Hartley Anderson Limited

Marine Environmental Consultancy

Foreshore Licence Application for Site Investigations for Oriel Wind Farm, off Co. Louth

Supporting information for the Stage 2 Appropriate Assessment

Report for
Oriel Wind Farm Ltd

Reference: J.PARK.473 – Report No. 1.2

November 2021

Rev:	Date:	Description:	Originator:	Approved for issue by:
A1	01-09-21	Draft for Internal Review	[redacted]	[redacted]
A2	08-09-21	2nd Draft for Internal Review		
B1	09-09-21	Draft for Customer Review		
B2	04-10-21	Revised Draft for Customer Review		
B3	17-11-21	Draft for Customer Approval		
0	18-1121	Issued		

Contents

1 Introduction 1
1.1 Background and document purpose 1
1.2 Legislative background and AA process 1
2 Project Description 5
2.1 Location 5
2.2 Proposed site investigations 5
2.3 Description of the proposed survey works 7
2.4 Survey vessels 12
3 Natura Impact Statement 14
3.1 Summary of screening outcome 14
3.2 Consideration of the nature and scale of potential effects from oil spillage 15
3.3 In-combination effects 16
3.4 Mitigation 17
4 Appropriate Assessment Conclusion 19
5 ARTICLE 12 ASSESSMENT 20
5.1 Relevant Annex IV species 20
5.2 European Protected Species Risk Assessment 21
5.3 Article 12 Conclusion 24
6 References 25
Appendix 1: Natura 2000 Site Information 26
Special Areas of Conservation (SAC) 26
Special Protection Areas (SPAs) 27

1 INTRODUCTION

1.1 Background and document purpose

Oriel Windfarm Limited (Oriel) is an Irish renewable energy company developing the proposed Oriel offshore wind farm ("Oriel Wind Farm" or "the Project") located in the north-west Irish Sea, 22km off the coast of Dundalk, County Louth. The Project will include wind turbines mounted onto a foundation installed into the seabed, an offshore substation and interlinking cabling between the turbines and the substation and an export cable between the substation and the shore.

Oriel was granted a Foreshore Licence in October 2005 from the then Department of Communications, Marine and Natural Resources (DCMNR), giving permission to carry out a technical work plan to investigate the suitability of an area to the east of Dundalk Bay for the construction of an offshore wind farm. The technical work plan included a geotechnical site investigation, an engineering assessment and the completion of an Environmental Impact Statement (EIS).

Following the completion of this work, Oriel applied for a Foreshore Lease in February 2007, to construct an offshore wind farm of up to 330MW potential in an area located off the coast of County Louth, approximately 22km east of Dundalk. For a number of reasons, the development of the project was delayed.

In May 2019, Oriel obtained a Foreshore Licence reference no. FS 006840 for initial surveys in the offshore wind farm area and offshore cable corridor. Oriel undertook both onshore and offshore surveys and commenced the engineering design of the wind park. Oriel now intends to undertake further site investigations of the offshore wind farm area and the offshore cable corridor to investigate the stability of the soil (seabed sediments) for the design of foundations and the detailed routeing of the inter array and export cables.

This report forms part of a Foreshore Licence Application to the Department of Housing, Local Government and Heritage (DHLGH) seeking permission to undertake site investigation works within the proposed development site to support the Project. The purpose of this report is to provide the information required to enable the Competent Authority (DHLGH) to determine whether the proposed site investigation works could have adverse effects on any of the relevant Natura 2000 sites for which a likely significant effect has been identified (Stage 1) and therefore require appropriate assessment (Stage 2), in accordance with the requirements as set out under Article 6(3) of the Habitats Directive (92/42/EEC).

1.2 Legislative background and AA process

The EU Habitats Directive (92/43/EEC) requires that Member States contribute to the creation of a coherent ecological network of sites through the identification and designation of Special Areas of Conservation (SAC) relating to those habitats and species listed in Annex I and Annex II of the Directive respectively. The EU Birds Directive (2009/147/EC) requires the protection of bird species listed in Annex I of that Directive, and regularly occurring migratory species, including the use of conservation measures through the designation of Special Protection Areas (SPAs). SACs and SPAs are collectively part of the Natura 2000 network. The relevant conservation agencies responsible for site selection designate sites on the basis of the presence of relevant qualifying habitats and species, and conservation objectives are set to maintain or, where relevant, restore, the features to a favourable conservation status. The requirements of the *EC Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* (the "Habitats and Species Directive")*;* and *EC Council Directive*

2009/147/EC (the "Bird Directive") have been implemented through the *European Communities (Birds and Natural Habitats) Regulations 2011* (as amended).

Article 6(3) of the Habitats Directive provides that, "*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4*[1]*, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*."

The Competent Authority (in this case DHLGH) must therefore undertake an Appropriate Assessment (AA) where likely significant effects are identified for qualifying interests of a relevant site from activities not directly connected with the management of the site. This requirement and the process by which such a consideration is made, is outlined in the *European Communities (Birds and Natural Habitats) Regulations 2011* (as amended), and in guidance at a European (European Commission 2019, European Commission 2021) and national (DoEHLG 2010, Office of the Planning Regulator 2021).

The key stages of the AA process are listed below and shown in Figure 1.1.

Stage 1: Screening for appropriate assessment. To assess, in view of best scientific knowledge, and in view of relevant site conservation objectives, if the project, individually or in-combination with another plan or project, is likely to have a significant effect on any Natura 2000 site.

Stage 2: Appropriate Assessment. Required if it cannot be excluded, on the basis of objective information, that the project, individually or in-combination with other plans or projects, will not have a significant effect on a Natura 2000 site. Where there are adverse impacts, an assessment of the potential mitigation of those impacts should be made. The appropriate assessment must include a final determination by the competent authority as to whether or not a proposed development would adversely affect the integrity of a Natura 2000 site. In order to reach a final determination, the consenting authority must undertake examination, analysis and evaluation, followed by findings, conclusions and a final determination. The appropriate assessment must contain complete, precise and definitive findings and conclusions, and may not have lacunae or gaps.

Stage 3: Assessment of alternative solutions. This process examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site.

Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain. An assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

As the project is not directly connected with the management of a Natura 2000 site, a screening exercise (Stage 1) has been undertaken to consider the potential for likely

[1] Article 6(4) relates to plans or projects which must be undertaken despite identification of an assessment determining a negative effect on a given site due to imperative reasons of overriding public interest (IROPI), including those of a social or economic nature. Suitable compensatory measures are required to maintain the coherence of the network should such a case be made.

significant effects to arise in relation to Natura 2000 sites from activities associated with the proposed survey scope as defined in Section 2, including in-combination with other plans or projects. The approach taken to screening was to:

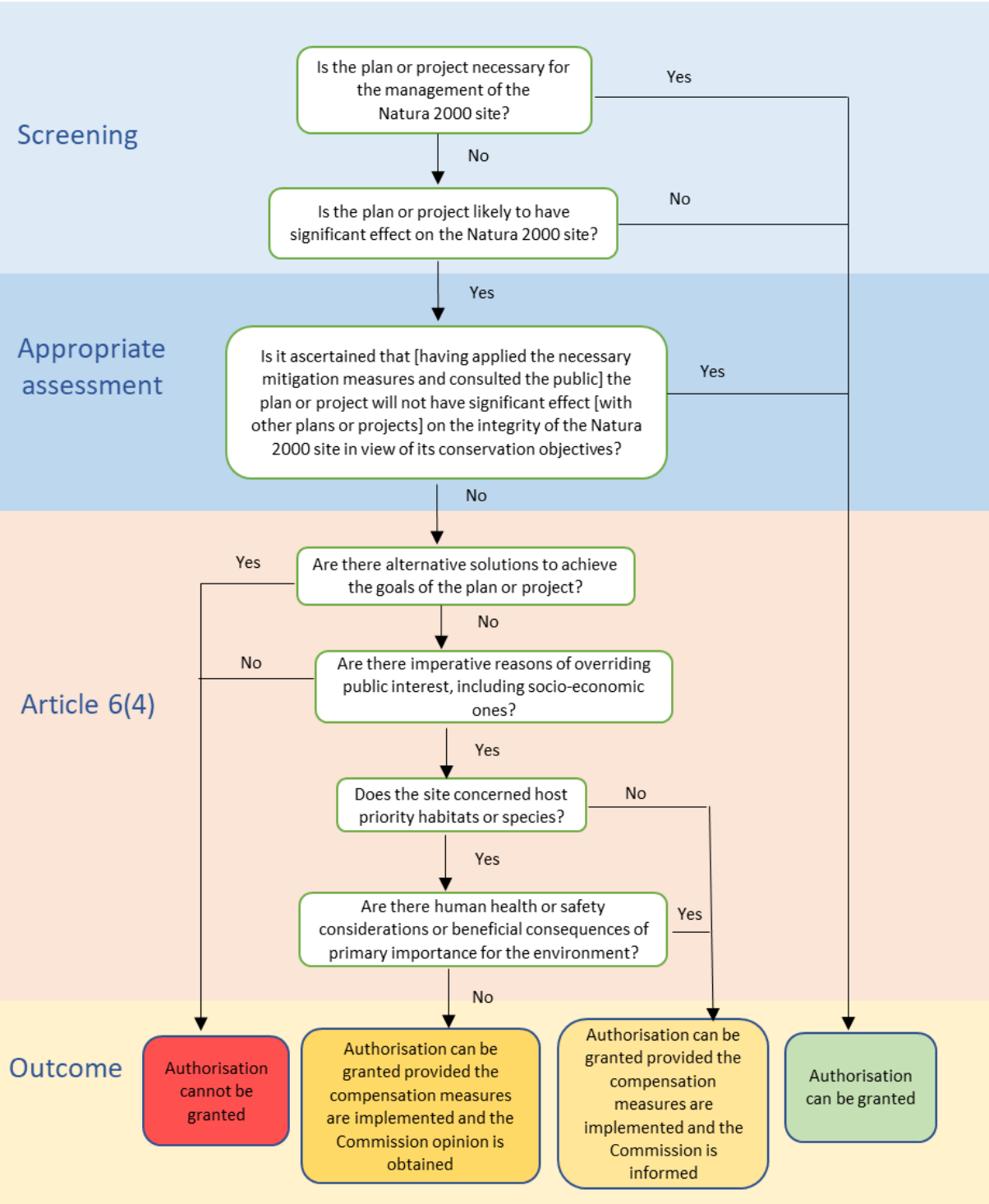
- Define the location and nature of the proposed activities, together with their potential to result in likely significant effects on European sites.
- Identify all relevant European sites and their qualifying interests with the potential to be affected by the proposed survey activities.
- Screen the relevant sites for the likelihood of significant effects that could result from the activities, based on the nature and scale of potential effects, including in-combination with other relevant activities.
- Conclude whether likely significant effects have been identified.

