

Dublin Array Offshore Wind Farm

Annex E: Report to inform Appropriate Assessment Screening

Site Investigation and Ecological Monitoring Works



Date: September 2021

Final

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Acronyms

Term	Definition
2DUHRS	2D Ultra High Resolution Seismic
CPT	Cone Penetration Test
cable corridor search area	Export Cable Corridor
EIAR	Environmental Impact Assessment Report
FL	Foreshore Licence
HDD	Horizontal Directional Drilling
GNSS	Global Navigation Satellite System
MAG	Magnetometer
MBES	Multi-beam Echosounder
MHW	Mean High Water
MMO	Marine Mammal Observer
NMS	National Monuments Service
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
NIS	Natura Impact Statement
PLONOR	Pose Little or No Risk to the Environment
SAC	Special Area of Conservation
SAM	Static Acoustic Monitoring
SBES	Single-beam Echosounder
SBP	Sub Bottom Profiler
SPA	Special Protection Area
SSS	Side Scan Sonar
UK	United Kingdom
QI(s)	Qualifying Interest(s)
UHRS	Ultra-High Resolution Seismic
WTGs	Wind Turbine Generators
ZoI	Zone of Influence

1 Introduction

- 1.1.1 RWE Renewables Ireland Limited (RWE) wish to undertake a geotechnical and geophysical site investigation for the proposed Dublin Array offshore wind farm development, in addition to ecological and wind, wave and current monitoring as defined in Section 4 of this report. The full suite of works will hereafter be referred to as the proposed works.
- 1.1.2 To secure the necessary consent to carry out the proposed works RWE are applying for a Foreshore Licence from the Department of Housing, Local Government and Heritage. The Foreshore Licence Application area is located immediately south of Dublin City in the foreshore adjoining the functional areas of Dublin City Council, Fingal County Council, Dun Laoghaire and Rathdown County Council and Wicklow County Council and extends approximately 17 km offshore and includes the vicinity of the Kish and Bray Banks.
- 1.1.3 The total Foreshore Licence application area encompasses an area of 1,130 km². Geophysical and geotechnical surveys are planned to take place within the array area, the Offshore Export Cable Corridors (Offshore ECCs) and the two associated potential landfalls at Poolbeg and Shanganagh (see Figure 1). The wind, wave and current measuring devices will be deployed within the array area. The maximum extent of the geotechnical, geophysical and metocean survey area is 189km², but the actual area which may be surveyed within this boundary is likely to be considerably less and may vary depending on what the project decides in terms of inter-array cabling, final layouts and export cable routes. Ecological monitoring inclusive of the static acoustic monitoring devices (SAM) will take place over a wider geographical area to provide data coverage of the array, Offshore ECCs and surrounding area within one tidal excursion of the site boundary.
- 1.1.4 The report has been produced by GoBe Consultants Ltd (GoBe) on behalf of RWE Renewables Ireland Limited. GoBe has been at the forefront of strategic planning, consenting and EIA for large scale offshore wind within the UK. GoBe's understanding of the requirements of the EIA and Appropriate Assessment (AA) processes will be applied in advising on assessment requirements and in developing robust survey methodologies.
- 1.1.5 GoBe has acted as lead EIA consultants on a number of recent offshore wind farms throughout the consenting process, including examples of projects consented under the Foreshore Licensing system in Ireland and within the UK under requirements of the Planning Act 2008 in England and Wales and Section 36 of the Electricity Act 1989 in Scotland. GoBe's role on these projects as lead EIA consultant has typically encompassed the following:
- Consents and stakeholder strategy development, management and delivery;
 - Preparation of scoping reports and analysis and implementation of scoping opinions;
 - Management of characterisation surveys, onshore and offshore;
 - Drafting of environmental statements or EIA Reports to support statutory consultation;
 - Preparation of Information to support AA (including screening for AA and Natura Impact Statements (or in the UK, Habitats Regulations Assessment) reports);

- 1.1.6 All GoBe staff have experience of the preparation of information to support Appropriate Assessments and EIA. Contributors to this report include Steve Bellew, Sarah Strong, Justine Davies and Phil New.
- 1.1.7 In accordance with the requirements set out under Article 6(3) of the Habitats Directive (92/42/EEC), this report presents information to support the competent authority, in this case the Minister for Housing, Local Government and Heritage, to undertake an Appropriate Assessment (AA) screening. The report aims to assist the Minister in determining whether the proposed works, alone and/or in-combination with other plans and projects, are likely to have an Adverse Effect on the Integrity (AEol) of any Natura 2000 site.
- 1.1.8 Where the likelihood of an AEol is uncertain under the precautionary principle, an NIS will be prepared (taking into account the conservation objectives of any relevant Natura 2000 sites) to inform and assist the competent authority in carrying out the AA (see Annex F: Applicant's Natura Impact Statement).

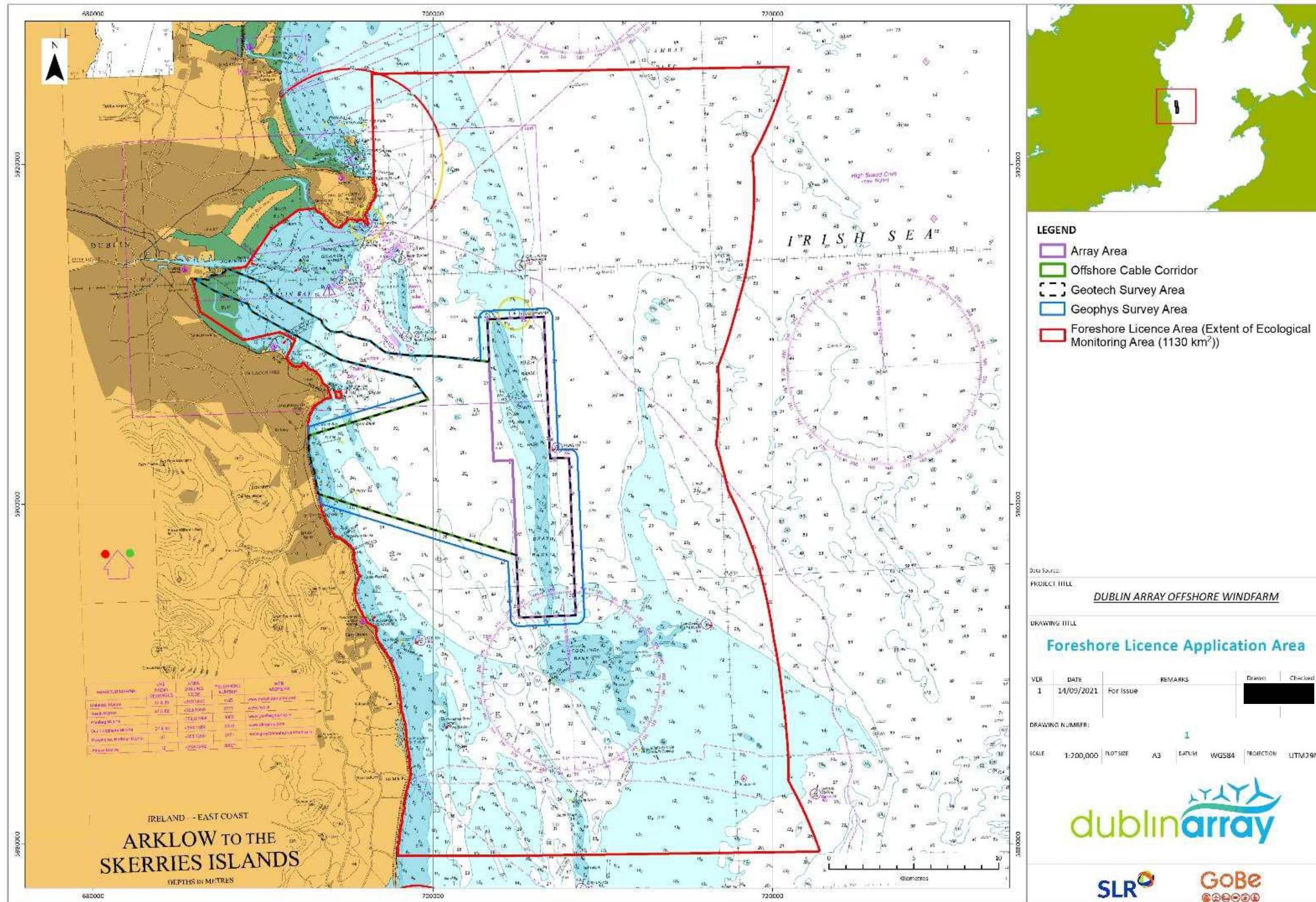


Figure 1 Foreshore Licence Application Area

1.2 Purpose of the Document

- 1.2.1 In view of the potential of the proposed works to affect European site(s) and as the project is not connected or necessary to the management of a European site, screening for AA is required. This report will document a preliminary evaluation of the potential effects of the proposed works upon European sites and identify effect-pathways for which an appropriate assessment is required against the Conservation Objectives of relevant European sites (those that could be significantly affected).
- 1.2.2 Regulation 42 of the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. No. 437 of 2011) (as amended) transposes Article 6(3) of the Habitats Directive into Irish law. Having regard to Regulation 42, it is recognised by the Applicants that the competent authority for carrying out Screening for Appropriate Assessment for the proposed development is the Minister for Housing, Local Government and Heritage. This report has been prepared by the Applicants to provide information to the Minister with respect to the potential for the site investigation and monitoring surveys to have likely significant effects on one or more Natura 2000 sites. The Minister as the competent authority are not bound to reach the same conclusion as this report.
- 1.2.3 In accordance with DEHLG (2009) and OPR (2021) guidance¹, (see Section 2.2), this report contains the following:
- ▲ Description of the project (or plan) i.e. site investigation and monitoring scope;
 - ▲ Local site characteristics;
 - ▲ Identification of relevant European sites and compilation of information on their qualifying interests and Conservation Objectives;
 - ▲ Assessment of likely effects (direct, indirect and cumulative, and on the basis of available information);
 - ▲ Screening statement with conclusions.

¹ Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of the Environment Heritage and Local Government (Ireland) (DEHLG) 2009, revised 11/02/10) and Appropriate Assessment Screening for Development Management: OPR Practice Note PN01. Office of the Planning Regulator, March 2012.

2 Legislative Background

2.1 Birds and Natural Habitats Regulations 2011

- 2.1.1 The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna) was adopted in 1992 and transposed into Irish Law by the European Communities (Birds and Natural Habitats) Regulations 2011 as amended (S.I. No. 477 of 2011) (the Habitats Regulations) and the Planning and Development Act (as amended). The Habitats Directive provides the framework for legal protection to ensure the conservation of a wide range of rare, threatened or endemic animal and plant species throughout the European Union. The Birds Directive (Conservation of Wild Birds Directive (79/409/EEC) aims to protect all of the 500 wild bird species naturally occurring in the European Union.
- 2.1.2 The provisions of the Habitats Directive seek to maintain or restore the “favourable conservation status” of habitats and species designated within protected areas, known as Natura 2000 sites. European sites consist of Special Areas of Conservation (SAC) and Special Protection Areas (SPA), which together provide for the protection and long-term survival of Europe’s most valuable and threatened species and habitats. Collectively, these sites comprise the Natura 2000 network of protected sites across Europe.
- 2.1.3 The requirement for an AA is set out in Article 6(3) of the Habitats Directive (92/43/EEC). If a project is likely to have a significant effect on a Natura 2000 site, either alone or in-combination with other plans or projects, it must undergo an AA Process (Section 2.1).

Article 6(3) of the Habitats Directive requires “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 AA 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, 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”.

2.1.4 Should the conclusion of the AA be that AEoI cannot be ruled out beyond reasonable scientific doubt, Article 6(4) goes on to state: *“If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.”*

2.1 Appropriate Assessment Process

2.1.1 The requirements of the ‘AA Process’ are generally satisfied through a progressive four-stage assessment process (DEHLG, 2009 as amended 2010) in accordance with the relevant guidance (Section 2.2). The four stages are shown in Figure 2, Stage 1: Screening for AA (AA screening); Stage 2: AA; Stage 3: Mitigation and consideration of alternatives; Stage 4: Imperative reasons of overriding public interest, with each stage determining if the subsequent step is required. Appropriate Assessment refers to the overarching assessment and the second stage within it, known as the ‘AA’. Information pertaining to the AA is detailed within a Natura Impact Statement (NIS) required by the competent authority to undertake the AA. The current report provides the information to support Stage 1 and Stage 2 – with no requirement to progress to Stage 3 identified.

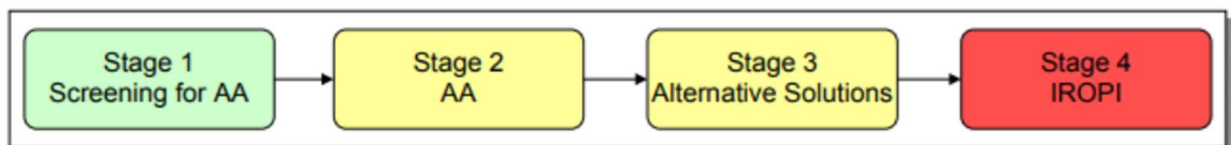


Figure 2 - Stages in the AA process (Source: DEHLG, 2009)

Stage 1: Screening for Appropriate Assessment

2.1.2 This report details information to inform the Stage 1: Screening for AA (often referred to as AA screening or Stage 1 screening). Screening is the first stage of the ‘AA Process’. AA screening **undertaken by the** competent authority, in this case the Minister for Housing, Local Government and Heritage, identifies the potential for Likely Significant Effects (LSE) on a European site (alone or in-combination with other projects or plans); it is an iterative process and considers an initial evaluation of a project to assess its predicted impacts against the Conservation Objectives of relevant Natura 2000 sites. AA screening should be undertaken without the inclusion of mitigation.

- 2.1.3 The DEHLG guidance (2009, amended 2010) states that screening determines whether AA is necessary by examining:
- ✦ Whether a project can be excluded from AA requirements because it is directly connected with or necessary to the management of the site; and
 - ✦ The potential effects of a project (either alone or in-combination with other projects or plans) on a Natura 2000 site in view of the site's conservation objectives and considering whether these effects will be significant.
- 2.1.4 The requirement to progress to Stage 2 is determined by the outcome of the screening stage.

Stage 2: Appropriate Assessment

- 2.1.5 An AA is required where the AA screening stage determines that the proposed works are likely to have a significant effect on a Natura 2000 site with respect to its Conservation Objectives. This second stage considers whether the proposed works (either alone or in-combination with other projects or plans), will result in an AEoI of a European site. Where AEoI are identified or where an adverse effect is uncertain, mitigation will be required. Mitigation measures will aspire to avoid impacts and effects at source insofar as possible and will be clearly stated together with an explanation as to how the measures will avoid or reduce the adverse effects.
- 2.1.6 The report produced for the AA of projects is known as a Natura Impact Statement (NIS) and documents the findings of this stage of the process (see Annex F: Applicant's Natura Impact Statement). The AA is carried out by the competent authority and is informed by the NIS. The requirement to proceed to next (third) stage of the 'AA Process' will be determined by the outcome of this second stage.

Stage 3: Alternatives

- 2.1.7 The potential need for Stage 3 is informed by the conclusions of Stage 2, the Applicant's NIS has identified no such requirement here. Stage 3 examines any alternative solutions or options that could enable the plan or project to proceed without AEoI of a European site, while meeting the objectives of the plan or project. The process must return to Stage 2 if an alternative is identified. If required to progress to Stage 3, the applicant must demonstrate that all reasonable alternatives have been considered and assessed, and that the least damaging option has been selected, before progressing to Stage 4.

Stage 4: Imperative Reasons of Overriding Public Interest

2.1.8 The potential need for Stage 4 is informed by the conclusion of Stage3, if the latter is required. Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a European site to proceed, in cases where it has been established that no less damaging alternative solution exists. The extra protection measures for Annex I priority habitats come into effect when making the IROPI. Compensatory measures must be proposed and assessed. The European Commission must be informed of the compensatory measures. Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.

