbour porpoise
Lambay Island SAC	Screened in for grey seal and harbour seal
North Anglesey Marine SAC	Screened in for harbour porpoise
Slaney River Valley SAC	Screened in for harbour seal
West Wales Marine / Gorllewin Cymru Forol SAC	Screened in for harbour porpoise
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC	Screened in for bottlenose dolphin and grey seal
North Channel SAC	Screened in for harbour porpoise
Saltee Islands SAC	Screened in for grey seal
Cardigan Bay/ Bae Ceredigion SAC	Screened in for bottlenose dolphin and grey seal
Murlough SAC	Screened in for harbour seal
Pembrokeshire Marine/ Sir Benfro Forol SAC	Screened in for grey seal

European Sites	Species
Strangford Lough SAC	Screened in for harbour seal
The Maidens SAC	Screened in for grey seal
Mers Celtiques - Talus du golfe de Gascogne SAC	Screened in for harbour porpoise
Ouessant-Molène SAC	Screened in for harbour porpoise
Abers - Côte des legends SAC	Screened in for harbour porpoise
Nord Bretagne DH SAC	Screened in for harbour porpoise
Côte de Granit rose-Sept-Iles SAC	Screened in for harbour porpoise
Tregor Goelo SAC	Screened in for harbour porpoise
Baie du Mont Saint-Michel SAC	Screened in for harbour porpoise
Chausey SAC	Screened in for harbour porpoise
Banc et récifs de Surtainville SAC	Screened in for harbour porpoise
Anse de Vauville SAC	Screened in for harbour porpoise
Récifs et landes de la Hague SAC	Screened in for harbour porpoise
The Murrough SPA	Screened in for little tern (breeding) and red-throated diver (wintering)

9.1 AA Screening Assessment

The AA screening identified the potential for LSE on the interest features of European sites with connectivity to the site investigation works and cable AoS. Following the screening exercise, 25 European sites were identified where a likely significant effect could not be excluded (without the use of mitigation measures). It was considered that a LSE could not be ruled out, applying the precautionary principle to cetaceans or pinnipeds that are qualifying features of 24 European sites and birds that are qualifying features of one European site. A NIS has been prepared in support of the foreshore licence application (Royal HaskoningDHV, 2022a – document reference: UB1019-RHD-ZZ-XX-RP-Z-0010).

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