The Stage 1 screening has been reported separately (Supporting information for the Stage 1 Screening for Appropriate Assessment, Report Reference: J.PARK.473 – Report No. 1.1, November 2021) and took account of Guidance from the National Parks and Wildlife Service - Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DoEHLG, 2010) and reflected the recent OPR 2021 Practice Note. It identified Natura 2000 sites which could be affected by the survey based the Source-Pathway-Receptor model. The sites identified for screening were assessed for the likelihood for significant negative direct, indirect and in-combination effects. A summary of Stage 1 screening outcome is given in Section 3.1.

The report documents the Stage 2 Appropriate Assessment and Natura Impact Statement.

In addition to the Stage 2 assessment and Natura Impact Statement, this report includes in Section 5 an Article 12 Assessment for relevant Annex IV species since under Article 12 of the Habitats Directive, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas.

Figure1.1: Consideration of a plan or project affecting a Natura 2000 site



Source: European Commission (2021)

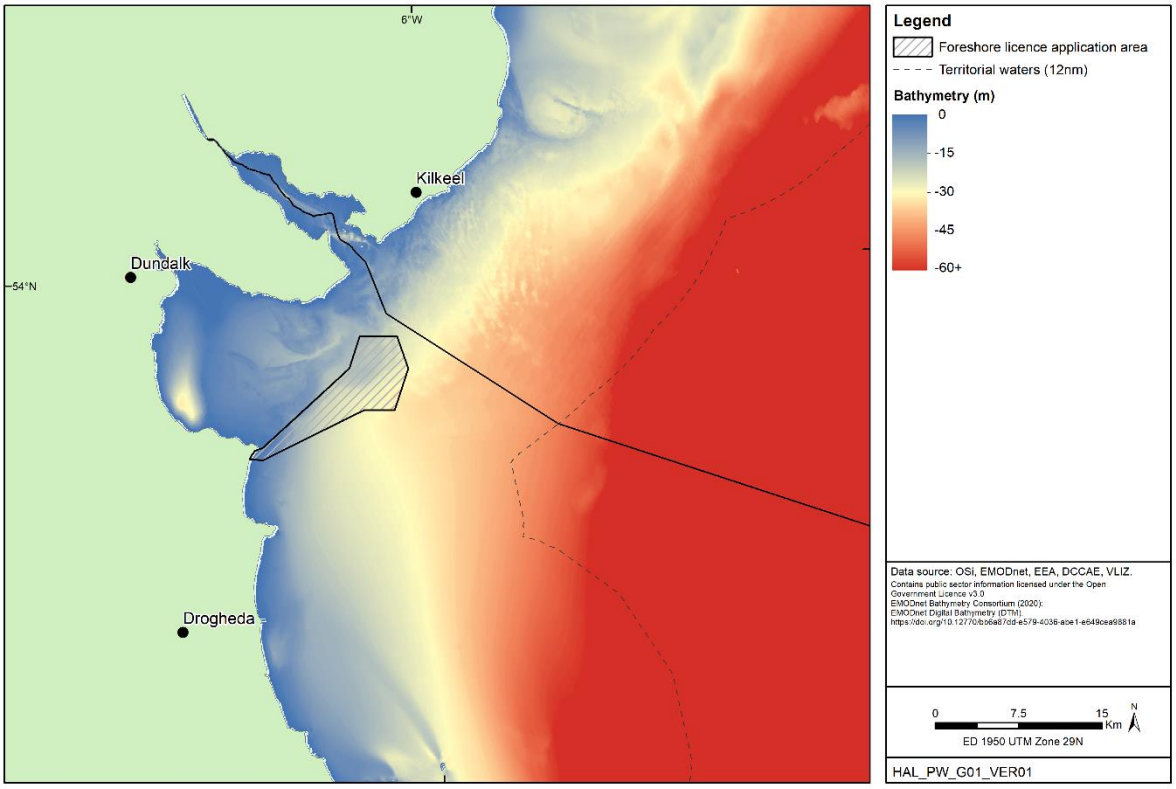
2 PROJECT DESCRIPTION

2.1 Location

The Foreshore licence application area comprises the Oriel offshore wind farm area and the offshore cable corridor (Figure 2.1). The offshore wind farm area is located off the coast of County Louth to the east of Dundalk Bay, approximately 22km east of Dundalk, 18km east of Blackrock, 5km south of the Cooley Peninsula and 10km north-east of Dunany Point. The offshore wind farm area covers approximately 27.8km^2 and is broadly hexagonal in shape with a length of approximately 5.3km west to east and 6.7 km north to south.

The offshore cable corridor is approximately 11km in length and covers an area of approximately 25km^2. The corridor is approximately 4km at its widest point, southwest of the offshore wind farm area, and narrows to approximately 1km at its narrowest point, just before landfall 700m south of Dunany Point.

Figure2.1: Map of Foreshore Licence Application Area



2.2 Proposed site investigations

The site investigations will include:

- Geophysical surveys
- Geotechnical and sediment sampling
- Environmental/ecological surveys and sampling
- Oceanographic and meteorological survey.

Table 2.1 provides information on each of the elements of the works and an indication of their duration. It is anticipated that the survey works will commence in Q2 2022 subject to approval of the Foreshore Licence application, appointment of a suitable contractor, availability of vessels and suitable weather conditions. To allow for unforeseen delays, approval of a Foreshore Licence for a 3 year period is sought.

Table2.1: Summary of surveys and indicative programme

Activity	Location	Proposed sample numbers	Duration
Geophysical Survey	Offshore windfarm area and offshore cable route	• Multibeam Echosounder (MBES) system for detailed bathymetric mapping • Side Scan Sonar (SSS) to achieve detailed seabed morphology and seafloor mapping • Magnetometer to detect geomorphological anomalies and ferrous obstructions • Sub-bottom Profiling (SBP), both single and multi-sources, to identify and characterise the layers of sediment/rock underneath the seafloor • Ultra-high-resolution multi-channel seismic (UHRS) to identify and characterise the layers of sediment/rock underneath the seafloor within the offshore site area. • Intertidal geophysical surveys including seismic, electrical resistivity and electromagnetic methods.	4 weeks (weather dependent)
Geotechnical Survey and Sediment Sampling	Offshore windfarm area and offshore cable route	27 no. deep investigation locations at proposed structure locations (25 wind turbines sites and two options for the offshore substation location). Each deep investigation location will require up to 3 drilled boreholes with a target depth of 50m below the seabed.	4-8 months (weather dependent; will be extended if unforeseen ground conditions are discovered)
		41 no. shallow investigation locations along proposed inter-array and export cable routes. Each location will require one vibrocore or gravity core with a target depth of 3m below the seabed.	
		Up to 6 no. deep investigation locations in the intertidal area. Each location would be a drilled borehole with a target depth of up to 50m.	
		Up to 12 no. shallow investigation locations in the intertidal area. Each location would be an excavated trial pit or borehole with a target depth of 3m below the beach. Excavated locations to be backfilled immediately on completion of the investigation. Cores and CPTs may be taken from the boreholes or trial pits.	
Environmental monitoring/ ecological sampling	Offshore windfarm area and offshore cable route	<u>FPODs or CPODs</u> Proposed to deploy up to 6 FPOD or CPOD devices to provide acoustic assessment of the presence/absence and species types of cetaceans (whales and dolphins). Each device will require a robust, heavy weight mooring blocks of *ca*. 250kg, clump chain and rope with either an acoustic release mechanism and benthic buoy or a robust	≤ 24 months (weather dependent)