2.2 Guidance

2.2.1 This report has been produced in accordance with the following guidance:

- ▲ Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of the Environment Heritage and Local Government (Ireland) (DEHLG) (2009, revised 11/02/10);
- ▲ Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities (DEHLG, 2010); Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- ▲ Guidance on EIS and NIS preparation for Offshore Renewable Energy Projects (DCCAE, 2017);
- ▲ Appropriate Assessment Screening for Development Management. OPR Practice Note PN01. (Office of the Planning Regulator, 2021);
- ▲ Assessment of plans and projects significantly affecting Natura 2000 sites Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. (EC, 2001);
- ▲ Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive (International Workshop on Assessment of Plans under the Habitats Directive, 2011);
- ▲ Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC (European Commission, 2007);
- ▲ Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2000);

- ▲ Marine Natura Impact Statements in Irish Special Areas of Conservation: A working document. Prepared by National Parks and Wildlife Service, DAHG (2012);
- ▲ Guidance to Manage the Risk to Marine Mammals from Manmade Sound Sources in Irish Waters. Prepared by National Parks and Wildlife Service, DAHG (2014); and
- ▲ Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EU - 21 November 2018).

2.3 Consultation

2.3.1 Consultation undertaken to support this Foreshore Licence application is provided in Table 1 below.

Table 1 Consultation undertaken in support of the Foreshore Licence

Consultee	Meeting details	Comments
Department of Housing, Local Government and Heritage.	19 November 2020 Online meeting	Preliminary consultation meeting – advice given by DHLGH to indicate area within Foreshore Licence boundary where static acoustic monitoring equipment would not be deployed. Advice regarding new guidance for presentation of Foreshore Licence figures.
	13 August 2021 Online meeting	Pre-application consultation following revision of scope of application. Advice received regarding required supporting documents
	23 August 2021 Online meeting	Pre-application call with Ecological Advisor to discuss information required to support Minister’s Appropriate Assessment Screening process.
National Parks and Wildlife Service	06 and 09 July 2021 Email correspondence	Email exchange regarding scope of works and proposed ecological mitigation measures. Confirmation from NPWS that the mitigation measures proposed appeared to be in order.
Dublin Port	09 July 2021 Email correspondence	Email sent regarding scope of works and proposed navigation mitigation measures.
Fishers	15 and 16 September 2021 Written briefing and meeting at harbours in Dun Laoghaire and Wicklow	Briefing meeting on proposed survey scope and foreshore licence application.

3 Method and Guiding Principles

3.1 Guidance

- 3.1.1 The method draws mainly upon guidance produced by DEHLG (2009) and OPR (2021) and is further defined by the principles that underlie the Habitats Directive (for example the precautionary principle and proportionality).
- 3.1.2 The method is required to identify all elements of the proposed works with the potential to have a significant effect on a European site (EC, 2001). These sites will be identified for AA screening with reference to the proposed works effect-sources, the geographical scale over which they could arise (the 'Zone of Influence' (Zol)) and possible interactions with European site's Qualifying Interests (QI). The well-established source-pathway-receptor (s-p-r) concept will guide the determination of the Zol and effect-pathways to European sites.

3.2 Source-pathway-receptor Approach

- 3.2.1 The s-p-r approach is the standard conceptual model that is used across a number of European Directives to characterise the means (pathways) via which effect-sources (such as the works being proposed) could be experienced by receptors (sensitive QI of a European site). Only where there is an identifiable source, a pathway and a sensitive receptor, is there likely to be a significant effect. The s-p-r framework refers to its three comprising elements that must all be present to identify a potential effect-pathway.
- 3.2.2 The most obvious extent of the Zol is within the 'footprint' of an effect where exposure might provide a direct pathway to a receptor. Source-pathway-receptor relationships are not always linear, and effects might be transmitted beyond the 'footprint' via hydrological pathways or enabled by impacts on another receptor (indirect effects). Notwithstanding this, how an effect might progress from its source along pathways to a particular European site can easily be discerned with reference to the receiving environment. Consideration of supporting habitat (defined as areas that can be used by a species, in particular those which may be listed as a feature of a designated site, to support that species survival and/or reproduction) is also important here.

3.3 Zone of Influence and Screening Criteria

- 3.3.1 Potential effects may not be confined to the area within the Foreshore Licence area but may extend to sites further afield due to the mobility of potential receptors (i.e. birds, marine mammals and fish).
- 3.3.2 The OPR (2021) guidance states that any European sites within the likely Zol of the plan or project should be considered within the AA Process. The Zol is established on a case by case basis using the s-p-r framework.

- 3.3.3 The method to identify the Zol defines all components of the Zol as:
- ▲ The area over which direct effects could occur within the project footprint;
 - ▲ The area of indirect impact surrounding the project footprint; and
 - ▲ The area that captures remote sites where species distribution/ ranges provide connectivity.
- 3.3.4 The area over which direct effects can occur has been defined as the boundaries within which the surveys are undertaken within the foreshore licence application. The geotechnical and metocean surveys will be undertaken within the boundaries of the array area and Offshore ECCs, as shown in Figure 3 to Figure 7. The geophysical surveys are also focussed on the Offshore ECCs and array area with a 500 m buffer applied around the latter. The extended foreshore licence area only applies to ecological monitoring, including deployment of Static Acoustic Monitoring (SAM) devices to the north and east of the Dublin Array and ecological monitoring across the extent of the tidal excursion.
- 3.3.5 Consideration has also been given to the presence of mobile species (marine mammals, fish and birds) that may pass through the area during key stages of their life cycle (e.g. migration and foraging from breeding colonies) and the connectivity to European sites across a wider study area.
- 3.3.6 For marine mammals, in addition to SACs within the immediate footprint, a Zol has been defined based upon the evaluation of noise propagation models in Konsberg (2010), with a distance of 250 km considered as a buffer for cetaceans, which takes in designated sites across the Irish Sea. This is considered extremely conservative in relation to the assessment of noise impacts from the survey, given the dissipation of noise levels over distance and the low levels of noise generated from the survey in an area with high levels of shipping. For seals, pathways are identified by known foraging ranges for harbour seal (120 km (SMRU, 2011)) and grey seal (145 km (Thompson *et al.* 1996)).
- 3.3.7 A similar approach has been adopted to define the Zol for bird species with consideration of the species most likely to be present (identified through site specific surveys undertaken in support of the Dublin Array EIAR) and connectivity to breeding colonies within foraging ranges of breeding seabirds as defined by Woodward *et al.* (2019).
- 3.3.8 The Zol for fish captures prey species within the immediate footprint and also migratory fish species which could pass through Dublin Bay from designated rivers during their life cycle.

4 Project Information

4.1 Overview

- 4.1.1 The proposed works will build upon information gathered in previous surveys to provide further geotechnical, geophysical, ecological and metocean information in relation to the offshore site conditions to inform detailed design decision in relation to foundation type, sizing and installation methodology along with cable route design and installation methodology selection and to verify the validity of previously acquired data in a changing environment.
- 4.1.2 In accordance with Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects, DCCA. 2018, pre-construction ecological monitoring may be required prior to construction of the wind farm commencing. These surveys can be repeated post construction in order to monitor any change in ecological receptors. A broad suite of monitoring activities has therefore been included within this Licence application and the final scope of ecological monitoring will be agreed in consultation with the appropriate statutory agencies.
- 4.1.3 The indicative locations of the survey areas which form the scope of the proposed works are shown in Figure 3 to Figure 7. The final geotechnical and ecological sampling locations and buoy deployment positions will be selected after a review of the most up to date geophysical data available in advance of selection of the sampling stations. The data will be reviewed for the presence of anomalies of potential anthropological origin and potential for ecological features such as subtidal reef. Locations will be micro-sited where necessary to avoid archaeological or ecological impacts. As such, no figure is provided for the benthic sampling locations, but taking a precautionary approach it has been assumed that samples could be taken anywhere across the Foreshore Licence application area.
- 4.1.4 Should the review of the geophysical data identify areas of paleo archaeological interest which require further archaeological investigation the sampling locations will be micro-sited to achieve this aim.
- 4.1.5 The survey components which are the subject of this Foreshore licence are summarised as in the following sections.

Geotechnical Survey

- ▲ Up to 61 geotechnical wireline-logged boreholes within the proposed array area covering the full site. These boreholes will be to a target depth of, approximately, 80 m below the seafloor and have a diameter of up to 254mm;
- ▲ Up to 61 deep push seafloor Cone Penetration Tests (CPTs) within the array area, to a target depth of, approximately, 80 m depth below the seafloor and have a diameter of approximately 40mm;

- ▲ Up to 31 seafloor CPTs with a diameter of approximately 40mm and 48 vibrocores with a diameter of approximately 150 mm diameter. These will be located within the Offshore ECC, extending into the array. Both techniques will be to an approximate depth of 6 m below the seafloor, five of each may be located within the intertidal area;
- ▲ Up to 12 nearshore geotechnical wireline logged boreholes and rotary cored drilling, approximately 100 mm diameter to a target depth of 45 m below seafloor (four at each landfall option).

Geophysical Survey

- ▲ A 2D Ultra High Resolution Seismic (2D UHR) survey and full suite of geophysical surveys for the array area (including a bathymetric survey, Side Scan Sonar (SSS), Shallow Reflection Seismic (Sub-bottom Profiling [SBP] and Marine Magnetometer [MAG]);
- ▲ A full suite of geophysical surveys for the Offshore ECCs (including a bathymetric survey, SSS, SBP and MAG survey; and
- ▲ Refraction survey at proposed export cable landfall locations including nearshore and intertidal area.

Ecological Monitoring

- ▲ Deployment of up to a maximum 10 Static Acoustic Monitoring (SAM) devices each deployed on a seabed mooring with a surface marker buoy to detect porpoises, dolphins and other toothed whales as part of a possible pre-construction and construction monitoring programme;
- ▲ Annual subtidal benthic ecology surveys over a three year period comprising drop down video (DDV), grab sampling (90 locations) and epibenthic trawls (90 no.);
- ▲ Annual intertidal ecology surveys over a three year period comprising up to 48 shallow hand cores, typically 90 mm in diameter and up to 500 mm in depth will be taken to be analysed for infauna, sediment granulometry and organic carbon content;
- ▲ Fish and shellfish surveys to include up to three annual potting surveys and 12 seasonal trawl surveys (4 per year) within the array area and along the Offshore ECC.

Metoccean Survey

- ▲ The wind resource and metoccean survey will comprise of up to two buoy mounted Floating Lidar (FLiDAR) units and up to two buoys with wave and current measurement devices.