Activity	Location	Proposed sample numbers	Duration
		mooring with a surface marker buoy. Batteries must be replaced and data downloaded every 3/4 months. Deployment and servicing would be undertaken from a survey vessel.	
	Offshore windfarm area and offshore cable route	Water Quality Sondes Proposed to deploy up to 6 sondes for water quality monitoring of parameters including turbidity, salinity, temperature, pH, dissolved oxygen, electrical conductivity. Each sonde will require a robust, heavy weight mooring block, clump chain and rope with either an acoustic release mechanism and benthic buoy or a robust mooring with a surface marker buoy.	
	Offshore windfarm area and offshore cable route	Benthic and intertidal Benthic survey techniques may include drop down video (DDV) and deployment of a mini Hamon grab or van Veen grab to obtain samples of 1-5kg in mass each. Manual digging may be used in the intertidal zone to collect the samples. Samples would be analysed to determine the benthic faunal community present and sediment geochemistry.	
	Offshore windfarm area and offshore cable route	Fish and shellfish GPS Tracking Up to 6 sondes may be deployed for the tracking of fish or shellfish within the windfarm and export cable corridor. Each sonde will require a robust, heavy weight mooring block, clump chain and rope with either an acoustic release mechanism and benthic buoy or a robust mooring with a surface marker buoy	
Oceanographic and meteorological	Offshore windfarm area and offshore cable route	All metocean survey works will occur at one location within the marine survey area. Data will be collected via a floating weather station, which will include a wave rider and a wind measurement LiDAR current profiler. The wave rider will be used to collect wave height and current data across the site, while the LiDAR system will be used to measure the wind characteristics within the site.	≤ 24 months (may be greatly reduced if findings are in line with existing data collected from previous surveys)

2.3 Description of the proposed survey works

2.3.1 Geophysical survey

The purpose of the geophysical survey is to determine the sediment conditions within the survey area in order to update the information gathered by previous surveys. This additional data will be used to better understand the sub-surface structure, in particular the sub-surface stratigraphy, and to confirm the bedrock elevation. The information will be used to assess the stability of the sub-surface soil for the design of foundations and the detailed routeing of the inter array and export cables.

The objectives of the geophysical survey are to:

- Produce detailed bathymetric mapping;
- Obtain detailed seabed morphology;

- Identify the nature of the seabed;
- Acquire both shallow and deep geological cross-sections of the wind farm site;
- Confirm the export cable route within the cable route corridor.

The geophysical survey will include bathymetric, side scan sonar, magnetometry and seismic sounding of the proposed site. Details of the exact survey equipment will be made available prior to commencement of the works; however, it is envisaged that the geophysical data acquisition will involve the following acoustic-based techniques:

- Multibeam Echosounder (MBES) system for detailed bathymetric mapping.
- Side Scan Sonar (SSS) for detailed seabed morphology and seafloor mapping.
- Magnetometer for detecting geomorphological anomalies and ferrous obstructions.
- Sub-bottom Profiling (SBP) to identify and characterise the layers of sediment/rock underneath the seafloor along the cable route corridor.
- Ultra-high-resolution multi-channel seismic (UHRS) to identify and characterise the layers of sediment/rock underneath the seafloor within the windfarm site.
- An ultra-short baseline acoustic positioning (USBL) system may be used to assist in the positioning of towed equipment relative to the vessel.

The geophysical survey will comprise transects with a total length of *ca*. 84km and a distance of 1km between each transect (Figure 2.2).

MBES

The MBES system will be used to provide detailed bathymetric mapping throughout the survey area. An MBES is a type of sonar (acoustic surveying) used in seabed mapping wherein acoustic waves are used to indicate depth-to-seabed. The device is typically affixed to a vessel's hull or towed in its wake. The process is non-intrusive, and the device will not make contact with the seabed at any point. The Kongsberg EM710 may be taken as an indicative example of a MBES system to be used in the completion of these works. The equipment will operate within a frequency range of 70-100kHz with sound pressure levels in the range of 225-231dB re1µPa at 1 metre range[2].

SSS

The side scan sonar will be used to achieve detailed seabed morphology and seafloor mapping of the survey area. The survey is carried out using a sonar device attached to a vessel that emits a fan-shaped pulse down towards the sea floor across a wide-angle perpendicular to the path of the sensor through the water. The intensity of the acoustic reflections from the seafloor of this fan shaped beam is recorded in a series of cross-track slices. When stitched together along the direction of motion, these slices form an image of the sea bottom within the swath (coverage width) of the beam. The equipment will operate within a frequency range of 100-500kHZ with source levels at 235dB re 1µPa at 1 metre range.

Magnetometer

A magnetometer detects ferrous objects and as such is used to locate and identify ferrous objects on or buried in the seabed within the range of the magnetometer. The device precisely measures the earth's magnetic field and detects any anomalies, which represent ferrous objects such as lost anchors, sunken ships and buried pipes. The magnetometer is typically towed behind a survey vessel or affixed to a vessel's hull. The process is non-intrusive, and

[2]https://cdn1.shipserv.com/ShipServ/pages/profiles/54162/documents/EM-710-Product-Description.pdf

the device will not make any physical contact with the seabed at any point. The G-882 Marine Magnetometer may be taken as an indicative example to be used in the completion of these works. The datasheet for this device in included in Appendix A of the Non-statutory Environmental Report.

SBP

The SBP will be used along the cable route corridor only. This device uses reflection seismology to give a 2D image of the sub-seabed geology. It is typically towed behind the vessel during survey works or affixed to the vessel's hull. The process is non-intrusive, and the device will not make any physical contact with the seabed at any point. The Innomar SES-2000 Quattro Parametric SubBottom Profiler[3] is used as an indicative example and the equipment will have a primary frequency of between 85 and 115kHz (with secondary low frequencies of between 2 and 20kHZ) and source levels of 235-245dB re 1µPa at 1 metre range.

UHRS

The UHRS will be used within the offshore wind farm area only, commonly used variants of this technology are known as sparkers and boomers. It will have the following characteristics as a minimum:

- repeatable source,
- frequency range of between 1kHz and 3.5kHz,
- broadband width in excess of 2.5kHz at -10db,
- vertical resolution better than 0.5 metres,
- penetration 50 metres,
- variable energy levels 100-1000 Joules,
- record length suitable for the maximum depth required (250ms),
- sampling rate 0.25ms.

Source levels estimated to be approximately 220dB re 1µPa at 1m[4]. A multi-channel hydrophone streamer will be used. The streamer will be neutrally buoyant or controlled, well maintained and free of air bubbles. The hydrophone will have a response appropriate to the source used but will generally have a flat response between 500Hz and 10kHz. The streamer will have at least 16 channels and be 50m long. A tail buoy with a radar reflector will be used to mark the streamer.

USBL

A USBL beacon may be used to precisely locate towed equipment (such as a sidescan sonar fish) relative to the vessel. Exemplar equipment includes Sonardyne Wideband Sub-Mini 6 Plus (WSM6+), Sonardyne Type 8300 Compatt 6, Kongsberg HiPAP which have a typical operating frequency of 20-40kHz.

2.3.2 Geotechnical survey

The purpose of the geotechnical survey is to investigate the stability of the soil for the design of foundations and the detailed routeing of the inter array and export cables.

---

[3] https://www.innomar.com/sbp-quattro.php
[4]https://www.aaetechnologiesgroup.com/applied-acoustics/products/sub-bottom-profiling/sound-source-sparkers/

Boreholes

Some 27 no. deep investigations will be carried out at potential structure locations (potential wind turbine and offshore substation locations) (Figure 2.2). Each deep investigation location will require up to 3 drilled boreholes with a target depth of 50m below the seabed. Thus, some 81 geotechnical boreholes will be drilled in the offshore wind farm area.

In situ testing will include the option of either down-hole wireline piezocone penetration testing (PCPT) associated to PS logging or down-hole wireline seismic cone testing (SCPT) over the full length of a borehole. These tests involve a shear wave source, located on a downhole probe or on the drilling frame at the surface respectively, and downhole geophones. While the activity can be described as resulting in impulsive sounds, the source levels are minor (70dB). SCPT tests will be executed at a minimum of four of the locations, which will be confirmed following the results of the geophysical survey. Two seismic measurements shall be carried out during each SCPT stroke at a depth interval of 1m; the envisaged number is 40-60 SCPT tests in total.

The boreholes will be advanced by alternating PCPT/SCPT and push/core sampling; requirements will depend on the material type encountered. Within a granular deposit, the boreholes will be advanced by alternating PCPT/SCPT and push sample. Where the sample recovery is poor using the push sampler, a hammer sampler will be used instead. Within the cohesive deposits, the boreholes will be advanced by PCPT/SCPT followed by two push samples. Rotary coring may be used instead of push sampling in suitable materials, in which case the CPT and cores will be alternated.

Up to 6 no. deep investigations will be carried out in the intertidal area. Each location would be a drilled borehole with a target depth of up to 50m.

Vibrocoring / gravity coring

It is estimated that some 41 no. shallow investigations will be required along the proposed inter-array and export cable routes. Each investigation will require one vibrocore or gravity core at each location with a target depth of 3m below the seabed. Figure 2.2 shows an indicative line for the cores. Vibrocoring is performed where cohesionless soil is expected. The vibrocorer will be lowered onto the seabed, after which the vibrocoring process will be started. Upon refusal or at target depth, the vibrocorer will be recovered on deck where the recovery rate is measured.