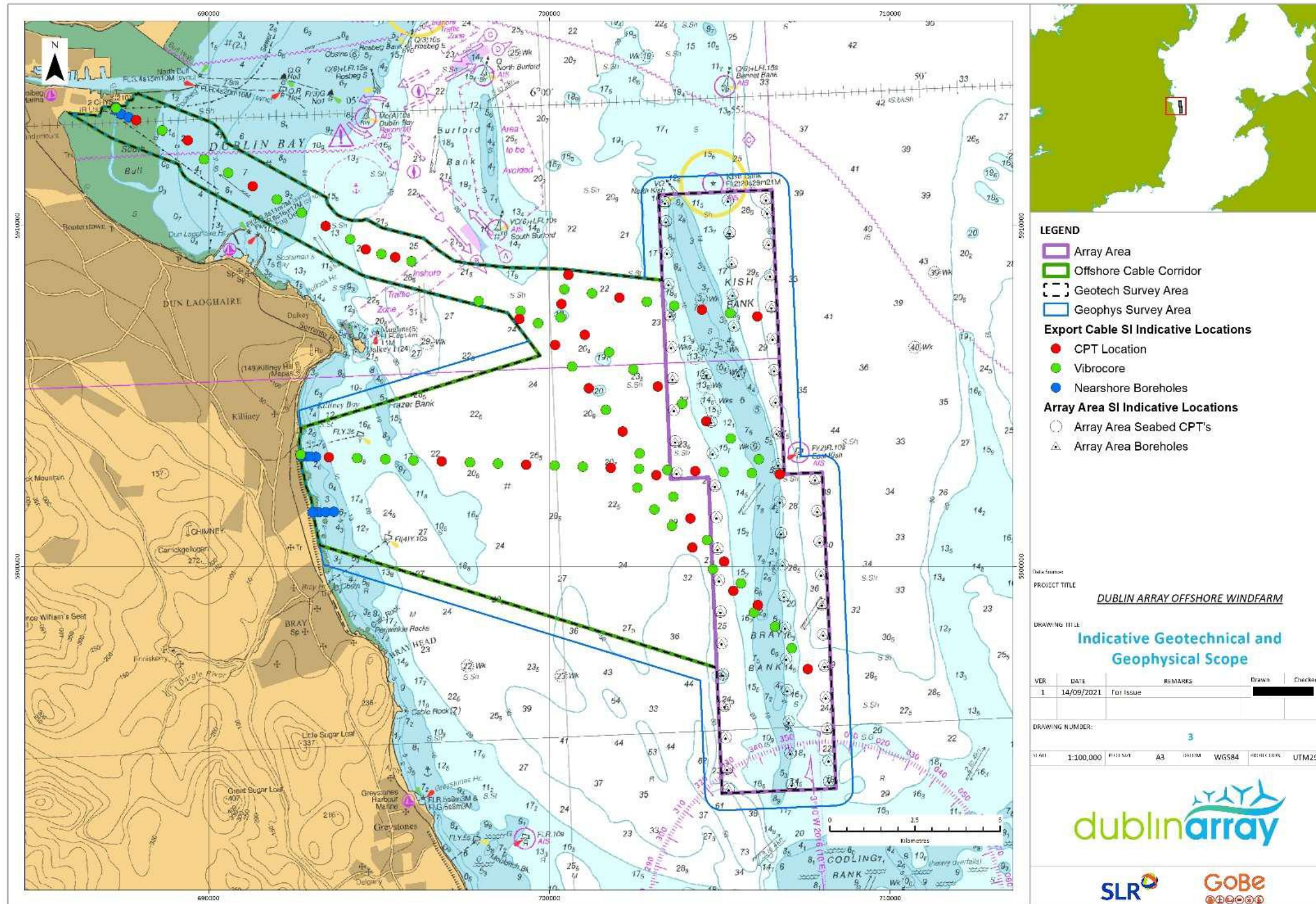


Figure 3 - Indicative Geotechnical and Geophysical Scope

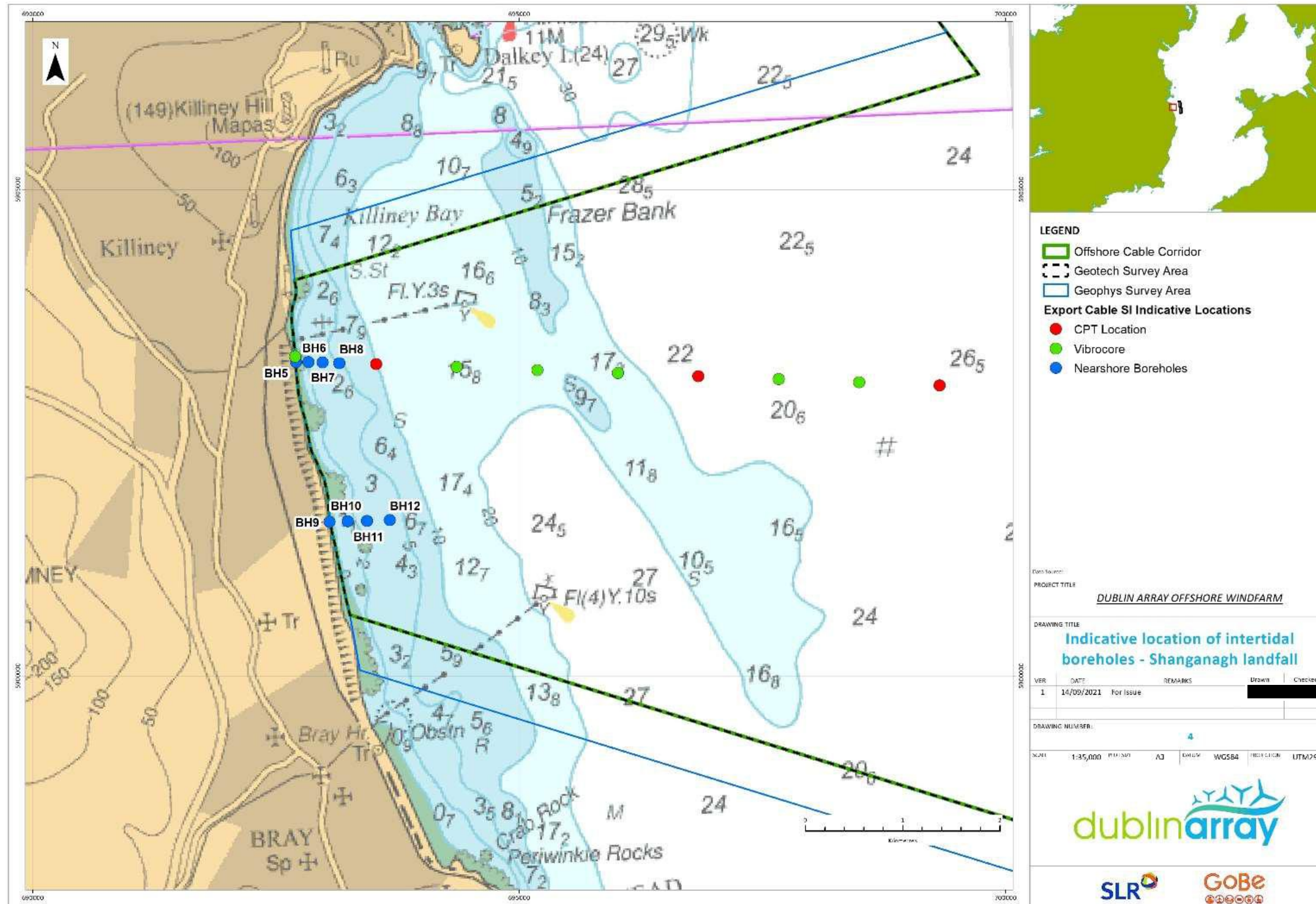


Figure 4 Indicative Location of the intertidal boreholes – Shanganagh landfall

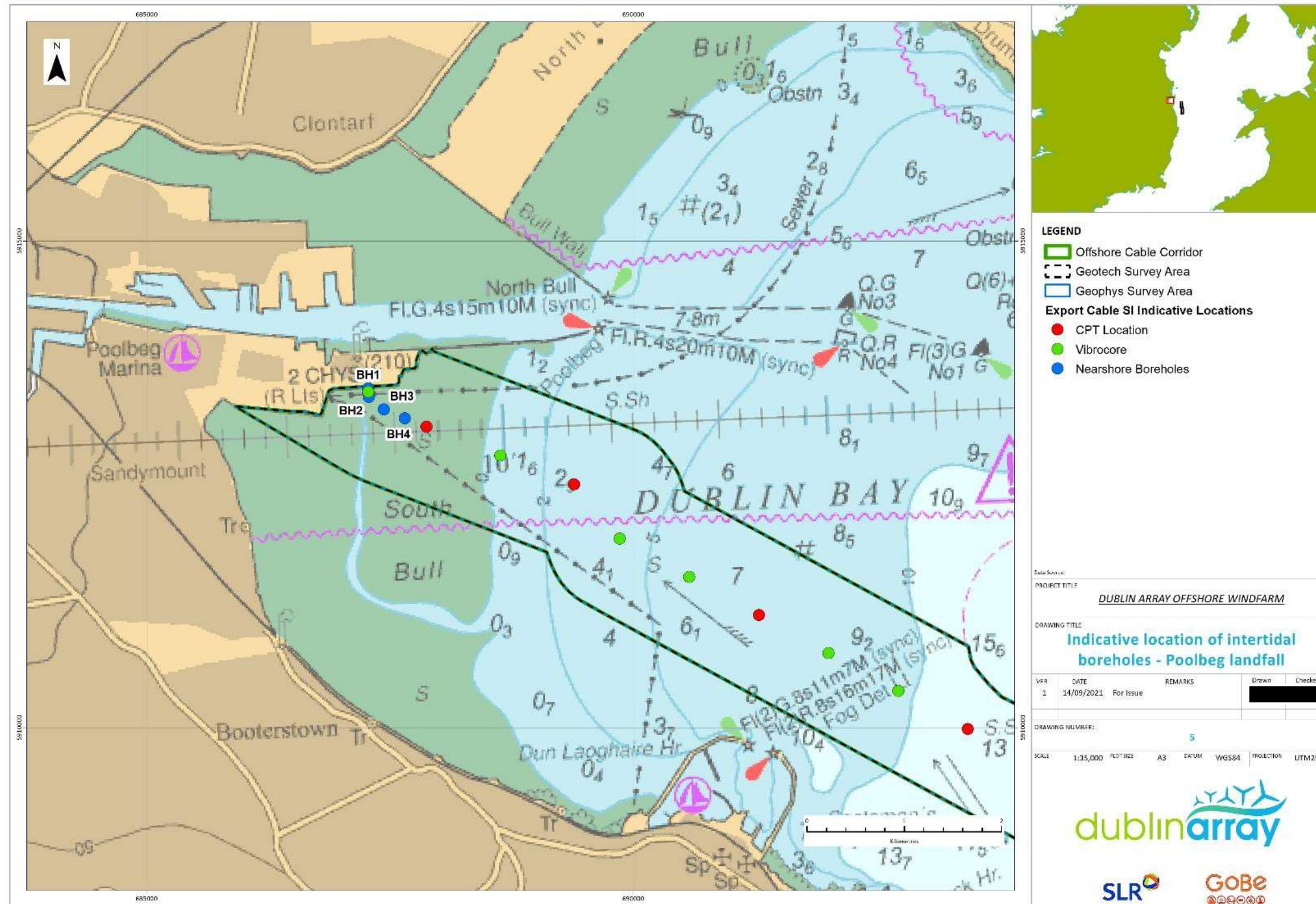


Figure 5 Indicative Locations of the intertidal boreholes – Poolbeg landfall

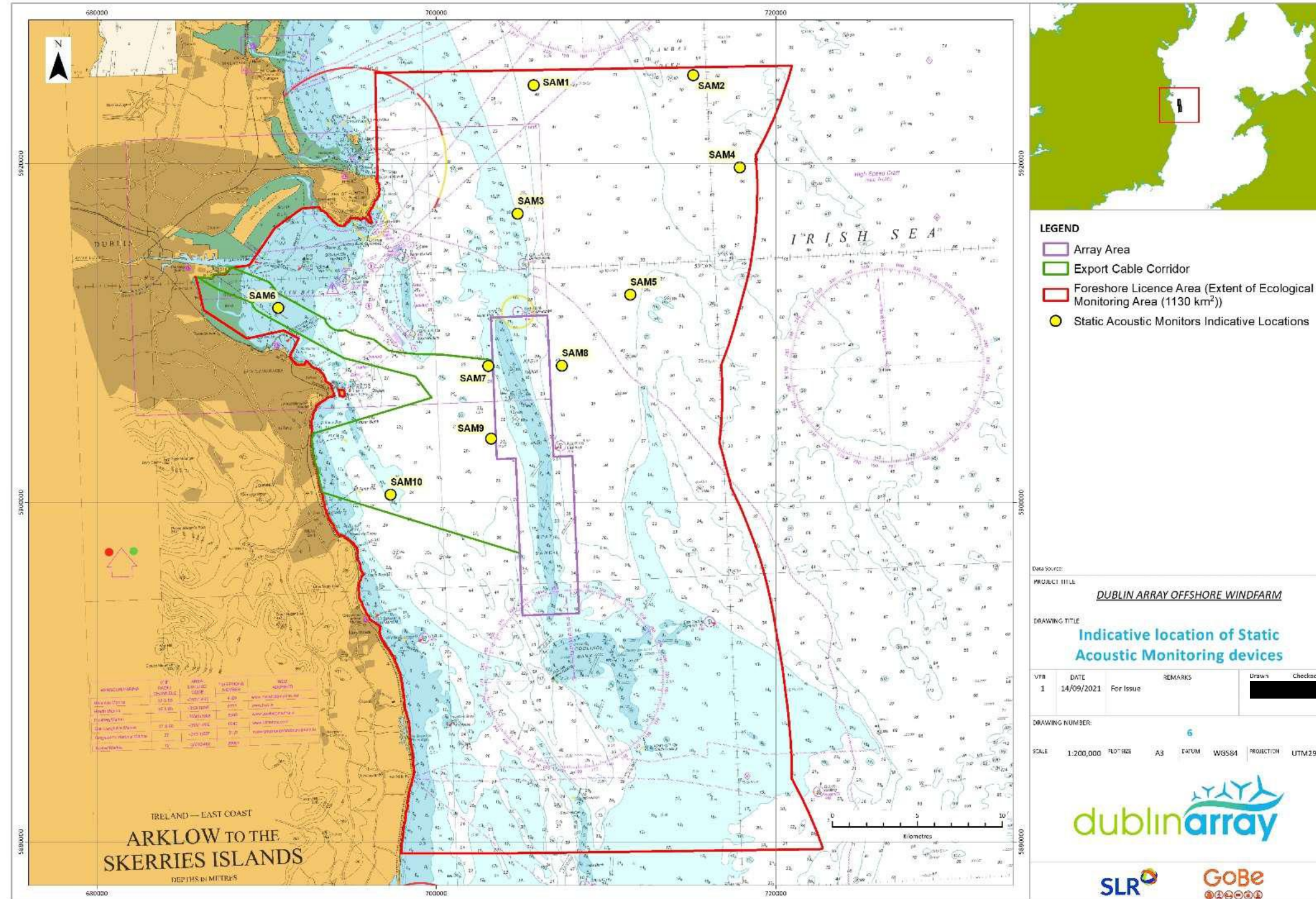


Figure 6 Indicative Location of Static Acoustic Monitoring devices

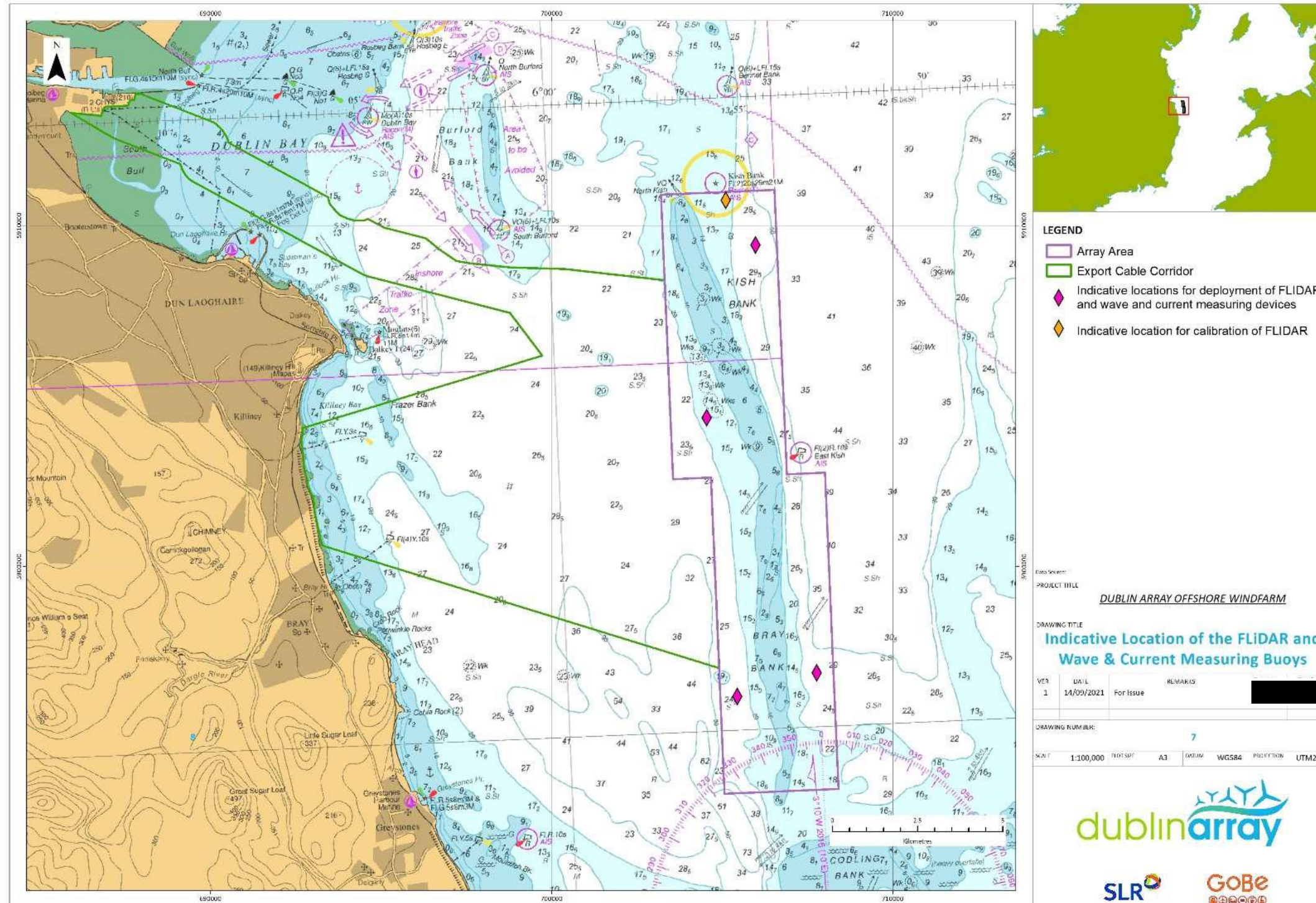


Figure 7 Indicative Location of the FLiDaR and Wave & Current Measuring Buoys

4.2 Method Statements

Geotechnical Survey

- 4.2.1 Indicative locations for the geotechnical sampling are shown in Figure 3. The final geotechnical sampling locations will be selected after a review of the most up to date available geophysical data. Prior to testing at each location, the data will be reviewed to ensure there are no restrictions for sampling, including surface boulders or other materials, or sensitive ecological features.
- 4.2.2 The survey vessel will be purpose built or suitably converted and equipped to undertake the required geotechnical operations offshore, in the expected tidal and current regime at the location. The geotechnical samples may be conducted from a dynamically positioned (DP) vessel or from a jack-up barge which will utilise a fixed anchoring system to maintain position. In the case of the latter, the works will be carried out from a self-elevating platform which is raised above the water's surface. The legs of a large jack-up barge will have a seabed footprint of approximately 15 – 20 m², the barge will have a very shallow draft (<2m). A typical DP vessel would be approximately 70 m in length with a draft of approximately 4 m and operational speed of approximately 5 knots.
- 4.2.3 A jack-up barge is most likely to be used in areas of shallow water. Alternatively, a smaller DP vessel may be required for sampling nearshore and in shallow water (<7 m depth) across the Kish and Bray Banks and nearshore. The vessel will have a shallow draft and be approximately 16 to 20 m in length. A similar vessel may also be utilised to conduct the CPTs and vibrocores in the shallower areas of the Kish and Bray Banks and within the nearshore and intertidal areas.
- 4.2.4 The vessels will be capable of remaining safely at sea for a minimum period of 28 days and shall at all times remain in full, proper and safe working order. Operations are likely to be on a 24-hour basis. The vessel shall be capable of performing the required range of geotechnical operations without the need of port calls. A crew change vessel will be required to facilitate crew transfers to and from the jack-up barge
- 4.2.5 A deck mounted crane or A- frame will be required. Vessel deck areas will have good lighting and deck areas used for equipment deployment/recovery will be either visible from the bridge or good quality closed-circuit TV pictures of such areas shall be provided on the bridge at all times of such operations and recorded.

Boreholes

- 4.2.6 Up to 61 boreholes to a depth of up to a geologically shallow depth of 80 m below seafloor are proposed within the array area to target potential foundation locations.