Gravity core (wireline self-weight penetration sampler) will be performed where cohesive soil is expected. The gravity corer will be lowered on the seabed and will penetrate in the seabed under its own weight. Upon refusal or at target depth, the gravity core will be recovered on deck where the recovery rate is measured.

Up to 12 no. shallow investigation locations will be carried out in the intertidal area. Each location would be an excavated trial pit or borehole with a target depth of 3m below the beach. Excavated locations will be backfilled immediately on completion of the investigation. Cores and CPTs may be taken from the boreholes or trial pits.

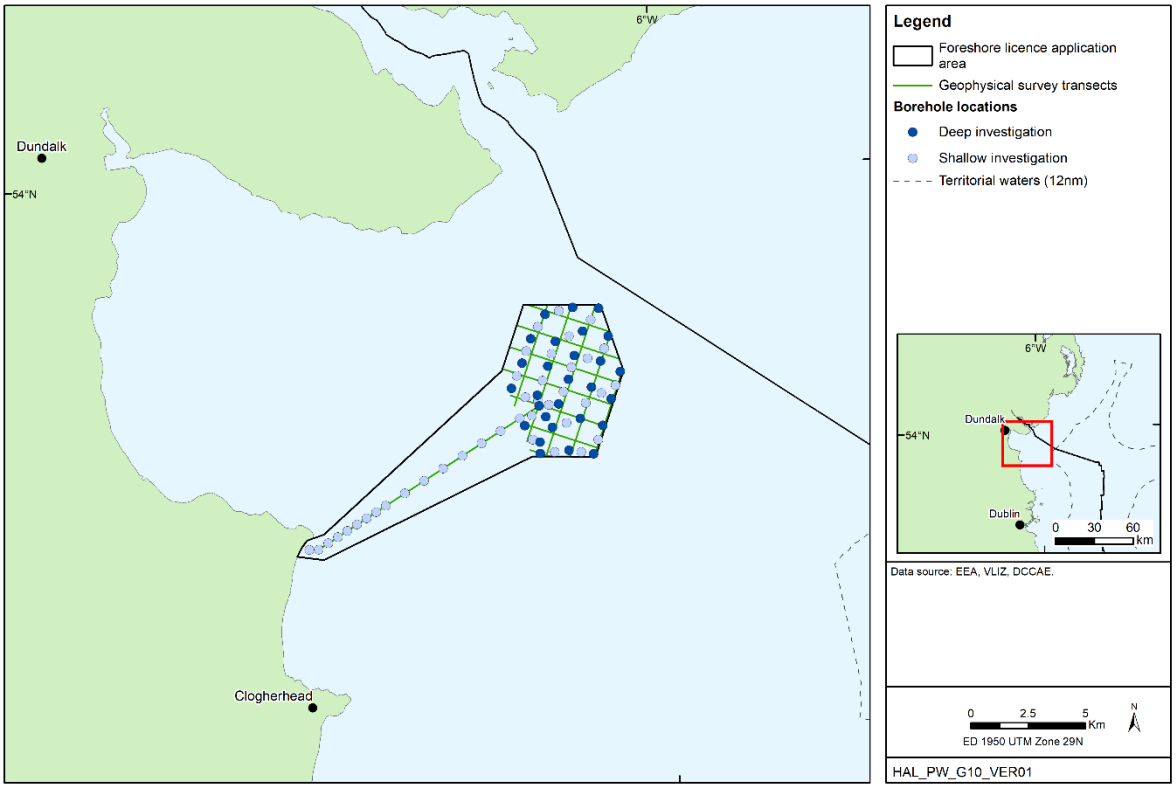
2.3.3 Ecological surveys

The purpose of the ecological surveys is to update the baseline environmental data collected from previous ecological surveys. The ecological scope of work will include the following:

CPODs

It is proposed to deploy up to 6 FPOD or CPOD devices for Static Acoustic Monitoring (SAM) of cetaceans. The devices will provide acoustic assessment of the presence/absence and species types of cetaceans to i) allow for the recording of species difficult to detect visually such as harbour porpoise, ii) provide data on other factors such as diel and tidal presence at the site. A CPOD is a self-contained computer and hydrophone in a sealed sonde approximately 1m in length which log the times and duration of click trains resembling the echo-location clicks produced by porpoises and dolphins. The acoustic device is independent of weather conditions once deployed and thus will ensure high quality data will be collected but only at a small spatial scale (typical detection distances of 250m (porpoises) to 800m (dolphins). Each CPOD will require robust, heavy weight mooring blocks of *ca*. 250kg, clump chain and rope with either an acoustic release mechanism and benthic buoy or a robust mooring with a surface marker buoy. Batteries will be replaced and data downloaded every 3/4 months. Deployment and servicing will be undertaken from a survey vessel.

Figure 2.2: Map of survey sample locations



Water quality sondes

It is proposed to deploy up to 6 sondes for water quality monitoring through the water column – these will be used to monitor a range of parameters including turbidity, salinity, temperature, pH, dissolved oxygen and electrical conductivity. Sondes will be either suspended from a surface marker buoy or a benthic buoy with acoustic release at a range of depths dependent on survey requirements. Each buoy would have a robust mooring on the seabed similar to the CPOD mooring described above.

Benthic and intertidal

Survey techniques will include drop down video (DDV) and deployment of a mini Hamon grab or van Veen grab to obtain samples of 1-5kg in mass each. Manual digging may be used in the intertidal zone to collect the samples. Samples will be analysed to determine the benthic faunal community present and sediment geochemistry.

Fish and shellfish GPS tracking

Up to 6 sondes may be deployed for the tracking of fish or shellfish within the windfarm and export cable corridor. Similar to the CPODs and water quality, the sondes will be deployed attached to a robust mooring with either a benthic buoy and acoustic release and/or a surface marker buoy.

2.3.4 Metocean Survey

The purpose of the metocean survey is to obtain site specific atmospheric, wave and wind data over a period of up to 24 months. All metocean survey works will occur at one location within the marine survey area which will be determined following the appointment of a suitable contractor. The data will be collected via a floating weather station, which will include a wave rider and a wind measurement LiDAR current profiler. This equipment will be mounted on specifically designed floating buoys which are moored to the seabed using an anchor chain and clump weights. All equipment including the moorings will be removed following completion of the survey. The wave rider will be used to collect wave height and current data across the site, while the LiDAR system will be used to measure the wind characteristics within the site.

2.4 Survey vessels

Separate survey vessels will be used for each activity. A larger vessel is required to complete the offshore geotechnical works, with smaller vessels used for the geophysical, metocean and ecological surveys. A smaller RHIB type vessel may be used for geophysical works in shallow waters. Land based drilling and excavators may be used for the investigations and surveys within the intertidal zone. The types of vessels are described below.

Offshore vessel

The survey vessel used for offshore geotechnical works will be either a jack-up barge or a Dynamic positioning (DP) vessel. Typical examples of the types of vessels used to undertake these works are provided in Appendix A of the Non-statutory Environmental Report.

Jack-up barges utilise a fixed anchoring system in order to maintain the required position within the site. The vessel consists of a self-elevating platform and four or six “legs”, that are deployed to the ocean floor mooring the vessel in place. The survey works are carried out from the self-elevating platform, which is raised above the water’s surface. If used, the jack-up barge will meet with the following minimum requirements:

- The vessel will have at least four mooring points;
- The self-elevating platform must be permanently manned (i.e. off-shift personnel to stay onboard even if the accommodation is not a permanent equipment of the jack-up);
- The platform must be provided with a class certificate verifying the provision of adequate safety equipment for the type of vessel and the number of on-board personnel; and

- The platform should be certified in compliance with the MODU (Mobile Offshore Drilling Unit) Code[5] and the RenewableUK guidelines[6].

Unlike jack-up barges, DP vessels maintain station via propellers and thrusters with inputs from satellite DGPS signals, allowing the vessels to be positioned over any point on the seabed and maintain position without employing a fixed anchoring system. Using thrusters or propellers, a DP vessel can maintain position within a 2m to 0.5m window depending on the sea state/weather conditions and available power. The vessel may also transit under DP control along a given pre-determined path.

If used, a DP vessel will meet the following minimum requirements:

- The vessel must be fully equipped with a Class II DP system as a minimum;
- Two DP certified operators with the necessary experience must be members of the crew; and
- The offshore works will be carried out on a 24-hour shift basis, with personnel working two 12-hour shifts. This will allow the works to be continuous.

Nearshore vessel

The smaller, nearshore vessel will be used in locations where the water depth is too shallow for the larger, offshore vessel to carry out the works. This vessel does not need to have a dynamic positioning system, however must have full DGPS capability. The vessel is usually held on station by joy-stick control and will deploy an anchor to assist in maintaining station (depending on sea state and weather conditions). The smaller vessel will use similar equipment to the larger vessel to carry out the required survey works.

The nearshore works will be carried out on a 12 hour per day basis, with the vessel returning to port at the end of each day.