- 4.2.7 A borehole is a method of drilling into the seabed to recover samples and enable downhole geotechnical testing to be completed. A drilling head is lowered to the seabed via a drill string with an outside diameter of up to 254 mm and stabilised using a seabed frame. The drill string is then rotated to commence boring. Tools are lowered into the drill string to recover samples or conduct in-situ soil testing. The drilling flush and drill cuttings are largely returned to the vessel and re-used or returned to shore for disposal, however some loss of flush and cutting should be expected. All drilling fluids will be in compliance with environmental requirements, where possible selected from the 'OSPAR List of Substances/Preparations Used and Discharged Offshore which are considered to Pose Little or No Risk to the Environment (PLONOR)'. The offshore boreholes will be left to back-fill naturally. The duration of the operations at each borehole location within the array area is expected to be approximately 48 hours.
- 4.2.8 Four boreholes are also planned at each of three possible landfall locations. The nearshore boreholes will be in water depth of 0 to 7 m and will be to a target depth of 45 m below seafloor. The external diameter of the drill pipe will be up to 100 mm. The nearshore boreholes may be grouted to within 2 m of surface of the base of mobile sediment typically using a 2:1 bentonite cement mix. The surface will be reinstated to previous condition as the investigations at each location are completed. Pre and post investigation site photographs will be taken. The duration of the operations at each borehole location within the array area is expected to be approximately 36 hours.
- 4.2.9 Access to the intertidal zone will be required for a tracked borehole rig and ancillary equipment to carry out the borehole drill. Existing public access routes in the vicinity will be utilised to access the coring locations at the two Shanganagh landfalls, with due consideration for any environmental or other relevant constraints. Alternatively, a landing craft may be used to bring the rig via the sea. At Poolbeg, access for machinery is planned to be lowered to the beach by crane from Shellybanks Road, or brought to shore by barge, and therefore there would be a small corridor (approximately 3 m) of disturbance by the machinery tracks between the point of access and sampling station. Access arrangements will be agreed with the relevant local authority once the survey contractor has been appointed and the equipment specification has been finalised.

Cone Penetration Tests

- 4.2.10 In-situ CPTs will be carried out across both the array area and the export cable corridor. Up to 61 seafloor CPTs up to an approximate geologically shallow depth of 80 m below seafloor are proposed within the array area and 31 CPTs to an approximate depth of 6 m below the seafloor in the Offshore ECC which extend into the array as shown in Figure 3. Five of the 31 cable route CPTs may be located within the intertidal areas.

4.2.11 A CPT rig will be lowered to the seafloor from a suitable vessel by a deck mounted crane or A-frame. An instrumented cone will then be pushed into the seabed at a constant speed. Continuous measurement of the cone end resistance, the friction along the sleeve of the cone and the pore water pressure will be recorded. The cone will then be recovered to the rig and the rig returned to the vessel. The duration of operation at each CPT location within the array area is expected to be, approximately, six hours.

Vibrocores

4.2.12 Up to 48 vibrocores are planned to a target depth of 6 m across the Offshore ECC and extending into the array area as shown in Figure 3. The vibrocore rig will be deployed from the vessel to the seabed by deck mounted crane or A-frame. High frequency, low amplitude vibration is transferred from the vibrocore head down through an attached barrel or core tube. The vibration effectively liquifies the sediment in immediate contact with the core barrel. The equipment is designed to ensure the integrity of the sample and therefore to minimise the extent of sediment disturbance. Penetration depth will be measured using an external spring and logged digitally. The vibrocore penetration rate will be recorded continuously on the vessel. The seabed elevation at the test location will also be recorded on the vibrocore rig.

4.2.13 The vibrocorer will be capable of recovering core liner samples 6 m in length and approximately 150 mm in diameter. To maximize recoveries a core catcher shall be used. This is attached to the end of the barrel which holds the sediment inside the barrel when withdrawn from the sediments. On recovery samples will be cut into 1 m lengths, labelled, capped and stored vertically prior to processing. The expected duration of the vibrocoreing operation at each location is less than 5 minutes.

Geophysical Survey

4.2.14 The geophysical survey requirements outlined below will cover a dedicated corridor over turbine foundation locations, inter-array, and export route cables within the array and to the proposed landfalls, at Poolbeg and/or Shanganagh. This part of the survey will occur within the array area and Offshore ECC, with coverage from sensors restricted to narrow corridors estimated to be 50 m to 500 m in width, depending on project requirements. A 500 m buffer around the array area has been included to allow for vessel turning.

4.2.15 The total area to be surveyed is approximately 50 km². This value may change depending on project decisions in terms of inter-array cabling, final layouts, and export corridor width. Nevertheless, the estimate of 50 km² is provided to indicate that, whilst the survey boundary encompasses an area of 189 km², the area to be surveyed within the boundary is considerably less.

- 4.2.16 The geophysical survey vessel will be purpose built or suitably converted and equipped to undertake the required operations offshore, in the expected tidal and current regime at the location. A typical vessel would be approximately 70 m in length with a draft of approximately 4m and operational speed of approximately 5 knots. A smaller vessel may also be required for sampling nearshore and in shallow water (<7 m depth).
- 4.2.17 The vessel will be capable of remaining safely at sea for a minimum period of 28 days and shall at all times remain in full, proper and safe working order. Operations are likely to be on a 24-hour basis. The vessel shall be capable of performing the required range of geophysical operations without the need of port calls.
- 4.2.18 A deck mounted crane or A-frame will be required. Vessel deck areas will have good lighting and deck areas used for equipment deployment/recovery will be either visible from the bridge or good quality closed-circuit TV pictures of such areas shall be provided on the bridge at all times of such operations and recorded.
- 4.2.19 The geophysical survey vessel will be dynamically positioned with full redundancy (specifically DP2).
- 4.2.20 A smaller geophysical survey vessel will be required in the shallow waters (less than 7 m LAT) across the Kish and Bray Banks and nearshore. The vessel will have a shallow draft and be approximately 16 to 20 m in length.
- 4.2.21 A summary of the geophysical survey techniques and equipment is provided in Table 2.

Multi Beam Echosounder

- 4.2.22 A multi beam echosounder (MBES) uses acoustic technology to provide detailed bathymetric mapping of the seabed. The MBES is typically hull or pole mounted on the survey vessel and is used in conjunction with a Global Navigation Satellite System (GNSS) aided inertial positioning and orientation system, specifically designed for geo-referencing and motion compensation in hydrographic surveying. The Reson T50R may be taken as an indicative example.

Side Scan Sonar

- 4.2.23 Side Scan Sonar (SSS) uses acoustic technology to image the surface of the seabed for the detection of objects or structures. The SSS is typically towed astern of the survey vessel and used in conjunction with high accuracy GNSS positioning. To obtain those images it digitises a sound pulse sent out from two transducers mounted on each side of the SSS towfish. Images are based on the amount of reflected sound energy and presented on a time basis resulting in a continuous, highly detailed image of the bottom. Seabed sediment classification can also be interpreted from the side scan data according to the intensity of the acoustic return. The Klein 3000 may be taken as an indicative example.

Magnetometer

- 4.2.24 Magnetometers (MAGs) detect ferrous objects and are used to locate and identify ferrous objects on or buried in the seabed. The device precisely measures the Earth's magnetic field and detects any anomalies, which represent ferrous objects such as lost anchors, abandoned fishing gear, shipwrecks and buried pipelines or cables. The magnetometer is a passive system (does not emit a signal) and is typically towed behind a survey vessel.

Sub Bottom Profiler and 2D Ultra High Resolution Seismic

- 4.2.25 A sub bottom profiler (SBP) will be required throughout the Offshore ECC and array area with different sub-bottom profiling equipment likely to be required in each area. SBP 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.
- 4.2.26 Across the Offshore ECC shallow investigation will be sufficient, which is usually achieved with a hull mounted pinger or chirp operating in single channel mode. In the array area acquisition of information to greater depths is needed for turbine location-specific foundation design. Ultra-high resolution multi-channel seismic technology such as a sparker or boomer system would likely be used to provide good quality data suitable for engineering works in the shallow (<80 m) subsurface.
- 4.2.27 The 2D Ultra High Resolution Seismic (UHRS) survey will cover the array areas over the Kish and Bray Banks, outside of Dublin Bay. Several lines will be run aligned with turbine locations, in a pattern that is most efficient to capture data directly at turbine locations but also considering local metocean conditions.

Refraction Survey

- 4.2.28 Refraction surveys are a useful method of understanding key geological boundaries by measuring the acoustic velocity through geological units. Seismic waves are generated by an acoustic source and refracted along geological boundaries and reradiated back to receivers which are placed on the surface. This is a useful method in the intertidal area as it can be performed as an onshore or offshore activity, usually from a RIB (rigid inflatable boat) or on foot, and does not have the same limitations of other shallow water survey methods e.g. interference from the multiple in pinger data.
- 4.2.29 A refraction survey will be carried out at the selected landfall, with a very shallow marine element, and onshore element. This survey will be carried out over defined survey lines at the selected landfall(s) only; the orientation and position of these survey lines will be confirmed closer to project execution.

Table 2 The proposed equipment to be used for the geophysical surveys

Survey technique	Operating frequency (kHz)	Est sound level at 1m over frequency band 10 Hz to 10kHz Sound Exposure Level (dB re1μPa2s)	Est sound level at 1m over frequency band 10 Hz to 10kHz Sound Pressure Level (dB re1μPaPeak)	Typical length of towed equipment (m)
Side-scan sonar (SSS)	300-500 (low) 500-900 (high)	N/A	228	<300
Multi-beam Echosounder (MBES)	190 -420	N/A	200-235	Hull- or Pole-mounted
Magnetometer (MAG)	passive	passive	passive	300
Single-beam Echosounder (SBES)	200	N/A	200	Hull- or Pole-mounted
Sub Bottom Profiler (pinger)	2-200	N/A	200-225	Hull- or Pole-mounted, or 150
Sub Bottom Profiler (boomer)	5	222	200-225	150
UHR Seismic Sparker	4	190	200-225	150
Refraction	5-150Hz	225	230	50 - 100 A sensor string of length 100m to 235m will be laid on the seabed to record the response.

Metocean surveys

- 4.2.30 Metocean monitoring equipment will comprise up to two buoys carrying FLiDAR units for wind measurement. Two wave rider buoys with wave and current measurement devices will also be deployed and remain on site for a minimum of two years and then recovered. Indicative locations are shown in Figure 7. The devices will be inspected and maintained as a minimum in accordance with manufacturers recommendations. Service visits are likely to be made at 6 monthly intervals for cleaning of sensors and replacement of consumables.
- 4.2.31 Up to two FLiDAR units will be deployed on site. The units will be deployed in close proximity to the Kish Lighthouse to validate the data collected against the data from the LiDaR positioned on the lighthouse. The temporary deployment will be for a period of 4 to 8 weeks, after which the units will be moved to longer term moorings, one to the west of the Bray Bank and the other to the east of the Kish Bank.
- 4.2.32 For the deployment of the buoys, the vessel will use dynamic positioning to maintain location. The mooring system is first deployed with mooring chain and clump weight being lowered from the vessel by winch or crane. A temporary buoy may be attached to the mooring on deployment before subsequently being replaced by the measurement buoys.

Ecological Surveys

Static acoustic monitoring devices

- 4.2.33 Up to 10 SAM devices may be deployed as part of a monitoring programme to detect porpoises, dolphins and other toothed whales and may remain in position for the duration of the Foreshore Licence period and then recovered. C-PODS are SAM devices with automated data-loggers, usually housed within a polypropylene tube and deployed on seabed moorings with a surface marker buoy. C-PODs detect porpoises, dolphins and other toothed whales by recognising trains of echo-location clicks made when detecting prey, navigating or interacting. C-PODs record the time of occurrence, centre frequency, intensity, duration, bandwidth and frequency trend of tonal clicks within the frequency range 20 kHz to 160 kHz and can be used to describe seasonal trends in habitat use.
- 4.2.34 A maximum of ten SAMs will be deployed, Figure 6 shows potential locations for installation within the array and between the array and shore and to the north and east of the array. The SAMs will remain operational for up to 5 years with service visits scheduled at two to three month intervals to replace batteries and to download data from the internal memory cards. The licence application area has been extended to accommodate deployment of SAM across a wider area to monitor marine mammal behaviour across the Foreshore Licence area taking account of the Rockabill and South Dalkey SAC to the north.

- 4.2.35 The devices comprise a 20 kHz to 160 kHz, omni-directional hydrophone in a large-diameter housing to reduce surface noise. Independent C-POD moorings may comprise a clump weight (~400 – 600 kg) marked with an IALA compliant buoy. The weight is linked by a ground line to further weight (~200 – 300 kg). The C-POD is tethered approximately 2 m from the seabed by a rope spur and riser connecting between the smaller weight and the surface marker buoy. The rope spur is connected to the centre of the C-POD so that the unit is orientated vertically in the tidal stream (Figure 9). When deployed, C-PODs have a positive buoyancy of approximately 0.7 kg. This means that PODs can be moored and allowed to float with the hydrophone housing upwards.
- 4.2.36 The exact height will vary with water depth at individual locations but in shallow water, the C-PODs will be moored midway between the bottom and the surface and in deep water, any position between 10 metres up and 10 metres down, to minimise interference of noise from seabed movement or from rain/breaking waves at the surface.
- 4.2.37 C-PODs will be deployed via a buoy laying tender or multi-CAT with a minimum usable deck space of 50 feet with a low freeboard and a deck-mounted towing winch. On arrival at the deployment location the workboat will either use dynamic positioning or an equivalent method to maintain the workboats at the deployment location. No vessel anchoring or attachment to the seabed will take place during installation.

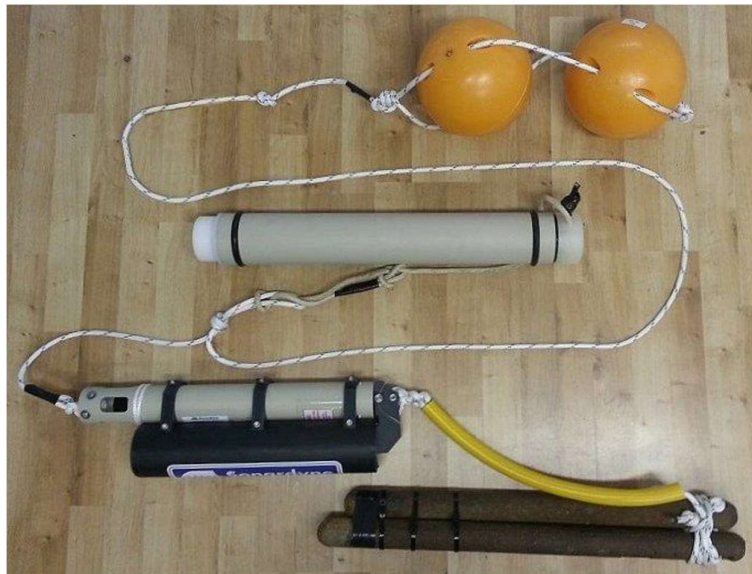


Figure 8 Example SAM (C-POD) and marker buoys (Chelonia Ltd)

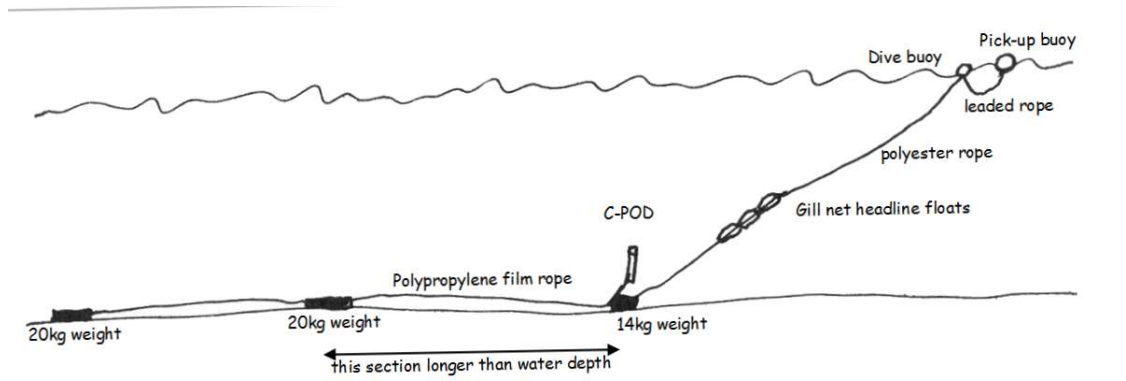


Figure 9 Schematic drawing of the SAM (C-POD) mooring (Chelonia Ltd)

Subtidal Benthic survey

- 4.2.38 In accordance with Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects, DCCAE, 2018, pre-construction ecological monitoring may be required prior to any construction of the wind farm commencing under a separate development consent. These surveys can be repeated post construction in order to monitor any change in ecological receptors. A broad suite of activities is included within this Foreshore Licence application and the final scope of ecological monitoring will be agreed in consultation with the appropriate statutory agencies. Pre-construction surveys are currently expected to be undertaken during the period 2023 to 2026.
- 4.2.39 Interpreted geophysical data will be used to provide ground types and seabed features across the lease area and cable corridors. This will be used to refine the selection of grab locations to ground truth the data and to provide material for biological sampling.
- 4.2.40 Up to 90 samples will be taken using a Hamon or Van Veen grab (0.1 to 0.2 m²) with a stainless steel bucket. Sample depth may be up to 20 cm depending on seabed type. The grab will be deployed and retrieved by winch. DDV will be deployed at each sampling location prior to grabs being taken.
- 4.2.41 Epibenthic sampling (up to 90 stations) will be undertaken using a standard 2 m CEFAS beam trawl fitted with a 5 mm cod designed to collect information on epibenthic invertebrate species, as well as small demersal and juvenile fish. Trawls will be standardised by length (500 m) or duration (10 minutes).