There will be no significant discharges from the offshore and nearshore survey vessels, and any discharge would be consistent with obligations under MARPOL, which effectively prevent pollution from such sources. The survey vessels will meet all relevant MARPOL requirements e.g. in relation to Annex I, Annex IV and Annex V on the prevention of pollution by oil, sewage and garbage from ships, respectively, under the Sea Pollution Act 1991 (as amended), and the Sea Pollution (Prevention of Pollution by Garbage from Ships) Regulations 2012 (as amended). The vessels will hold a Shipboard Oil Pollution Emergency Plan (SOPEP).

[5] https://rules.dnv.com/docs/pdf/gl/maritimerules/gl_iv-6-2_e.pdf
[6]https://www.renewableuk.com/news/309151/Guidelines-for-the-Selection-and-Operation-of-Jack-ups-in-the-Marine-Renewable-Energy-Industry.htm

3 NATURA IMPACT STATEMENT

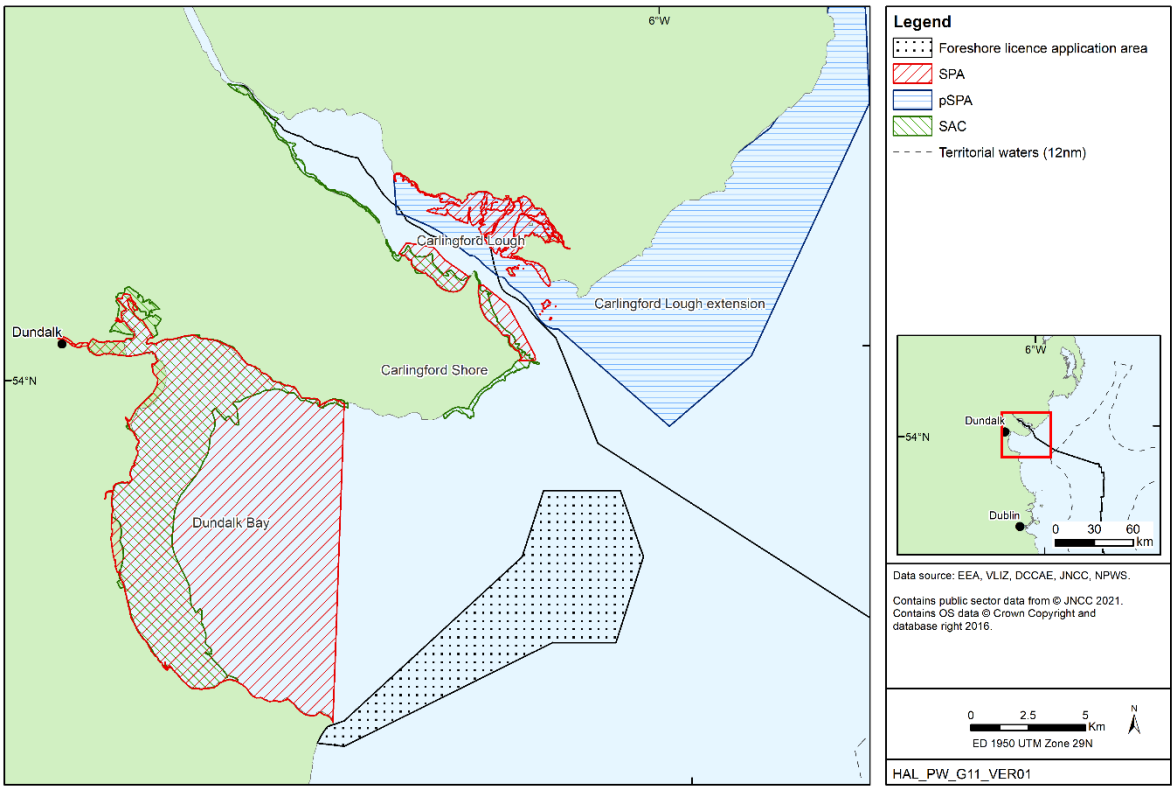
3.1 Summary of screening outcome

The conclusion of the Stage 1 Screening for AA was that Likely Significant Effects could not be discounted for the Special Conservation Interests of five European sites on the basis of the potential effects of oil spillage from the survey vessels. These sites are listed in Table 3.1 and shown in Figure 3.1, with relevant Natura 2000 site information given in Appendix 1.

Table3.1: Natura 2000 sites screening in for Appropriate Assessment

Site code	Site name	Relevant qualifying interests
IE0000455	Dundalk Bay SAC	Mudflats and sandflats not covered by seawater at low tide
		Estuaries
IE0002306	Carlingford Shore SAC	Annual vegetation of drift lines
IE0004026	Dundalk Bay SPA	Common scoter
		Red-breasted merganser
		Great crested grebe
		Common shelduck
IE0004078	Carlingford Lough SPA	Light-bellied Brent Goose
UK9020161	Carlingford Lough SPA	Light-bellied Brent Goose
		Sandwich tern
		Common tern

Figure3.1: Natura 2000 sites screening in for Appropriate Assessment



3.2 Consideration of the nature and scale of potential effects from oil spillage

The severity of effects from oil spills depends on a range of factors, including oil type, spill size and track, presence of sensitive species or features, spill response activities etc. Sources of potential oil spills associated with the planned activities comprise fuel, lubricating and hydraulic oils. Diesel fuel storage capacities for the typical survey vessels and jack-up barge (see Non-statutory Environmental Report Appendix A) are up to 2500 m^3 which represents the maximum possible spill size.

Environmental risk is generally considered as the product of probability (or frequency) and consequence. Potential environmental consequences of oil spills include offshore effects (principally on seabirds but also plankton, fish, benthos and marine mammals) and coastal impacts (in the event that persistent oil reaches the coastline). The fate of oil spills to the sea surface is relatively well understood (IMO 1988), with eight main oil weathering processes:

- Evaporation;
- Dispersion;
- Emulsification;
- Dissolution;
- Oxidation;
- Sedimentation/Sinking;
- Biodegradation; and
- Combined processes.

The processes of spreading, evaporation, dispersion, emulsification and dissolution are most important early on in a spill whilst oxidation, sedimentation and biodegradation are more important later. Diesel fuel is light oil, which evaporates and disperses rapidly in the seawater temperatures typical of the Irish Sea.

The trajectory of an oil spill within the survey area would be influenced by hydrography (dominated by tidal currents) and wind. The area is characterised by relatively weak tidal currents which floods to the north-west and ebbs to the south-east. The flows are relatively weak with tidal current speeds typically less than 0.2 m/s. This was confirmed by the wind farm project specific floating LiDAR data, which showed current speeds were below 0.2m/s for 80% of the 12 months monitoring period. Wind would be the principal factor under most conditions, and prevailing wind directions would most likely result in the movement of surface oil away from the coast. Field observations and trajectory modelling indicates that spilled diesel would disperse naturally within 8 hours, although given the proximity of the survey area to the coast the possibility of some shoreline oiling cannot be discounted.

Seabird vulnerability to surface pollutants, including oil results from toxicity, oiling of feathers leading to ingestion during preening and loss of insulating properties. Based on aerial and boat based surveys of seabird and waterbird distribution and abundance in the area, vulnerability within the survey area during the period of planned investigations varies from low to very high. Although numbers of auks (particularly of guillemots) were high in late summer, very few individuals of the Special Conservation Interests species of the Carlingford Lough SPA (see Table 3.1) were recorded in the surveys. Common scoter a Special Conservation Interest of the Dundalk Bay SPA were recorded in relatively high abundance in April, however, the species only overwinters in the survey area, departing in spring to breeding grounds in the north e.g. Iceland, Scandinavia. The common scoter observed were concentrated at the seaward edge of Dundalk Bay and to the north of the survey area. Given the low probability of a spill occurring, the rapid dispersal of a diesel slick and the limited number of the species

of Special Conservation Interest of the relevant sites present in the survey area, it is concluded that the conservation objectives of the SPAs will not be adversely affected. However, to reduce the risks further a range of mitigation measures will be implemented, as outlined below.

Should shoreline oiling occur, the main natural processes of oil removal would be evaporation and biodegradation, with recovery anticipated to be rapid (weeks to months). The annual vegetation of drift lines feature of the Carlingford Shore SAC is considered very unlikely to be affected by beaching oil since it is only reached by the sea at extreme high water springs or at high tide during an onshore gale. The estuaries and mudflats and sandflats not covered by seawater at low tide features of the Dundalk Bay SAC would not be predicted to be heavily oiled by a spill from survey activities (based on volumes, anticipated natural dispersion and probability of occurrence). Recovery from spill effects would be rapid, unless the diesel fuel became incorporated into anaerobic muddy sediments which is not anticipated.