Intertidal Benthic Survey

4.2.42 Monitoring of the intertidal area may also be undertaken on an annual basis for two to three years. Monitoring will comprise a walkover survey and a series of shallow hand cores, at up to 8 stations at the proposed landfall location. Sampling locations will be chosen to be representative of the upper, middle and lower shore, and will be taken along three transects and analysed for infauna, sediment granulometry and organic carbon content

Fish and Shellfish Surveys

4.2.43 Up to three annual potting surveys may be undertaken using fishing gear comparable to that used by the local fishing fleet and suitable for whelk, crab and lobster. Ten strings, each comprising 20 pots will be deployed. Deployment locations will provide coverage of the proposed array and cable corridors as well as locations within a tidal excursion (14 km to north and south) of the array boundary.

4.2.44 Target species, gear and deployment locations will be agreed in consultation with the local fishing industry and the Sea Fisheries Protection Authority (SFPA).

4.2.45 Seasonal trawl surveys may also be undertaken during Winter, Spring, Summer and Autumn periods for two – three years. The surveys will include up to 15 pelagic and up to 15 otter trawls. Deployment locations will provide coverage of the proposed array and cable corridors as well as locations within a tidal excursion of the development boundary. The location of the trawls will be agreed in consultation with the local fishing industry and the Sea Fisheries Protection Authority (SFPA).

4.3 Survey schedule

4.3.1 It is anticipated that all aspects of the proposed works will be undertaken within a five year period from award of the Foreshore Licence, indicative timescales are provided below:

- ▲ Geotechnical survey may commence in Summer 2022. Offshore geotechnical survey will take approximately two to three months and the nearshore geotechnical survey anticipated to last approximately two months;
- ▲ Geophysical survey may commence in Summer 2022. The offshore geophysical surveys are anticipated to last for approximately two to three months, although the exact duration will be dependent on the complexity of the array layout. The refraction survey at the selected landfall is estimated to take approximately two to three weeks;
- ▲ SAM deployment will take approximately two weeks during mid 2022, independent of other surveys, the equipment will remain on site for the duration of the Foreshore Licence to provide a long term data set of pre construction monitoring of marine mammals;

- ▶ Flidar and Metocean Buoys will be deployed in Summer 2022, independent of the other surveys and will remain operational for between 12 and 24 months;
- ▶ Annual subtidal ecology surveys lasting approximately 1 to 2 months will be undertaken to provide three years pre construction data from 2023 to 2026;
- ▶ Annual intertidal surveys lasting approximately 1 to 2 weeks will be undertaken to provide three years pre construction data between 2023 to 2026; and
- ▶ Annual potting survey with four seasonal trawl surveys per year over a three year period between 2023 to 2026.

5 Receiving Environment

- 5.1.1 The Foreshore Licence area comprises the offshore areas of the proposed Dublin Array, incorporating the array area and Offshore ECC and a larger area inclusive of the extent of one tidal excursion along the tidal axis from the proposed development boundary to capture ecological surveys including SAM. The limit of territorial waters forms the eastern limit and the coastline the western.
- 5.1.2 The array area is in the vicinity of the Kish and Bray banks, and the cable corridor search areas extend from the array shore-wards to Mean High Water (MHW) at three potential landfall options, one at Poolbeg / Shellybanks and two options at Shanganagh.
- 5.1.3 This section describes the receiving baseline environment within the Foreshore Licence area, which has been achieved using data from existing studies. The baseline has been considered with reference to four main receptor groups (terrestrial features have been screened out given the works only apply to the intertidal and subtidal environment, and according to methods outlined in Section 3.3):
- ▲ Subtidal and intertidal benthic ecology;
 - ▲ Offshore and intertidal ornithology;
 - ▲ Marine mammals; and
 - ▲ Fish ecology.
- 5.1.4 Information has been compiled for a study area that includes the Foreshore Licence application area and a wider area where appropriate. The studies undertaken to characterise the baseline environment and inform the assessment of benthic ecology, ornithology, marine mammals and fish ecology are summarised below.

5.2 Subtidal and intertidal benthic ecology

- 5.2.1 Data from existing studies confirms that the Kish and Bray Banks are two interconnected sandbanks characterised by sand, shell, gravel and cobble sediments. To the east of the sandbanks, the general area is characterised by a large expanse of sand and areas of sand and shell. The literature indicates that the benthic habitats of the Kish and Bray Banks are characterised with moderate faunal diversity and a range of biotopes depending on the sediment structure.

- 5.2.2 None of the surveys of the area carried out to-date have indicated the presence of any rare or unusual species, or benthic species of conservation importance. The 2021 site specific benthic subtidal survey (Fugro, 2021) undertaken to inform the EIA of Dublin Array observed Annex I habitat which are slightly covered by sea water all the time and areas of boulders and cobbles defined as potential stony reef. The reef habitat observed ranged from ‘not a reef’ to ‘medium reef’ was located in the nearshore areas where the Offshore ECC makes landfall at Shanganagh. No other Annex I habitats or Annex II species, OSPAR threatened and/or declining species and habitats (OSPAR, 2008) were observed within the survey area (Fugro, 2021).
- 5.2.3 The intertidal area at the Shanganagh Cliff and Shanganagh Park landfall zones has been characterised (Aquafact, 2017 and 2021) and shows the upper shore consisting of a band of cobbles and pebbles with occasional boulders grading into a finer gravel and coarse sand down the shore. This zone upper to midshore was classified as ‘barren littoral shingle’ merging into ‘barren littoral coarse sand’ in the middle to lower shore a small patch of the biotope ‘*Lanice conchilega* in littoral sand’ was noted between scattered boulders, cobbles and pebbles to the north of the proposed landfall location.
- 5.2.4 In the intertidal area at Poolbeg from the upper shore to the lower shore the principal biotope recorded over the majority of the survey area was classified as ‘Fine sands with *Angulus tenuis* community complex’. Incipient Marram grass dunes are forming in three locations in the upper shore above high water mark. Rock armour is employed throughout the upper shore survey area to counteract coastal erosion. In the Shelly Bank area the rock armour has a canopy of macroalgae and a vertical zonation of several biotopes typically found on rocky shores but compressed into narrow vertical bands.

5.3 Birds

- 5.3.1 Ireland is internationally important for breeding bird populations. When considering breeding birds in Ireland as a whole, for fifteen species more than 1% of the biogeographical population² breeds in Ireland. For two species, European storm-petrel (*Hydrobates pelagicus*) and roseate tern (*Sterna dougallii*), more than 10% of the biogeographical populations are found breeding in Ireland, while significant numbers of great cormorant (*Phalacrocorax carbo*) and Manx shearwater (*Puffinus puffinus*) also breed.
- 5.3.2 There are several seabird species that have been identified in Dublin Array site survey reports and considered as key species for other offshore impact assessments elsewhere in Ireland and the UK due to their sensitivity to the potential effects of plans and projects. The key species are listed in Table 3, together with details on the key season for each species. Consideration has been given to these species and pathways identified to more distance SPAs and breeding colonies around the Irish Sea as detailed in Section. 3.3.

² A biogeographic population is the distribution of species in a defined geographic space.

Table 3- Summary of key bird species in the Foreshore Licence area.

Key species	Key season
Manx shearwater (<i>Puffinus puffinus</i>)	Breeding season – birds leave the Irish Sea and migrate south for non-breeding season.
Gannet (<i>Morus bassanus</i>)	Breeding season – most Gannets move south in non-breeding season.
Shag (<i>Phalacrocorax aristotelis</i>)	Predominantly breeding season.
Herring gull (<i>Larus argentatus</i>)	All year.
Great black-backed gull (<i>Larus marinus</i>)	Predominantly breeding season, although some birds present all year.
Kittiwake (<i>Rissa tridactyla</i>)	Predominantly breeding season for displacement, all year for collision risk.
Little gull (<i>Hydrocoloeus minutus</i>)	Non-breeding season.
Common tern (<i>Sterna hirundo</i>)	Post-breeding season – birds leave the Irish Sea and migrate south for non-breeding season.
Arctic tern (<i>Sterna paradisaea</i>)	Post-breeding season – birds leave the Irish Sea and migrate south for non-breeding season.
Roseate tern (<i>Sterna dougallii</i>)	Breeding and post-breeding season – birds leave the Irish Sea and migrate south for non-breeding season.
Guillemot (<i>Uria aalge</i>)	Predominantly breeding season.
Razorbill (<i>Alca torda</i>)	Predominantly breeding and post-breeding season.

- 5.3.3 The inshore extent of the Foreshore Licence area falls within the South Dublin Bay and River Tolka Estuary SPA, which supports an internationally important population of light-bellied Brent goose and nationally important populations of a further nine wintering species. Furthermore, the site supports a nationally important colony of breeding common tern and is an important staging/passage site for a number of tern species (roseate tern, common tern and Arctic tern) in the autumn (mostly late July to September).
- 5.3.4 In addition, there are a variety of migratory wildfowl, waders and passage migrant species that may be recorded within the Foreshore Licence area at certain times of the year and which might be sensitive to the impacts arising from the proposed development.

5.4 Marine mammals

- 5.4.1 A review of existing data sources indicates that the key species likely to be present within the survey area and surrounds are harbour porpoise (*Phocoena phocoena*), harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). Other species have been recorded in the area, including minke whales (*Balaenoptera acutorostrata*), bottlenose dolphins (*Tursiops truncatus*), Risso's dolphins (*Grampus griseus*) and common dolphins (*Delphinus delphis*), however they are not commonly encountered, and density estimates are considered very low.
- 5.4.2 This report has been informed by published survey data (including SCANS III, ObSERVE) and the site specific surveys undertaken to support the EIAR for the construction, operation and maintenance and decommissioning of Dublin Array (referred throughout as the site specific surveys). All cetaceans are listed under Annex IV of the Habitats Directive, which means that they are protected wherever they occur. Bottlenose dolphin and harbour porpoise, grey and harbour seals are also listed under Annex II of the Directive. Annex II species require that core areas of their habitat are designated as European Sites.
- 5.4.3 Given marine mammals are mobile species that have extended foraging ranges, consideration has been given to the presence of species and European sites across a wider study area to capture all pathways. In addition to SACs within the immediate footprint, based upon the evaluation of noise propagation models in Konsberg (2010), the distance of 250 km is considered as a buffer for cetaceans, this is extremely conservative in relation to the assessment of noise impacts from the survey, given the dissipation of noise levels over distance and the low levels of noise generated from the survey in an area with high levels of shipping. For seals, pathways are identified by known foraging ranges for harbour seal (120 km - SMRU, 2011) and grey seal (145 km - Thompson *et al.* 1996).
- 5.4.4 The harbour porpoise is the most widely distributed and most common cetacean species in the waters of Britain and Ireland (NPWS 2019). They occur in all parts of the British and Irish continental shelf and are recorded year-round within most of their range. Harbour porpoise was the most commonly sighted marine mammals during the site specific surveys. While sightings rates and resulting density estimates were high in November 2019 and September 2020, overall there was no evidence of a seasonal pattern in the sightings.

- 5.4.5 The Foreshore Licence application area overlaps the Rockabill and Dalkey Island SAC, designated for harbour porpoise. The occurrence, abundance, distribution and community composition is well informed by records collated over two decades. Porpoise density and abundance estimates were last obtained in 2013 and 2016 (O'Brien and Berrow, 2016). A slight increase in density of porpoises in 2016 compared with 2013 was found (the coefficient variation of the pooled density estimates were 0.06 and 0.10 individuals per km² for 2013 and 2016 respectively). In 2016, harbour porpoise were found to be distributed throughout the SAC survey area, but significant changes occurred in their spatial distribution between individual surveys with abundance higher in the northern section of the SAC during August and September when compared to June and July data. Harbour porpoise sightings in the outer Dublin Bay area also varied between surveys but were generally low compared to adjacent waters surveyed within the SAC; most sightings were distributed to the north and south of Dublin Bay (O'Brien and Berrow, 2016).
- 5.4.6 In addition to the Rockabill and Dalkey Island SAC, four UK sites with harbour porpoise as a QI fall within the extended ZoI of 250 km; North Anglesey Marine SAC, West Wales Marine SAC, North Channel SAC and Bristol Channel Approaches SAC.
- 5.4.7 Bottlenose dolphins are described as being one of the most frequently recorded and familiar cetaceans occurring in Ireland, occurring in group sizes between three and 30 in coastal waters, and larger groups of hundreds of individuals in offshore waters (NPWS 2019). Bottlenose dolphin sightings during the ObSERVE surveys were mainly located in the west and the south of Ireland. Site specific surveys undertaken to support the construction of Dublin Array windfarm identified a total of four groups across the 13 surveys undertaken.
- 5.4.8 SACs with bottlenose dolphins listed as qualifying features within 250 km of the Foreshore Licence application area are located at Cardigan Bay SAC and Llyn Peninsula and the Sarnau SAC on the Welsh coast.
- 5.4.9 Grey seals occur throughout Irish waters, and those in Ireland are considered to be part of a meta-population that also inhabits adjacent jurisdictions (NPWS 2019). They have a Favourable conservation status with an increasing trend in Irish waters (NPWS 2019). There are 2 grey seal SACs within foraging range: Lambay Island SAC and the Saltee Islands SAC. In addition, there are three SACs in the UK part of the Irish Sea that lists grey seals as a qualifying feature but not the primary reason for site selection: Cardigan Bay SAC, Pembrokeshire Marine SAC and Llyn Peninsula and the Sarnau SAC.
- 5.4.10 Harbour seals occur throughout Irish waters, in estuarine, coastal and fully marine areas. They have been assessed as having a Favourable conservation status in Irish waters (NPWS 2019). There are two harbour seal SACs on the east coast of Ireland, Lambay Island SAC and the Slaney River Valley SAC. In addition, there are two SACs on the east coast of Northern Ireland: Murlough SAC and Strangford Lough SAC. No sightings were recorded of harbour seal during the site specific surveys.

5.4.11 Lambay Island designated for grey and harbour seals lies to the north, outside of the Foreshore Licence application area but within likely foraging range for both species. Grey seals and harbour seals occur year-round and the island's intertidal shorelines, coves and caves are used by resting and moulting seals. Dalkey Island (within Rockabill and Dalkey Island SAC) is also a known haul-out and breeding site for grey seals (NPWS, 2009). Harbour seal forms part of the mixed colony (with greys) around Dalkey Island and Dublin Bay.

5.5 Fish ecology

5.5.1 The Irish Sea supports a variety of commercial fisheries. Species identified in the Stock Book 2019 (Marine Institute, 2020) as being of commercial importance in the Irish Sea include cod, haddock, whiting, plaice, sole, Nephrops, ray species (*Raya clavate*, *Raya montagui*, *Raya brachyiura*) and herring. On the Kish and Bray Banks, key target species have been skates and rays and mixed demersal species, together with some dredging for scallop, but more recently whelk have been the dominant target species. Across the Offshore ECC there are potting fisheries for whelk, brown crab, velvet crab and lobster.

5.5.2 Seven species of fish are known to spawn in the vicinity of the proposed Foreshore Licence area, namely lemon sole (*Microstomus kitt*), sprat (*Sprattus sprattus*), plaice (*Pleuronectes platessa*), sole (*Solea solea*), whiting (*Merlangius merlangus*), cod (*Gadus morhua*) and the Norwegian lobster (*Nephrops norvegicus*) (Coull *et al.*, 1998). With the exception of plaice, all spawning is recorded as being of low intensity. The nursery areas which occur in the vicinity include those for cod, haddock (*Melanogrammus aeglefinus*), herring, lemon sole, Nephrops, plaice, whiting (Coull *et al.*, 1998) and sandeel (Ellis *et al.*, 2012). With the exception of cod and whiting, all nursery grounds are recorded as being of low intensity.

5.5.3 Given the potential for a pathway of effects from underwater noise (generated by geophysical and geotechnical survey), consideration has been given to the presence of migratory species that may pass through the area during key stages of their life cycle. The nearest designated salmonid rivers to the geophysical and geotechnical boundary are approximately 50 km to the north, and 95 km to the south of the proposed development area (Boyne River SAC and Slaney River SAC respectively).

5.5.4 However, migratory fish are known to have a temporal or spatial overlap with the proposed Foreshore Licence area. River systems flowing into Dublin Bay (the River Liffey, River Tolka and River Dodder) are reported to support sea trout (*Salmo trutta*). Atlantic Salmon (*Salmo salar*) are known to occur within the River Liffey, whilst the Dodder and Tolka also support smaller populations (Holmes *et al.*, 2018). Sea trout (CSTP, 2016) and salmon (Holmes *et al.*, 2018) have also been reported in the River Dargle which flows through Bray (approximately 10 km southwest of the proposed Dublin Array site). European eel (*Anguilla anguilla*) has been documented in the Tolka and Liffey rivers (Holmes *et al.*, 2018) and the Lower Liffey is a migratory corridor for river and brook lamprey known to occur in the wider Liffey catchment. No SACs for migratory fish fall within the ZoI for the proposed works.

6 Identification of Potential Impacts

6.1.1 A number of potential impacts have been identified for consideration; these are listed in Table 4 relative to each main ecological receptor group which has the potential to be affected (as indicated by a ✓).

Table 4- Potential impacts resulting from proposed works.

Potential Impact	Receptor Group			
	Subtidal and intertidal benthic ecology	Birds	Marine Mammals	Fish
Underwater noise may result in injury or disturbance.		✓	✓	✓
Increased vessel traffic during survey may result in an increased noise, disturbance and/or collision risk.		✓	✓	
Direct disturbance, a small area of benthic habitat (subtidal and intertidal) may be temporarily affected.	✓	✓	✓	✓

6.2 Underwater noise may result in injury or disturbance.

6.2.1 Underwater noise will be generated by a number of the surveys considered within the Foreshore Licence application (see Table 5). For the geophysical surveys, magnetometers are passive systems that do not emit any sound and will not be considered further. DAHG (2014) states that geophysical survey methods have the potential to produce significant levels of anthropogenic sound in water depending on the survey methods used, with large surveys utilising seismic airgun arrays resulting in the highest level of risk. For smaller surveys (similar to the proposed works), the level of impact from underwater noise is variable depending on a number of factors including the type of the equipment being used, its sound signal and propagation characteristics, and the depth in which it is operating.

6.2.2 Geotechnical surveys generate sound and vibrations and the scale of drilling activity and associated acoustic output can be very variable depending on the type, drill diameter, depth and seabed geology/composition.

Geotechnical survey outputs

- 6.2.3 DAHG (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters states that whilst drilling activities are considered of a relatively lower risk than those from “noisier” activities (i.e. pile driving, explosions) and that the sound pressure levels (SPLs) generated are not considered likely to result in injury, they are of a sufficient level that may result in masking, avoidance or other disturbance effects.
- 6.2.4 Drilling activity is common in coastal and marine construction and infrastructure works and can also form part of highly specialised oil and gas exploration and development. The scale of drilling activity and associated acoustic output can be very variable depending on the type, drill diameter, depth and seabed geology/composition. The DAHG (2014) guidance acknowledges that drilling from these types of sources generally produces moderate levels of continuous omnidirectional sound at low frequency (several tens of Hz to several thousand Hz and up to c.10 kHz). However, the DAHG (2014) guidance does not refer to potential impacts from geotechnical borehole operations which are of much smaller scale (in terms of core depth and diameter) than that which would usually be required as part of construction and oil and gas operations (Kyhn, 2014; Green and Charles, 1987).
- 6.2.5 For the techniques proposed in this Foreshore Licence, underwater noise levels for geotechnical drilling, comparable to that proposed (drilling 120 kW, 83 mm diameter drill bit, 1500 rpm, 16–17 m drill depth in sand and mudstone) have been reported to amount to 142–145 dB re 1 Pa rms @ 1 m (30–2000 Hz) (Erbe and McPherson, 2017; OSPAR, 2009a and 2009b). Cone Penetration Testing (CPT) is not considered to exceed levels at which are harmful or harassing to marine mammals (NMFS, 2017) therefore poses no risk of injury or disturbance.

Geophysical survey outputs

- 6.2.6 Geophysical acoustic instruments are known to produce sound at a range of frequencies within the range of marine mammal hearing (see Table 5 and Table 6) however the transmission of the sound from the source may vary significantly depending on the system, with the source levels, beam width and propagation effects all changing depending on the equipment used. For the equipment used within the proposed works, SSS and MBES surveys, the frequency ranges vary between 190 and 420 kHz (MBES) and 300/900 kHz (SSS). All these systems fall outside the hearing threshold of all species (harbour porpoise has the highest frequency range of 200 Hz to 180 kHz (Southall et al., 2007)). Magnetometer surveys are passive systems and do not emit a signal or generate underwater noise. Therefore, it is considered that there would be no potential for injury or disturbance to any cetacean or fish species from these equipment.

- 6.2.7 SBP and UHRS produce sound at lower frequencies which may be audible to marine mammals and fish. This introduces the potential for significant adverse impact on these species by auditory (e.g., induction of temporary threshold shift (TTS) or permanent threshold shifts (PTS)) and perhaps even non-auditory means (e.g., tissue damage), in addition to disturbance and other significant behavioural effects which are considered below.
- 6.2.8 Depending on the location and scale of the survey area and the data objectives, such acoustic surveys may require a period of hours, days or weeks, with many surveys being performed on a 24-hour basis once they have begun. Given the nature of the equipment and use, sound is directed towards the seabed and attenuates rapidly.

Environmental Survey outputs

- 6.2.9 SAM devices detect cetaceans by listening for the noises they make, the devices themselves are silent when logging and do not emit at any noise frequency. Given the nature of the devices, the potential for noise disturbance will be limited to that generated by the deployment and final retrieval of the devices by the vessel (see Section 6.3).
- 6.2.10 Seabed sampling equipment proposed for these surveys (benthic grabs, epibenthic trawls and drop down video), do not directly emit any sound, with the only potential noise being the equipment interacting with the seabed or from the vessel deploying the equipment. Given the nature of the equipment, the potential for noise disturbance will be limited to that generated by the deployment of the equipment by the vessel.

Vessel noise

- 6.2.11 The presence of survey vessels on site will generate underwater noise at a frequency of 50 to 300Hz as a consequence of their operation. Ship-radiated noise is predominately low frequency (<1kHz) other than in the area close to vessels (Southall *et al* 2007) and will be within the audible range of marine mammals. The vessels used for the surveys include geotechnical and geophysical survey vessels, typically 70 m in length and an operational speed of approximately 5 knots, smaller vessels will be required to operate within the nearshore.

Table 5 Noise levels for survey techniques

Noise source	Operating frequency (HZ)	Sound Pressure Level (dB re1µPaPeak @1m)
SSS	300,000-900,000	228
MBES	190,000 -420,000	200-235
SBP	2000-200,000	200-225
Drilling	30-2000	190
Vessel noise	50-300	142 - 145

Marine Mammals

- 6.2.12 Both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication and hunting (Richardson *et al*, 1995). Given that marine mammals are dependent upon using sound for a number of essential functions, exposure to noise created from anthropogenic sources can induce a range of effects. Such effects will depend upon the sound frequency, level and whether the noise created is impulsive or non-impulsive (Southall *et al.*, 2019). Consequent effects may include masking of biologically important noises (perceptual impacts), induced stress, and behavioural changes such as displacement from feeding, resting or breeding grounds (DAHG, 2014). The impacts of underwater sound on marine species can be broadly summarised as physical traumatic injury and fatality; auditory injury (either permanent or temporary), disturbance and indirect effects on prey.
- 6.2.13 The DAHG (2014) report ‘Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters’ provides the most recent guidance for assessing the significance of noise disturbance to marine mammals and addresses several key potential sources of anthropogenic sound. The following auditory band widths for marine mammals which may be present in the vicinity of the proposed survey area are extracted from the DAHG (2014) guidelines and are shown in Table 6. It is noted that the DAHG guidance uses criteria based upon Southall *et al* 2007; since this publication, an update from Southall *et al* 2019 proposed new marine mammal exposure criteria. This assessment will make reference to the DAHG guidance but also make use of the most up to date scientific information available in Southall *et al* 2019.

Table 6 Marine mammal auditory band widths (Southall *et al* 2007 and 2019)

Marine mammal Group	Marine mammal species	Estimated auditory band width (Hz) (2007)	Estimated auditory band width (Hz) (2019)
Low-Frequency Cetaceans	Baleen whales (Minke Whale)	7 - 22,000	7 -35,000
Mid-Frequency Cetaceans / *High frequency cetaceans	Most toothed whales and dolphins (including bottlenose, Risso’s and common dolphins)	150 – 160,000	150 – 160, 000
High Frequency Cetaceans / *very high frequency	Certain toothed whales, porpoises (including harbour porpoise)	200 – 180,000	275 – 160, 000
Pinnipeds (in water)	Grey Seal and Harbour Seal	75 – 75,000	50 – 86,000

* Southall *et al*, 2019 categorises for the marine mammal groups

6.2.14 As part of the risk assessment undertaken for the purposes of this assessment, a literature review was undertaken to identify potential thresholds to determine PTS onset defined in Table 7 which were able to be assessed against existing publicised sounds levels for drilling and the geophysical surveys UHRS and SBP.

Table 7 Sound pressure levels (SPL) injury criteria proposed by Southall *et al* 2007 and 2019 for individual marine mammals exposed to discrete noise events.

Marine mammal group (Southall, 2007)	Southall 2007		Southall 2019	
	TTS re:1μPa (peak)	PTS re:1μPa (peak)	TTS re:1μPa (peak)	PTS re:1μPa (peak)
Low-Frequency Cetaceans	224	230	213	219
Mid-Frequency Cetaceans	224	230	224	230
High Frequency Cetaceans	224	230	196	202
Pinnipeds (in water)	212	218	212	218

Geotechnical

- 6.2.15 The only published metrics for drilling identified in the literature review were root-mean-squared Sound Pressure Levels (SPLrms). The most widely used guidance for assessing underwater noise impacts to marine mammals are the Southall *et al.* (2007) thresholds or more recently the Southall *et al.* (2019) thresholds. Neither of these papers provide thresholds for SPLrms but rather use SPLpeak values which are not directly comparable. The only SPLrms metrics for PTS onset are those detailed by NMFS (2003) which determined that PTS onset could occur above 190 dB re 1 Pa rms (SPLrms), which is substantially higher than the levels reported by Erbe and McPherson (2017) and those expected from the proposed geotechnical survey. Drilling activity operates at a source level peak below that reported to result in either TTS or PTS for any of cetacean or pinniped species present, 145 dB re 1 Pa rms @ 1 m (Erbe and McPherson, 2017). Whilst not directly comparable, as an approximation, the SPLrms is typically between 3 – 7dB lower than the equivalent SPLpeak (e.g. Blackwell *et al.* (2004) and Guan (2020)). Therefore, assuming a 7dB uplift, the SPLpeak value for drilling may approximately be 152dB (based on Erbe and McPherson 2017). This is below the TTS thresholds for continuous sounds as proposed by Southall *et al.* (2007) (224dB SPLpeak for cetaceans and 212dB peak for pinnipeds). As such, there is no risk of injury to marine mammals from the proposed drilling works.
- 6.2.16 The updated Southall *et al.* (2019) criteria only identifies a SELcum threshold for PTS or TTS onset from continuous noise sources such as that from drilling works. Modelling for sound levels from drilling works for offshore wind farms (e.g. East Anglia Two Offshore Wind Farm) identified that the threshold for PTS and TTS onset for all marine mammal hearing groups would be less than 100 m from a drilling vessel. Therefore, it can be concluded that there will be no potential for injury to marine mammals from the proposed works. While the sound levels from drilling may result in some degree of localised disturbance to marine mammals any disturbance would be expected to be small-scale and short-term with surveys lasting approximately 2 -3 months, with no effects lasting beyond the period of the works.
- 6.2.17 Specifically for harbour porpoise, Bach *et al.*, 2013 concluded that even the substantially higher noise levels (when compared to the geotechnical works being considered here) associated with offshore oil and gas platforms and drilling activities do not pose a significant threat to small high frequency cetaceans such as harbour porpoise. Small-scale temporary displacement may occur as a result of the presence of the survey vessel itself, however this is likely to be non-additional to any effects from the drilling works. As such, it is considered that any disturbance effects from the geotechnical works would be negligible.

Geophysical

- 6.2.18 . There is a wealth of data available from studies and assessments undertaken within the USA from surveys using the same equipment. These studies (e.g. Incidental Take Allowance applications (e.g. CSA Ocean Sciences Inc., 2020)) have used the modelling methodology published by the National Oceanographic Atmospheric Administration (NOAA) (Guan, 2020), which is based on monitoring data and considers the tight beam nature of the sound (from some SBP equipment).
- 6.2.19 The type of SBP used for specific survey elements (e.g. pinger or sparker) and also the nature of the sound beam produced (i.e. parametric (tightly focused) or non-parametric (directional but not focused in the same way) has implications for the potential impact ranges expected. The studies (reviewed and summarised in CSA, 2020) demonstrate that emitted sound levels from the SBP will attenuate to 120 dB SPLrms within 4 to 157 m from the source (which is the level used for behavioural disturbance in level B harassment assessments in the USA).
- 6.2.20 The available data on SBPs such as those proposed for the UHRS survey are also determined primarily in SPLrms rather than SPLpeak, therefore, it is not possible to directly convert SPLrms values to SPL (peak) values (without knowing the time period over which the rms was calculated), however, it is considered unlikely that peak values would be much greater than the rms value (with the peak value expected to be 3 to 7 dB higher than the rms (Guan, 2020)). Even allowing for a level of uncertainty and conservatism, with the extremely rapid attenuation of the sound source (primarily being at 100 kHz), it is expected that any potential for injury (using the Southall *et al.* (2007) or Southall *et al.* (2019) criteria) to any marine mammal species within the area from the use of SBP would be fully within the distance at which avoidance arising from the presence of the vessel(s) would occur (i.e. approximately 1 km as demonstrated in Graham *et al.* (2019)).
- 6.2.21 Modelling of SBP equipment (CSA 2020), which has been validated by the in-field monitoring data, identifies that the sound levels are predicted to have attenuated to 120 dB SPLrms (threshold for disturbance assessments in the US) within 141 m of the source. Based on the monitoring data noted in CSA (2020), a more conservative estimate of level at range would be 146 dB SPL at 144 m (for an undefined system), however even for this system which showed somewhat greater sound propagation than the modelling, this still demonstrates the extremely rapid attenuation from the estimated source levels for these systems of approximately 211 dB SPL(peak). Even if the rate of attenuation slowed after this distance, the sound level would not remain above a level which may result in disturbance within a few hundred metres of the vessel and consequently any small displacement effect would be contained fully within the disturbance area from the presence of the vessel itself. Therefore, marine mammals will be at negligible to no risk of disturbance or injury.