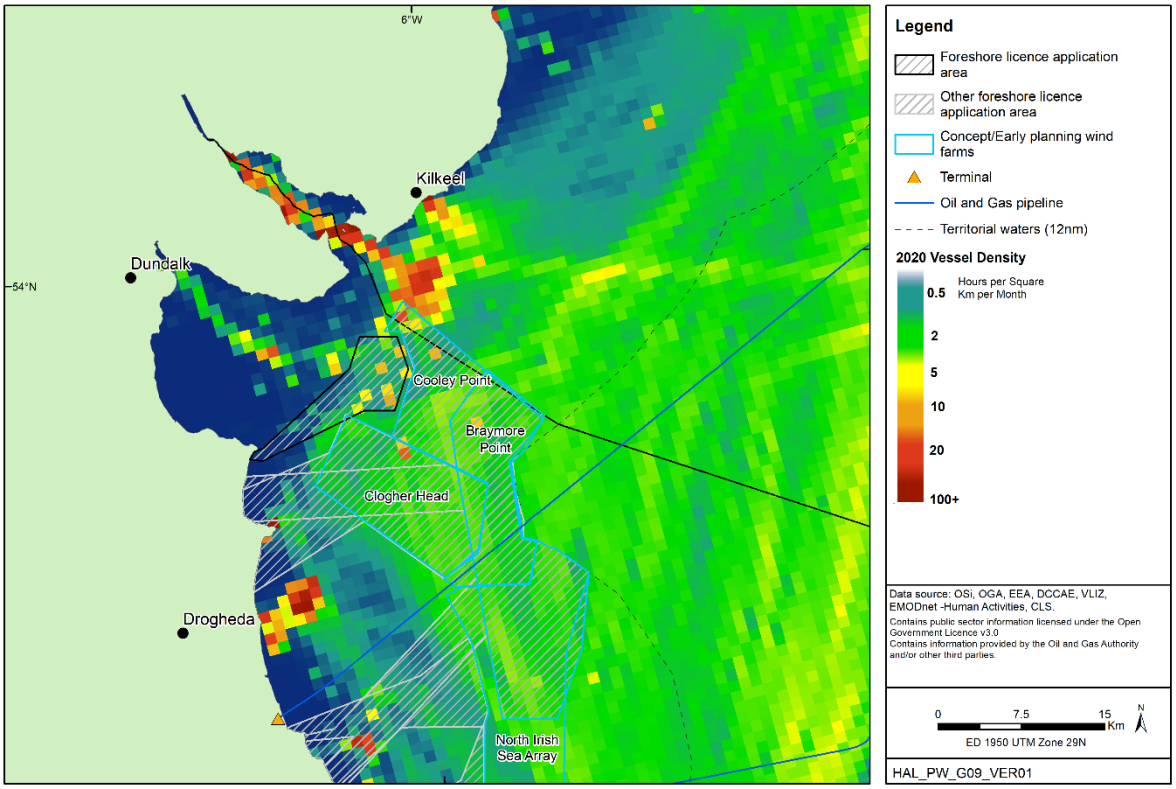
3.3 In-combination effects

A number of early concept offshore wind farm areas are located close to the proposed Oriel survey area (Figure 3.). None of these have received consent, and the timing of any potential works for these is uncertain and is highly likely to be outside of the proposed Oriel survey schedule. All of these areas and related cable corridor areas of search have been, or are being, subject to foreshore licence applications for investigative works of a similar nature to that proposed for this application[7]. There is the potential for works associated with site investigations at Cooley Point, Braymore Point, Clogher Head and the North Irish Sea Array to take place within the schedule of works for this application, for example, as the licences granted provide a five year period within which to complete the works. In view of the similarity of the nature of the works between these applications, and the potential for in-combination effects, particular in relation to underwater noise, Oriel will maintain awareness of the scheduling associated with these other licences, and engage with the licence holders, as required. However, in view of the low sound power levels of the acoustic equipment used in such surveys, which are spatially discrete, and of short duration, it is concluded that such surveys will not result in likely significant in-combination effects.

Shipping activity in the area is dominated by fishing, particularly in the offshore area, with vessels in transit to or actively fishing the West Irish Sea Mudbelt, which is primarily targeted for *Nephrops*. Cargo vessels in transit to Dundalk, Warrenpoint and Drogheda are also present in the area, with lower densities of recreational, passenger and other vessels. In view of the level of existing shipping in the area, the temporary presence of the limited number of survey vessels will not result in likely significant in-combination effects.

[7] Cooley Point, Braymore Point, Clogher Head, North Irish Sea Array

Figure 3.2: Other relevant activities



3.4 Mitigation

Ireland is a contracting party to the *Convention on the Prevention of Marine Pollution by Dumping from Ships 1972*, and to the *Paris Convention on the Prevention of Marine Pollution from Land-based Sources 1974* (the "Oslo" and "Paris" Conventions respectively, both of which include offshore installations), and has adopted as a minimum requirement the international standards set by PARCOM and OSPAR. Ireland has ratified the *International Convention for the Prevention of Pollution from Ships 1973* as modified by the *Protocol of 1978* relating thereto (MARPOL 73/78) and implements requirements through regulations under the *Sea Pollution Act 1991 (as amended)*. Any vessel, including jack-up barge if used, used in the site investigations would therefore be subject to relevant controls under MARPOL.

Prevention and mitigation measures will be implemented to minimise, so far as practicable, the occurrence and magnitude of oil spills. For example, the fuel storage area and fuel tank vents on the jack-up barge would all be bunded. Main deck drains can be plugged if necessary to contain deck spillages, and a large quantity of adsorbent granules will be available in spill response kits on the jack-up barge.

Vessels will be refuelled in port but if a jack-up barge is used, offshore refuelling (bunkering) may be necessary. In this eventuality, every practical precaution will be taken to avoid a spill or leak of fuel into the sea. Bunkering of the jack-up barge would be limited to daylight hours, with calm seas, and with continual visual observation of the hose transfer. Hoses will be colour-coded, pressure tested, and equipped with breakaway fittings to prevent hose contents draining out in the event of an accidental or emergency disconnect. Jack-up barge fuel transfer practices and procedures will be audited and reviewed prior to, and during all relevant activities. Oil spill prevention and response will be included in the environmental awareness training proposed for barge and vessel crews as part of an induction to working on the site

investigations. All vessels will have Ship Onboard Pollution Emergency Plans (SOPEP), which outline shipboard prevention and contingency measures.

The surveys will result in a marginal increase in levels of marine traffic and therefore could theoretically increase the risk of accidents and potentially spillage of marine diesel fuel. The survey activities will be communicated through notices to mariners and the vessels will display appropriate navigational lighting. In view of the duration and scale of activity and standard good navigation practice, the probability of a collision with another vessel is considered to be extremely low, such that diesel spillage and potential effects are not considered to be likely.

4 APPROPRIATE ASSESSMENT CONCLUSION

The conclusion of the Stage 1 Screening for AA was that Likely Significant Effects could not be discounted for the Special Conservation Interests of five European sites on the basis of the potential effects of oil spillage from the survey vessels and these sites were screened in for a Stage 2 Appropriate Assessment (Natura Impact Statement, NIS).

This NIS has examined and analysed, using the best scientific knowledge, the potential impact sources and pathways, how these could impact on the sites' Qualifying Interests and whether the predicted impacts would adversely affect the integrity of the European sites. Mitigation measures are identified (see Section 3.4) to ensure that any impacts on the conservation objectives of the European sites will be avoided during the proposed site investigations such that there will be no risk of adverse effects to them.

These conclusions are based on objective scientific evidence and there is no reasonable scientific doubt in relation to these conclusions.

5 ARTICLE 12 ASSESSMENT

5.1 Relevant Annex IV species

Under Article 12 of the Habitats Directive, Annex IV species are afforded strict protection throughout their range, both inside and outside of designated protected areas. Those Annex IV species (cetaceans) that could potentially occur in the survey area are described below.

The survey area lies within Stratum 5 of the ObSERVE surveys, which extends from Carlingford Lough in the north to Carnsore Point in the south, and from the coast offshore to approximately the limit of the Irish EEZ. This area was surveyed a total of four times during the ObSERVE programme, in summer and winter 2015 and 2016. Harbour porpoise were observed throughout this area in all surveys, with density estimates of between approximately 0.7 and 1.0 porpoise per km^2 – the highest estimated across any survey strata. A single small group of bottlenose dolphins were recorded in one survey; waters to the south and west of Ireland are more important for this species. Small numbers of Risso's dolphins and minke whale were also observed in summer. Other cetacean species previously recorded in low numbers in the area include common dolphin, fin whale and humpback whale (Wall *et al.* 2013).

Berrow *et al*. (2011) carried out a visual and passive acoustic survey in a block within the northern Irish Sea, extending from Carlingford Lough, Co. Louth in the north to Bray Head, Co. Wicklow in the south. Harbour porpoise was by far the most commonly recorded marine mammal species, with 51 sightings comprising 83 individuals (estimated density of between 1.54-1.59 animals km^2), 6 minke whales were also recorded. Most sightings of harbour porpoise were east of Rockabill and Lambay Island off north County Dublin and towards the southern end of the survey area east of Greystones, Co. Wicklow. Minke whale sightings were east of Rockabill and Lambay Island off north County Dublin (Berrow *et al*. 2011).

Site specific information on the cetaceans present in the area comes from monthly boat-based surveys completed between May 2018 to May 2020 (with the exception of February, March and April 2020 due to COVID restrictions). Monthly aerial surveys were commenced in April 2020 for 6 months (although it should be noted the primary objective of the aerial survey programme was to assess the abundance and distribution of birds present in the area, APEM 2020) with static acoustic monitoring (SAM) between November 2019 and November 2020 (O'Brien *et al.* 2020).