Vessel noise

- 6.2.22 With regard to the underwater sounds created by vessels, the sound character likely to be created by the vessels proposed for use for the proposed works (50 - 300 Hz 160-175 dB re 1 μ Pa (Raleigh, 2020)) do fall within that which is audible by the most common marine mammal species within the Foreshore Licence area. The DAHG (2014) guidance states that harbour porpoise and harbour seals are known to avoid vessels (Palka and Hammond, 2001; Henry and Hammill, 2001; Johnson and Acevedo-Gutiérrez, 2007). Continuous noise from boat traffic can cause smaller cetaceans like harbour porpoises to avoid boats resulting in a disturbance. They are known to react to vessels by moving away from them at distances as great as 1 km. This suggests that in commercial shipping lanes, harbour porpoises may be excluded from those areas (SMRU, 2009).
- 6.2.23 With regard to harbour seals these references relate only to hauled out individuals. Given that the haul-out sites are outside of the proposed Foreshore Licence area, no pathway of effect exists for this aspect of disturbance of pinnipeds.
- 6.2.24 The noise associated with the large shipping vessels is widely considered unlikely to cause physical trauma but could make preferred habitats less attractive as a result of disturbance (habitat displacement, area avoidance) (Erbe *et al.*, 2019). A study by Beck *et al.* (2013) notes that marine mammals frequenting the Dublin Port shipping channel will be well accustomed to shipping noise. Ambient underwater noise in Dublin Bay has been estimated at around 113 db by Beck *et al.* (2013) and by McKeown (2014).
- 6.2.25 Given the existing vessel levels within the site and that the noise associated with the survey and ecological monitoring vessels and C-POD and metocean buoy deployment vessels will be less (relative to large shipping vessels), short term, temporary and intermittent and that the proposed works will not result in a significant increase in vessel traffic in the area no significant disturbance or displacement effects are expected for any of the marine mammal species identified within the baseline.

Summary of effects for underwater noise on marine mammals

- 6.2.26 In summary, any noise generated at the site of the proposed works will attenuate rapidly to background levels (characterised by ambient environmental noise and shipping noise). Based on the expected sound levels and monitoring data of the various equipment, sound levels are expected to not exceed those which may result in injury to any marine mammal.

- 6.2.27 Low frequency cetaceans (baleen whales) and pinnipeds would be the most susceptible to disturbance effects from the noise predicted. However, low frequency cetaceans are not commonly encountered within the Foreshore Licence area, and density estimates are considered very low, as such even these more sensitive species are unlikely to be significantly affected. With regard to pinnipeds (all of which hear in the low frequency range), although a level of localised disturbance may result this is expected to be minimal, with all disturbance effects from the proposed equipment being within that expected from vessels and consequently highly localised.
- 6.2.28 It is acknowledged that a number of European sites which fall outside of the Foreshore Licence application area are within the wider ZoI for mobile qualifying interests (grey and harbour seals, harbour porpoise and bottlenose dolphin). However, the proposed activities do not include underwater dredging, piling, blasting or high frequency energy release as part of seismic survey. As such, since any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised as stated above and therefore no pathway exists to these sites.

Table 8 Summary of pathways for marine mammals from geophysical and geotechnical survey outputs

Marine mammal group	Estimated auditory bandwidth	SSS	Bathy	MAG	Drilling	SBP	Vessel noise	UHRS	Impact
Low frequency cetaceans	7 - 22,000	*	*	*	√	√	√	√	Potential limited to disturbance only, no PTS or TTS predicted
Mid frequency cetaceans	150 – 160,000	*	*	*	√	√	√	√	Potential limited to disturbance only, no PTS or TTS predicted
High frequency cetaceans	200 – 180,000	*	*	*	√	√	√	√	Potential limited to disturbance only, no PTS or TTS predicted
Low frequency pinnipeds in water	75 – 75,000	*	*	*	√	√	√	√	Potential limited to disturbance only, no PTS or TTS predicted

* SSS and bathymetric survey activity is outside of the frequency range of marine mammals and magnetometers are passive systems,

Fish

- 6.2.29 The closest SACs for fish species are located at Boyne River SAC (50 km to the north), and Slaney River SAC (95 km to the south), given the distance involved, the potential for effects on fish is limited to the pathways for migratory species from these SACs and potential for effects on prey species. Underwater noise in the low frequency range overlaps the hearing sensitivity (100 - 1000 Hz) of many fish species (Spig *et al.*, 2017 and Popper and Fay, 2011). Impacts are predicted for species that utilise sound for ontogenetic behaviours such as mate finding and courtship, as well as routine behaviours including species recognition, foraging, and predator-prey interactions (Codarin *et al.*, 2009, Picciulin *et al.*, 2010, Purser and Radford, 2011, Bracciali *et al.*, 2012, Voellmy *et al.*, 2014, Shannon *et al.*, 2016, Simpson *et al.*, 2015).
- 6.2.30 Popper *et al.* (2014) is the most widely used guidance for assessing impacts on fish from underwater noise. This guidance proposes the use of primarily qualitative methods for assessing the impacts of continuous noise sources Popper *et al.* (2014) defines a risk-based approach for assessing noise impacts on fish, with different risk levels defined for three different groups, split depending on the considered relative sensitivity of the fish to underwater noise, which is determined based on the presence of a swim bladder and whether the swim bladder is linked to the auditory system for the species. The three groups are:
- ▲ Fish with no swim bladder (least sensitive);
 - ▲ Fish with a swim bladder not involved in hearing; and
 - ▲ Fish with a swim bladder involved in hearing (most sensitive).
- 6.2.31 As noted above, fish are sensitive to noise in lower frequencies, which results in no impact from the MBES and SSS on fish species as the frequencies are too high (>100kHz) to be detected (fish hearing is generally limited to a few thousand Hz, with a few hearing specialists capable of detecting sounds up to a few tens of kHz (as reviewed in Popper *et al.* 2014)). As the MAG is a passive device this will also have no impact on any fish species. The SBPs used for the UHRS survey is considered to be an impulsive sound and will therefore be required to follow the guidance described for seismic airgun surveys (Popper *et al.*, 2014). The guidelines state that while it is evident that there are behavioural reactions to seismic airguns, there is limited evidence of mortality (Popper *et al.*, 2014). Table 9 provides the thresholds for the fish groups stating the recoverable injury thresholds and TTS thresholds as shown in Popper *et al.*, 2014.

6.2.32 The risk of injury was defined as low for the noise generated by the geophysical works, as there will only be notable effects in the near-field from the source, while in the far-field there will be very low-level effects. Studies suggests that peak sound pressure levels at 500 m distant from the source of airguns are below the threshold for causing injury or mortality, with fish struggling to even “feel” the particle motion during the survey (Amaral *et al.*, 2018). As the proposed works are expected to use a lower intensity of equipment compared to the seismic airguns used by Amaral *et al.*, it is therefore considered likely that there is no risk of injury or mortality to fish from the proposed works.

Table 9 Thresholds for fish groups (impulsive)

Fish group	Recoverable injury threshold	TTS threshold
Fish with no swim bladder (least sensitive);	>216dB SEL _{cum} re 1 Pa ⁻² s or >213dB re 1 Pa rms @ 1 m peak,	>>186 dB SEL _{cum} re 1 Pa ⁻² s
Fish with a swim bladder not involved in hearing; and	>203dB SEL _{cum} re 1 Pa ⁻² s or >207dB re 1 Pa rms @ 1 m peak	>186 dB SEL _{cum} re 1 Pa ⁻² s
Fish with a swim bladder involved in hearing (most sensitive).	>203dB SEL _{cum} re 1 Pa ⁻² s or >207dB re 1 Pa rms @ 1 m peak	186 dB SEL _{cum} re 1 Pa ⁻² s

6.2.33 The Popper *et al.* (2014) guidance for impacts from drilling noise (continuous sounds) recommends a primarily qualitative assessment, with numerical thresholds only provided for fish with a swim bladder involved in hearing, with a threshold for recoverable injury from drilling operations of 170dB SPLrms and for TTS at 158dB SPLrms. For all groups, the risk of mortal injury was defined as low, regardless of the distance from the source (Popper *et al.*, 2014), consequently it is considered that the drilling works proposed will not result in any mortality or mortal injury to fish.

- 6.2.34 The noise levels published in the literature of up to 145dB re 1 Pa rms @ 1 m (SPLrms) for drilling works (Erbe and McPherson, 2017) and those expected from the proposed works are such that it is not expected that the works will result in sound levels which would result in any form of injury to fish species. As such, it is expected that the only impacts to fish from the drilling works would be from disturbance and masking effects. Additionally, studies have shown that auditory impacts alone are unlikely to cause significant responses in organisms, with no disturbance, directional response or change in behaviour of organisms. However, when the disturbances are visible to the fish, the organism began to react directionally and move out of the vicinity of the source (Wardle et al., 2001). Therefore, any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works, and consequently the works are not predicted to result in any significant effects on the prey species for features of relevant SACs and nor is it expected that any significant effects would result on migratory species on passage.
- 6.2.35 In addition to the information presented from the guidance above, the physical scope of the proposed works is small and the area of seabed affected by increased noise levels at any one moment is very small in relation to the surrounding widespread environment and habitats. Any noise generated will be expected to attenuate rapidly to background levels (characterised by ambient environmental noise and shipping noise) although some localised, temporary and intermittent disturbance and displacement of fish (prey species and migratory species on passage) is likely in the locality of the works, this is not expected to result in significant effects.

Birds

- 6.2.36 Seabirds are potentially impacted by underwater noise resulting in loss of feeding or displacement. Birds species most likely to be most sensitive to underwater noise are those which forage underwater for extended periods of time. Other seabirds that may shallow dive, dip, dive or surface feed are less sensitive to underwater noise, due to the brevity of exposure time and sensitivity to disturbance (Furness *et al.*, 2012, Fleissbach *et al.*, 2019).
- 6.2.37 In relation to Dublin Array, the following seabird species have been considered; gannet, guillemot, razorbill, puffin, cormorant, shag and Manx shearwater. Terns, that feed by shallow dives, are considered less vulnerable and mostly occur closer to the mainland coast. Several gull species (including kittiwake) may occur in the area in high densities, but they feed at the surface only, and are considered the least vulnerable to this impact. Underwater noise, and any other impact associated with the presence of a vessel and associated survey disturbance, will be short term, intermittent and transient. As the vessel undertakes surveys, it will move throughout the survey area, therefore allowing birds to return to any areas they are potentially disturbed from. Based on the ranges provided by Woodward *et al* (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area.

- 6.2.38 Furthermore, seabirds, unlike marine mammals or fish, only forage below the surface for very short periods of time. It is therefore highly likely that should any noise related impacts occur to birds whilst foraging underwater, they would be able to return to the surface and escape the impact and therefore injury. Any impacts associated with survey impacts will be limited in terms of duration and spatial extent, allowing birds to return to areas once the survey has moved to another area. Based on the above, there is no likelihood that a LSE would result from the impact to the seabird species listed above.
- 6.2.39 It is acknowledged that a number of European sites for breeding seabirds fall outside of the Foreshore Licence application area are within the wider ZOI when considering the foraging ranges defined by Woodward *et al.*, (2019) , however, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and therefore no pathway exists to these sites.

6.3 Increased Vessel Traffic may Result in an Increased Disturbance and/or Collision Risk

Birds

- 6.3.1 The inshore extent of the Foreshore Licence area falls within the South Dublin Bay and River Tolka Estuary SPA, which supports an internationally important population of light-bellied Brent goose and nationally important populations of a further nine wintering species. Furthermore, the site supports a nationally important colony of breeding common tern and is an important staging/passage site for a number of tern species (roseate tern, common tern and Arctic tern) in the autumn (mostly late July to September).
- 6.3.2 In considering the potential effects of vessel disturbance upon bird species, Fliessbach *et al.*, (2019) found common tern and Arctic tern to have very low vulnerability to vessel disturbance. In fact, both of these species breed on man-made structures within Dublin docks in the summer months (NPWS, 2015a). Roseate terns are also considered to have low vulnerability to vessel (and even helicopter) disturbance (Furness *et al.*, 2013). Wintering diving ducks present within the SPAs will not be present within the summer months when the surveys will be undertaken.
- 6.3.3 The proposed inshore survey extent is within a popular coastal area of high amenity which will have increased activity during summer months, South Dublin Bay is an important staging/passage site for a number of tern species in the autumn (mostly late July to September) As a result, the presence of additional anthropogenic activity on/near the shore during summer would not cause a significant additional disturbance as the species on site would be accustomed to high disturbance levels or largely absent on site.

- 6.3.4 Given the very low vulnerability to vessel disturbance of species most likely to be present and minimal vessel movement (vessels will be stationary for much of the time whilst sampling), the effects of disturbance upon bird receptors is not expected to be significant, particularly as effects would be short term, temporary and localised in nature.

Marine Mammals

- 6.3.5 Vessel movements are considered to have the potential to result in death or injury in marine mammals as a result of collision. The key navigational features in the area are considered to be the shallow banks within the site (Kish and Bray) which dictate vessel routeing in the area. Given the shallow water depths associated with the Kish and Bray Banks, larger commercial vessels currently avoid the area, with only smaller fishing or recreational vessels transiting through the proposed site.
- 6.3.6 While commercial traffic does currently avoid the banks, the surrounding area has a number of high density vessel routes passing to the west and north of the site, which are in the majority associated with transiting into and out of Dublin Bay (and associated ports and harbours). This includes regular passenger and freight ferry routes, fishing (actively fishing and in transit) and recreational traffic.
- 6.3.7 Given survey vessels will be operated at slow speeds and/or be stationary for a large portion of the time and the proposed works will not result in a significant increase in vessel traffic in the area, it can be determined that there will be no significant change to the existing level of collision risk to marine mammals.
- 6.3.8 Similarly, the deployment and final retrieval of the SAM and FLiDaR and Metocean buoys will require the presence of a vessel fitted with either dynamic positioning or an equivalent method to maintain the workboats at the deployment location. No vessel anchoring or attachment to the seabed will take place during installation. Increased vessel disturbance will be limited to the time taken to deploy, service (once every 3-4 months) and retrieve the devices.

6.4 Temporary Disturbance to Habitat

All Receptor Groups

- 6.4.1 A number of the intended survey techniques are intrusive, in that they remove or disturb a small area of seabed, namely the boreholes, vibrocores, CPTs, ecological grab samples and trawls and moorings. Seabed disturbance across the subtidal (array and Offshore ECC) from 61 boreholes across the array of approximately 254 mm diameter, up to 61 CPTs of approximately 40mm, 31 shallow CPTs (40 mm) and 48 vibrocores (150 mm diameter), up to 90 ecological grab samples (20cm) together with moorings for the SAM and Flidar and wave monitoring units will result in a total area temporary disturbance of 50.88 m² across the subtidal extents of the Foreshore licence area. Once completed, CPT, vibrocores and boreholes will be left to backfill naturally.
- 6.4.2 In addition, for all the geotechnical locations, the boreholes may be drilled from a jack up barge, there will be an additional area, approximately 15 to 20 m² of seabed disturbance/location within the footprint of the steel frame and jack-up vessel spud-legs with an additional 4260 m² of temporary disturbance, which equates to 3.7% of the total Foreshore licence area. The total area of seabed removed or disturbed across the Foreshore Licence area will be highly localised, especially when set within the context of the scale of features and physical processes present in Dublin Bay.
- 6.4.3 Within the intertidal area, disturbance will arise from up to 12 nearshore boreholes (100 mm diameter), five CPTs (40 mm) and up to 48 intertidal ecological samples. The area of intertidal affected by sampling would equate to a very small area (0.62 m²) when set within the context of the scale of the total available intertidal feature, and the area of physical disturbance would be highly localised.
- 6.4.4 Within the intertidal area, sampling locations fall within the 'Mudflats and sandflats not covered by seawater at low tide' QI for the South Dublin Bay SAC. Machinery is planned to be lowered to these sampling locations by crane from Shelly Banks Road, or brought to shore by barge, and therefore there would be a small corridor of disturbance by the machinery tracks between the point of access and sampling station. No habitats or species of conservation importance are noted in the precise location of the sampling sites, but, access to the beach by track machine has the potential to impact areas of *Zostera noltii*, marram grass (*Ammophila arenaria*) and Annual vegetation of drift lines.
- 6.4.5 A refraction survey will be carried out at the selected landfall, with a very shallow marine element, and onshore element. The survey will be carried out by RIB or on foot with minimal disturbance. The survey itself is non-intrusive and will not result in any disturbance of the seabed or intertidal sediments.

- 6.4.6 A proportion of the proposed survey works area overlaps with the South Dublin Bay and River Tolka SPA, disturbance would be generated from the survey activities potentially resulting in birds being disturbed from supporting habitats for this SPA. There is a potential for localised disturbance of roosting birds within these intertidal areas should the works overlap temporally with their presence.
- 6.4.7 Physical disturbance to habitats and communities and any indirect localised displacement of prey (benthic and fish) would be short term, temporary and over a negligible footprint, therefore no potential exists for significant effects to habitats or species.