Harbour porpoise were sighted in every month of the boat-based surveys within the offshore wind farm area and buffer with data from these surveys providing modelled estimates of a monthly average of 0.57 animals per km^2 and monthly peak of 1.33 animals per km^2. SAM results showed porpoises to be present on average 99% of days monitored with detection rates varying between 1-9 detections per hour across the four locations monitored within the survey area, with dolphins rarely detected. Season appeared to influence porpoise presence differently across the survey area, with winter and summer overall important periods for porpoise presence. The effect of diel cycle also varied, although night, morning and/or evening phases often yielded more detections than day phases. Tidal cycle and tidal phase only affected detection rate at some locations, where slack low water coincided with increased detections (O'Brien *et al*. 2020).

Aerial survey of the marine survey area and surrounding area (APEM 2020) indicated that over the 6 month period between April and September 2020, 53 individual cetaceans were observed, of which 45 were recorded as dolphin/porpoise (April: 18 individuals, May: 5, August: 15, September: 7), 3 harbour porpoise (June: 1 individuals, August: 2) and 3 dolphin

species (September). One baleen whale and one minke whale were recorded in September. Very few dolphins were recorded by the boat-based surveys. Minke whale were sighted during the boat-based site-specific surveys between the months of June and October, although most sightings were outside the offshore wind farm area. These sightings provided modelled estimates of a monthly average of 0.04 animals per km^2 and a monthly peak of 0.26 animals per km^2.

5.2 European Protected Species Risk Assessment

With respect of the proposed survey activities, Section 3.2 of the Stage 1 screening report identified and described the main sources of potential effect relevant to marine mammals as:

- physical presence of the survey vessels,
- underwater noise including from the vessel and survey equipment.

These sources are also relevant to this EPS risk assessment of cetacean species.

5.2.1 Physical presence of the survey vessels

Section 4.2.2 of the Stage 1 screening report indicated that the physical presence of the vessel may influence the distribution and movements of sensitive species in the water column, including EPS such as harbour porpoise, dolphin species and minke whale. As hearing specialists, any displacement of cetaceans is most likely associated with acoustic disturbance, which is discussed below. However, the physical presence of the vessel around areas of existing shipping activity, and its temporary presence, are anticipated to cause no more than temporary and localised low-level behavioural responses similar to those from established vessel traffic, such that significant effects on EPS are not predicted.

5.2.2 Underwater noise including from the vessel and survey equipment

Noise sources and propagation

Section 4.2.3 of the Stage 1 screening report provides a detailed description of the main noise sources associated with the proposed survey activities (summarised in Table 5.1 below) and their likely propagation in the environment.

Table 5.1: Potential acoustic survey equipment and indicative source characteristics

Equipment	Indicative source characteristics	
	Nominal operating frequency	**Source level**
UHRS sparker/boomer	1-3.5kHz	222dB re 1µPa @1m (peak)
Side-scan sonar	100kHz & 500kHz	235 dB re 1µPa @1m (peak)
Multi-beam echosounder e.g. Kongsberg EM710	70-100kHz	225-231dB re 1µPa @1m (peak)
Sub-bottom Profiler e.g. Innomar SES-2000 Quattro Parametric	Primary: 85-115kHz Secondary: 2-20kHz	235-245dB re 1µPa @1m (peak)

Underwater noise emitted by small leisure craft and vessels <50m tends to have a source level of 160-175 dB re 1µPa@1m, and with greater sound energy in relatively higher frequency (above 1kHz) when compared to large ships; support and supply vessels (50-100m) are

expected to have source levels in the range 165-180dB re 1µPa@1m range and with most energy in lower frequencies (OSPAR 2009). For the purpose of this noise assessment, the survey vessel is assumed to be of 50-100m in length. Veirs *et al*. (2016) estimated sound characteristics for a wider variety of ships (from pleasure craft to container ships) in transit across the Haro Strait (west coast of North America). Median received levels of ship noise within the study area were measured to be most elevated above ambient noise at the lower frequencies (20-30dB from 100-1,000Hz), and to a lesser extent also at higher frequencies (5-13dB from 10-40kHz). The use of thrusters for DP has been reported to result in increased sound generation of ~10dB compared to the same vessel in transit: measurements at 600m range to an offshore supply vessel of 79m length recorded broadband SPL (18-3,000Hz) of 148dB re 1µPa (root-mean-squared, rms) when in DP mode, compared to 135.5dB re 1µPa rms when in transit at a speed of 10 knots (Rutenko & Ushchipovskii 2015).

Noise measurements of emitted sounds from logging involving sound sources including PS logging (entirely downhole) and SCPT (downhole logging with a surface source) are not available. These involve very small noise sources (~70dB) which generate a shear wave that is detected at depth within the borehole. A small (75kg) free fall hammer may be used in sampling if sample recovery using a push sampling method is not possible. Measurements from the use of a 100kg free fall hammer for standard penetration testing (Erbe & McPherson 2017) recorded source levels of 151-160 dB re 1 µPa^{2}s @ 1 m (20-24kHz), which are likely to be comparable to those potentially generated by the hammer sampling for this survey.

Risk assessment

Section 4.2.3 of the Stage 1 screening report indicates that with respect to underwater noise, a distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria of sound levels, with the most recent criteria presented in Southall *et al*. (2019). Auditory capabilities, and in particular the range of frequencies over which sensitivity is greatest, varies between species and criteria are assigned to functional hearing groups with accompanying injury criteria. Table 5.2 provides details of the relevant cetaceans (i.e. harbour porpoise, bottlenose dolphin, common dolphin, minke whale) listed by functional hearing group, their estimated hearing range and recommended injury criteria, defined as the sound level at which a permanent threshold shift (PTS; permanent hearing damage) is estimated to occur.

Table 5.2: Marine mammal auditory injury criteria to impulsive and non-impulsive noise by functional hearing group

Functional hearing group (species relevant to the survey area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria**	
		Impulsive noise (dB re 1µPa, peak, unweighted)	**Non-impulsive noise** $L_{E,24h}$ (dB re 1 µPa²·s)
Low frequency cetaceans Minke whale *(Balaenoptera acutorostrata)*	0.2 kHz to 19 kHz	219	199

Functional hearing group (species relevant to the survey area)	**Estimated hearing range** (region of greatest sensitivity) [frequency of peak sensitivity]	**Proposed injury (PTS onset) threshold criteria**	
		Impulsive noise (dB re 1µPa, peak, unweighted)	**Non-impulsive noise** $L_{E,24h}$ (dB re 1 µPa²·s)
High-frequency cetaceans Bottlenose dolphin (*Tursiops truncatus*)	150 Hz to 160 kHz (8.8 kHz to 110 kHz) [58 kHz]	230	198
Very high frequency cetaceans Harbour porpoise (*Phocoena phocoena)*	275Hz to 160kHz (12kHz to 140kHz) [105kHz]	202	173

Source: Southall et al. (2019). Notes: The region of greatest sensitivity represents parameters f1 and f2, which are the bounds of the flat, central portion of the frequency-weighting curve region; the frequency of peak sensitivity represents parameter f0. $L_{E,24h}$ *= cumulative sound exposure level over 24 hours, weighted according to functional hearing group.*

Of the species likely to occur in the survey area, the harbour porpoise has the lowest threshold criteria for the onset of PTS at 202dB re 1µPa. Given the source characteristics and evidence of propagation presented in Section 4.2.3 of the Stage 1 screening report, the potential sources in the planned survey (including all geophysical and geotechnical techniques) will not result in received sound levels exceeding this threshold or those of the other EPS beyond more than a few metres from the source. Therefore, given the very small radius (a few metres) within which injury may potentially occur and the relatively low numbers of EPS likely to be present during the temporary surveys, the risk of injury to EPS is considered to be negligible, and significant effects are not considered to be likely.

Underwater noise from the survey vessel itself and the drilling of the shallow boreholes (the noise from which will not be greater than that associated with the vessel) could potentially cause behavioural disturbance of EPS present in the area. Reported responses include avoidance, changes in swimming speed, direction and surfacing patterns, alteration of the intensity and frequency of calls (review Erbe *et al*. 2019). Harbour porpoises and minke whales have been shown to respond to survey vessels by moving away from them, while some other species, such as common dolphins, have shown attraction (Palka & Hammond 2001). While there is potential for some behavioural disturbance of cetaceans in response to survey vessel noise, the area of potential disturbance will be highly localised (i.e. within a few hundred metres radius), in an open sea habitat (i.e. with movement of animals not restricted by geographic features such as a shoreline), transient and of short overall duration. The increase in underwater noise from the survey vessel activities, relative to existing levels in the wider area from other shipping and fisheries, is expected to be negligible.

Considering the acoustic characteristics of the potential sources and their propagation, the relevant evidence of effects on cetaceans from vessel noise, seismic survey and the proportionally lower potential for effects of the specific sources being used, in addition to the small spatial footprint and short duration (approximately one week) of the planned survey, the risk of behavioural disturbance to EPS is considered to be extremely low, and significant effects are not considered to be likely.

5.3 Article 12 Conclusion

The Article 12 assessment of the potential impacts on EPS from proposed survey activities concludes that:

- the risk of injury to EPS is considered to be negligible, and significant effects are not considered to be likely
- the risk of behavioural disturbance to EPS is considered to be extremely low, and significant effects are not considered to be likely.

Therefore, it is concluded that the proposed survey activities will not give rise to significant impacts to species listed under Annex IV of the Habitats Directive.

6 REFERENCES

APEM (2020). Ornithological and Marine Megafauna Aerial Survey Results of Oriel Offshore Wind Farm. APEM Scientific Report P4972, 132pp.

Berrow S, O'Brien J, Ryan C, McKeogh E & O'Connor I (2011). Inshore boat-based surveys for cetaceans – Irish Sea. Report to the National Parks and Wildlife Service. Irish Whale and Dolphin Group, 24pp.

Erbe C & McPherson C (2017). Underwater noise from geotechnical drilling and standard penetration testing. *The Journal of the Acoustical Society of America* **142**: EL281.

European Commission (2019). Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. 80pp.

European Commission (2021). Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. 114pp

IMO (1988). Manual on Oil Pollution, Section IV Combating Oil Spills. International Maritime Organization, London 216pp.

NPWS (2011a). Dundalk Bay SAC 000455 and Dundalk Bay SPA 004026 conservation objectives, 42pp.

NPWS (2011b). Dundalk Bay SAC - Conservation objectives supporting document- marine habitats. Version 1, 11pp.

O'Brien J, Pommier M & Berrow S (2020). Static Acoustic Monitoring (SAM) at the proposed windfarm site at Oriel. Final Report to Oriel Windfarm Limited. Irish Whale and Dolphin Group, 23pp.

Office of the Planning Regulator (2021). Appropriate Assessment Screening for Development Management. OPR Practice Note PN01. 46pp.

OSPAR (2009). Overview of the impacts of anthropogenic underwater sound in the marine environment. OSPAR Commission Biodiversity Series 2009. Publication Number 441/2009, 34pp.

Palka DL & Hammond PS (2001). Accounting for responsive movement in line transect estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences* **58**: 777–787.

Rutenko AN & Ushchipovskii VG (2015). Estimates of noise generated by auxiliary vessels working with oil-drilling platforms. *Acoustical Physics* **61**: 556-563.

Southall B, Finneran JJ, Reichmuth C, Nachtigall PE, Ketten DR, Bowles AE, Ellison WT, Nowacek DP & Tyack PL (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* **45**: 125-232.

Southall B, Nowacek DP, Bowles AE, Senigaglia V, Bejder L, & Tyack PL (2021). Marine Mammal Noise Exposure Criteria: Assessing the Severity of Marine Mammal Behavioral Responses to Human Noise. *Aquatic Mammals* **47**: 421-464.

Veirs S, Veirs V & Wood JD (2016). Ship noise extends to frequencies used for echolocation by endangered killer whales. *PeerJ* **4**: e1657.

APPENDIX 1: NATURA 2000 SITE INFORMATION

The tabulations in this Appendix contain lists of the qualifying interests for each Natura 2000 site subject to Appropriate Assessment (listed in **Error! Reference source not found.**) and those features of relevance to the survey programme. Additional information on site conservation objectives is also provided, which along with the qualifying interests inform a consideration of the nature of the interaction with the potential sources of likely significant effect.

Special Areas of Conservation (SAC)

Site Name: Dundalk Bay SAC **Site Code: IE0000455**
Site information
Relevant qualifying interests: Estuaries, mudflats and sandflats not covered by seawater at low tide, perennial vegetation of stony banks, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean salt meadows (*Juncetalia maritimi*) **Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area:** estuaries, mudflats and sandflats not covered by seawater at low tide (note other Annex I features of the site are beyond the 5km screening criterion noted in Section 3.3.1) **Summary Conservation objectives:** • To maintain the favourable conservation condition of estuaries • To maintain the favourable conservation condition of mudflats and sandflats not covered by seawater at low tide • To maintain the favourable conservation condition of perennial vegetation of stony banks • To maintain the favourable conservation condition of *Salicornia* and other annuals colonising mud and sand • To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) **Feature attributes and targets defining favourable conservation status:** **https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000455.pdf**
Closest distance (km) to the survey: 4.5km
Consideration of site interest features against potential sources of likely significant effect
Oil spills Oil spills from the survey vessels would be a source of potential effect for Annex I habitats. Given the potential for an oil slick to drift under wind and water currents to the Annex I habitats adjacent to the survey area, the site is considered further in Section **3**.2.

Site Name: Carlingford Shore SAC **Site Code: IE0002306**
Site information
Relevant qualifying interests: Annual vegetation of drift lines, Perennial vegetation of stony banks

Site Name: Carlingford Shore SAC **Site Code: IE0002306**
Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Annual vegetation of drift lines **Summary Conservation objectives:** • To maintain the favourable conservation condition of Annual vegetation of drift lines • To maintain the favourable conservation condition of Perennial vegetation of stony banks **Feature attributes and targets defining favourable conservation status:** https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002306.pdf
Closest distance (km) to the survey: 4.5km
Consideration of site interest features against potential sources of likely significant effect
Oil spills Oil spills from the survey vessels would be a source of potential effect for Annex I habitats. Given the potential for an oil slick to drift under wind and water currents to the Annex I habitats adjacent to the survey area, the site is considered further in Section 3.2**.**

Special Protection Areas (SPAs)

Site Name: Dundalk Bay SPA **Site Code: 004026**
Site information
Relevant qualifying interests: Northern pintail (*Anas acuta*), Eurasian teal (*Anas crecca*), mallard (*Anas platyrhynchos*), greylag goose (*Anser anser*), light-bellied brent goose (*Branta bernicla hrota*), dunlin (*Calidris alpina*), red knot (*Calidris canutus*), ringed plover (*Charadrius hiaticula*), black-headed gull (*Chroicocephalus ridibundus*), Eurasian oystercatcher (*Haematopus ostralegus*), herring gull (*Larus argentatus*), common gull (*Larus canus*), bar-tailed godwit (*Limosa lapponica*), black-tailed godwit (*Limosa limosa*), common scoter (*Melanitta nigra*), red-breasted merganser (*Mergus serrator*), Eurasian curlew (*Numenius arquata*), European golden plover (*Pluvialis apricaria*), grey plover (*Pluvialis squatarola*), great crested grebe (*Podiceps cristatus*), common shelduck (*Tadorna tadorna*), common redshank (*Tringa totanus*), northern lapwing (*Vanellus vanellus*); Waterbird assemblage **Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area:** common scoter, red-breasted merganser, great crested grebe **Summary Conservation objectives:** • To maintain the favourable conservation condition of those qualifying interests listed above in Dundalk Bay SPA, including the wetland habitat as a resource for the regularly occurring migratory birds that utilise it. **Feature attributes and targets defining favourable conservation status:** https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004026.pdf
Closest distance (km) to the survey: <1km
Consideration of site interest features against potential sources of likely significant effect
Oil spills Oil spills from the survey vessels would be a source of potential effect for Annex I habitats. Given the potential for an oil slick to drift under wind and water currents and affect the waters of the site and to beach on the intertidal habitats adjacent to the survey area and affect seabirds, waders, divers and wildfowl, the site is considered further in Section **3**.2.

Site Name: Carlingford Lough SPA
Site Code: IE0004078

Site information

Relevant qualifying interests: Light-bellied Brent Goose (*Branta bernicla hrota*), Wetland and Waterbirds

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: Light-bellied Brent Goose, Wetland and Waterbirds

Summary Conservation objectives:

- To maintain the favourable conservation condition of Light-bellied Brent Goose
- To maintain the favourable conservation condition of the wetland habitat

Feature attributes and targets defining favourable conservation status:
https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004078.pdf

Closest distance (km) to the survey: 5.7km

Consideration of site interest features against potential sources of likely significant effect

Oil spills
Oil spills from the survey vessels would be a source of potential effect for the qualifying interests indicated above. Given the potential for an oil slick to drift under wind and water currents to beach on the intertidal habitats adjacent to the survey area and affect waders and wildfowl, the site is considered further in Section 3.2.

Site Name: Carlingford Lough SPA
Site Code: UK9020161

Site information

Relevant qualifying interests: Sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*), light-bellied brent goose (*Branta bernicla hrota*)

Qualifying interests identified for further consideration on the basis of a foreseeable interaction with the survey area: sandwich tern, common tern

Summary Conservation objectives:
To maintain or enhance the population of the qualifying species
Fledging success sufficient to maintain or enhance population
To maintain or enhance the range of habitats utilised by the qualifying species
To ensure that the integrity of the site is maintained;
To ensure there is no significant disturbance of the species and
To ensure that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species

https://www.daera-ni.gov.uk/sites/default/files/publications/doe/carlingford-lough-SPA-conservation-objectives-2015.pdf

Site Name: Carlingford Lough SPA **Site Code: UK9020161**
Closest distance (km) to the survey: 7km
Consideration of site interest features against potential sources of likely significant effect
Oil spills Oil spills from the survey vessels would be a source of potential effect for the qualifying interests indicated above. Given the potential for an oil slick to drift under wind and water currents to **affect the waters of the site and to** beach on the intertidal habitats adjacent to the survey area and affect wildfowl and foraging terns, the site is considered further in Section 3.2.