7 Stage 1: AA Screening

7.1 Identification of Relevant European sites and Qualifying Interests

- 7.1.1 The SACs and SPAs (and the relevant associated QIs) screened in through consideration of the s-p-r to the AA screening stage have been summarised in Table 10 and Table 11. These sites are shown spatially in relation to the Foreshore Licence area in Figure 10.
- 7.1.2 Table 10 and Table 11 outline the distance to the geophysical survey boundary (which encompasses all geotechnical works) and the wider ecological boundary, both distances are provided given the nature of effects which may arise from the geophysical and geotechnical surveys are different in nature and scale to those associated with ecological monitoring and bouy deployment.
- 7.1.3 Note for European sites that fall within the ZoI for mobile species, only the qualifying features that are mobile are listed in the tables below. For bird species only species that fall with the mean maximum foraging distance from breeding colonies designated as SPAs (determined by Woodward *et al* 2019) are listed.

Table 10 Summary of all SACs identified for Screening.

SAC Site Name and Code Qualifying Interests		Closest distance to geophysical boundary	Closest distance to ecological boundary
1	Rockabill to Dalkey Island SAC [003000]	Overlaps	Overlaps
	Reefs [1170] Harbour Porpoise (<i>Phocoena phocoena</i>) [1351]		
2	The Murrough Wetlands SAC [002249]	8 km	Overlaps
	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]		
3	Howth Head SAC [000202]	5 km	Overlaps
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230], European dry heaths [4030]		
4	Bray Head SAC [000714]	1.5 km	Overlaps
	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230], European dry heaths [4030]		
5	North Dublin Bay SAC [000206]	1.2 km	Overlap
	Mudflats and sandflats not covered by seawater at low tide [1140]		

SAC Site Name and Code Qualifying Interests		Closest distance to geophysical boundary	Closest distance to ecological boundary
	Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]		
6	Baldoyle Bay SAC [000199] Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	9 km	2 km
7	Ireland's Eye SAC [002193] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	9 km	0.9 km
8	South Dublin Bay SAC [000210] Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	Overlap	Overlap
9	Codling Fault Zone SAC [003015] Submarine structures made by leaking gases [1180]	14 km	2 km
10	Wicklow Reef SAC [002274] Reefs [1170]	17.5 km	4 km
11	Malhide Estuary SAC [000205] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Annual vegetation of drift lines [1210], Perennial vegetation of stony banks [1220], Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> [7210],	11 km	5 km

SAC Site Name and Code Qualifying Interests		Closest distance to geophysical boundary	Closest distance to ecological boundary
	Alkaline fens [7230]		
12	Magherabeg Dunes SAC	24 km	10 km
	Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Petrifying springs with tufa formation (Cratoneurion) [7220]		
13	Buckronee-Brittis Dunes And Fen SAC	28 km	14. km
	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (<i>Calluno- Ulicetea</i>) [2150] Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170] Humid dune slacks [2190] Alkaline fens [7230]		
14	Lambay Island SAC [000204]	18.5 km	4.5 km
	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] <i>Halichoerus grypus</i> (Grey Seal) [1364] <i>Phoca vitulina</i> (Harbour Seal) [1365]		
15	Rogerstown Estuary SAC [000208]	17 km	7 km
	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]		

SAC Site Name and Code Qualifying Interests		Closest distance to geophysical boundary	Closest distance to ecological boundary
	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]		
16	North Anglesey Marine SAC Harbour porpoise	38 km	23 km
17	West Wales Marine SAC Harbour porpoise	75 km	56 km
18	North channel SAC Harbour porpoise	100.5 km	83 km
19	Bristol Channel Approaches SAC Harbour porpoise	178 km	159.5 km
20	Slaney River SAC Harbour Seal Salmo salar (Salmon) [1106]	95 km	32 km
21	Pen Llyn a'r Sarnau SAC Bottlenose dolphin Grey seal	77.5 km	60 km
22	Cardigan Bay SAC Bottlenose dolphin Grey seal	119 km	100 km
23	Pembrokeshire Marine SAC Grey seal	136 km	120 km
24	Saltee Islands SAC Grey seal	113 km	98 km
25	Murlough SAC Harbour seal	89 km	76 km
26	Strangford Lough SAC Grey seal	112 km	97 km

Table 11- Summary of all SPAs identified for Screening.

SPA Site Name and Code Qualifying Interests				Closest distance to geophysical geotechnical boundary	Closest distance to ecological boundary
1	The Murrough SPA [004186]			8 km	Overlap
	Red-throated Diver	Greylag Goose	Light-bellied Brent Goose		
	Wigeon	Teal	Black-headed Gull		
	Herring Gull	Little Tern	Wetland and Waterbirds		
2	Howth Head Coast SPA [004113]			6 km	Overlap
	Kittiwake				
3	Dalkey Islands SPA [004172]			0.8 km	Overlap
	Roseate Tern	Common Tern	Arctic Tern		
4	North Bull Island SPA [004006]			1 km	overlap
	Light-bellied Brent Goose	Redshank	Shoveler		
	Shelduck	Turnstone	Oystercatcher		
	Teal	Black-headed Gull	Golden Plover		
	Pintail	Dunlin	Grey Plover		
	Bar-tailed Godwit	Black-tailed Godwit	Knot		
5	Ireland's Eye SPA [004117]			9 km	0.4 km
	Cormorant	Kittiwake	Razorbill		
	Herring Gull	Guillemot			
6	South Dublin Bay and River Tolka Estuary SPA [004024]			overlap	Overlap
	Light-bellied Brent Goose	Arctic Tern	Black-headed Gull		
	Oystercatcher	Bar-tailed Godwit	Roseate Tern		
	Ringed Plover	Redshank	Common Tern		
	Grey Plover	Knot	Sanderling		
	Dunlin				
7	Baldoyle Bay SPA [004016]			7 km	2.4 km
	Light bellied brent goose	Shelduck	Ringed plover		
	Golden plover	Grey plover	Bar tailed godwit		
	Wetlands and waterbirds				

SPA Site Name and Code Qualifying Interests			Closest distance to geophysical geotechnical boundary	Closest distance to ecological boundary	
8	Malahide Estuary SPA [001025]		11.5 km	5 km	
	Great crested grebe	Light bellied brent goose			Shelduck
	Pintail	Goldeneye			Red breasted merganser
	Oystercatcher	Golden plover			Grey plover
	Knot	Dunlin			Black tailed godwit
	Bar tailed godwit	Redshank			Wetlands and waterbirds
9	Lambay Island SPA [004069]		18 km	4 km	
	Fulmar	Cormorant			Shag
	Greylag goose	Lesser black backed gull			Herring gull
	Kittiwake	Guillemot			Razorbill
	Puffin				
10	Wicklow Head SPA [004127]		19 km	5 km	
	Kittiwake				
11	Rogerstown Estuary SPA [004015]		17 km	6 km	
	Greylag goose	Light bellied brent goose			Shelduck
	Shoveler	Oystercatcher			Ringed plover
	Grey plover	Knot			Dunlin
	Black tailed godwit	Redshank			Wetland and waterbirds
12	Rockabill SPA [004014]		26 km	14 km	
	Purple sandpiper	Roseate tern			Common tern
	Arctic tern				
13	Skerries Islands SPA [004122]		26 km	14 km	
	Cormorant	Shag			Light-bellied Brent Goose
	Purple Sandpiper	Turnstone			Herring Gull
14	Saltee Islands [004002]			113km	98km
	Fulmar	Gannet	Cormorant		
	Shag	Lesser black backed gull	Herring gull		
	Kittiwake	Guillemot	Razorbill		
15	Grassholm SPA		157km	142km	
	Gannet				

SPA Site Name and Code Qualifying Interests				Closest distance to geophysical geotechnical boundary	Closest distance to ecological boundary
16	Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island			75km	56km
	Manx shearwater				
17	Copeland Islands			153km	138km
	Manx shearwater				
18	Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro			156km	140km
	Manx shearwater	Puffin	kittiwake		
	Storm petrel				

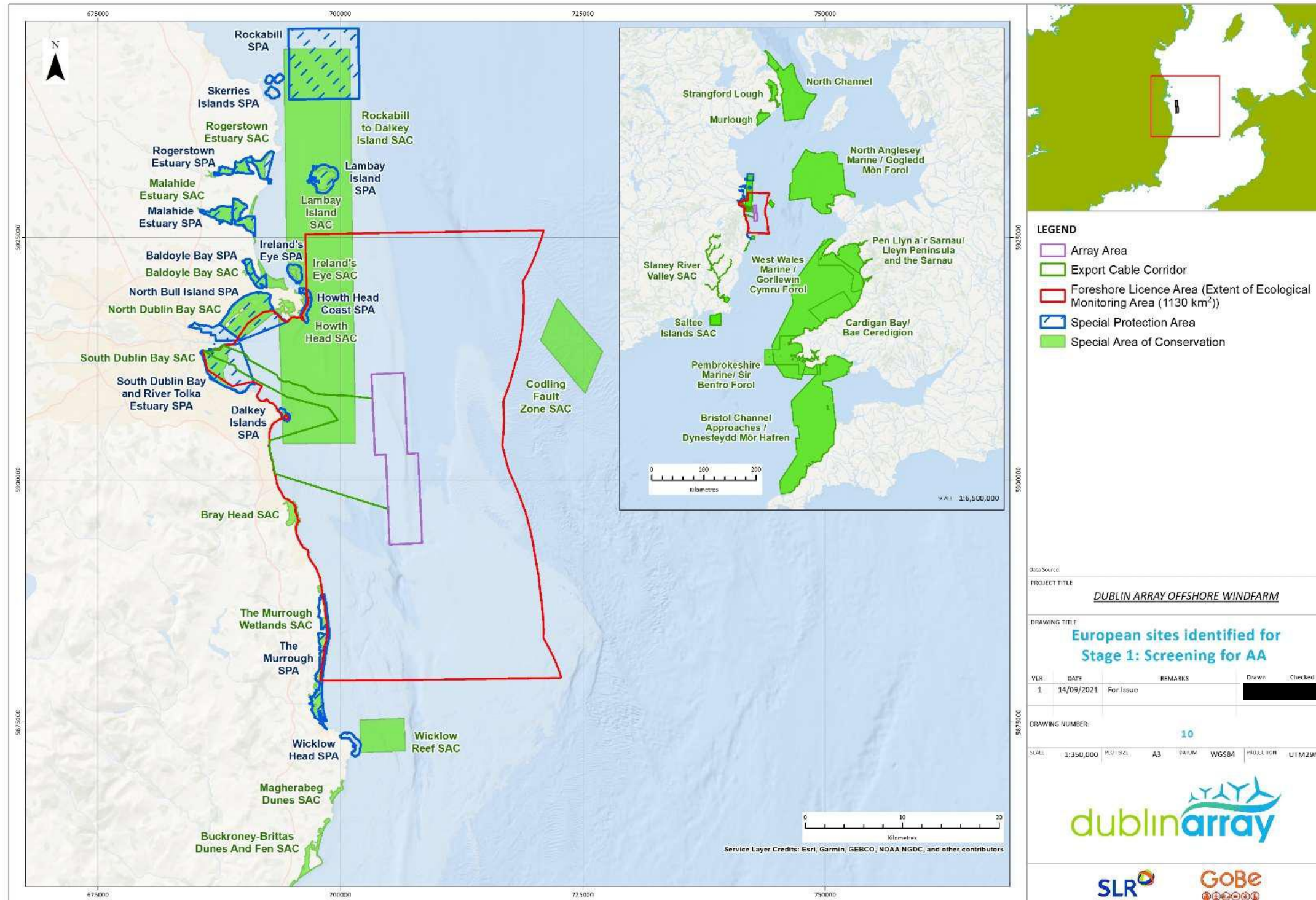


Figure 10 - European sites identified for Stage 1: Screening for AA.

7.2 Designated Sites Conservation Objectives

- 7.2.1 In order to determine whether significant effects are likely to occur to an SAC or SPA, the predicted effects must be measured against each site's conservation objectives. However, specific conservation objectives have not been set for all of the sites listed in Table 10. As such, generic Conservation Objectives as published by the NPWS have been used in these cases, these are as follows: **To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)**
- 7.2.2 In a generic sense '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.
- 7.2.3 While 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,
 - 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.
- 7.2.4 However, where available, specific Conservation Objectives and QI target attributes that define Favourable Conservation Condition for a particular habitat or species at a given site are detailed in Table 12 and Table 13 and have been used in the Applicant's screening process.

Table 12- Site specific conservation objectives and targets for SACs identified for Screening.

SAC Site Name and Code Qualifying Interests	Objectives and Targets
Rockabill to Dalkey Island SAC [003000]	
Reefs [1170]	<p>To maintain the favourable conservation condition of Reefs in Rockabill to Dalkey Island SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent area is stable or increasing, subject to natural processes.</p> <p>The distribution of reefs is stable or increasing, subject to natural processes.</p> <p>Conserve the following community types in a natural condition: Intertidal reef community complex and Subtidal reef community complex.</p>
Harbour Porpoise (<i>Phocoena phocoena</i>) [1351]	<p>To maintain the favourable conservation condition of harbour porpoise in Rockabill to Dalkey Island SAC, which is defined by the following list of attributes and targets:</p> <p>Species range within the site should not be restricted by artificial barriers to site use.</p> <p>Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site.</p>
South Dublin Bay SAC [000210]	
Mudflats and sandflats not covered by seawater at low tide [1140]	<p>To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in South Dublin Bay SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent habitat area is stable or increasing, subject to natural processes.</p> <p>Maintain the extent of the <i>Zostera</i>-dominated community, subject to natural processes. See map 4</p> <p>Conserve the high quality of the <i>Zostera</i>-dominated community, subject to natural processes</p> <p>Conserve the following community type in a natural condition: Fine sands with <i>Angulus tenuis</i> community complex.</p>
Salicornia and other annuals colonising mud and sand [1310]	<p>No site-specific objectives available, (Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)</p>
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]	
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	
North Dublin Bay SAC [000206]	

SAC Site Name and Code Qualifying Interests	Objectives and Targets
Mudflats and sandflats not covered by seawater at low tide [1140]	<p>To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in North Dublin Bay SAC, which is defined by the following list of attributes and targets.</p> <p>The permanent habitat area is stable or increasing, subject to natural processes.</p> <p>Maintain the extent of the <i>Mytilus edulis</i>-dominated community, subject to natural processes.</p> <p>Conserve the high quality of the <i>Mytilus edulis</i>-dominated community, subject to natural processes.</p> <p>Conserve the following communities in a natural condition: Fine sand to sandy mud with <i>Pygospio elegans</i> and <i>Crangon crangon</i> community complex and Fine sand with <i>Spio martinensis</i> community complex.</p>
Baldoyle Bay SAC [000199]	
Mudflats and sandflats not covered by seawater at low tide [1140]	<p>To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Baldoyle Bay SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent habitat area is stable or increasing, subject to natural processes.</p> <p>Conserve the following community types in a natural condition: Fine sand dominated by <i>Angulus tenuis</i> community complex; and Estuarine sandy mud with <i>Pygospio elegans</i> and <i>Tubificoides benedii</i> community complex.</p>
The Murrough Wetlands SAC [002249]	
Atlantic salt meadows (<i>Glaucopuccinellietalia maritimae</i>) [1330]	(Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	
Codling Fault Zone SAC [003015]	
Submarine structures made by leaking gases [1180]	(Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)
Lambay Island SAC [000204]	
Grey seal	To maintain the favourable conservation condition of Grey Seal in Lambay Island SAC which is defined by the following list of attributes and targets:

SAC Site Name and Code Qualifying Interests	Objectives and Targets
	Access to suitable habitat, breeding behaviour, moulting behaviour, resting behaviour and disturbance.
Harbour seal	To maintain the favourable conservation condition of harbour Seal in Lambay Island SAC which is defined by the following list of attributes and targets: Access to suitable habitat, breeding behaviour, moulting behaviour, resting behaviour and disturbance.
Howth Head SAC [000202]	
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Howth Head SAC, which is defined by the following list of attributes and targets: Habitat length, Habitat distribution, Physical structure, Vegetation structure and Vegetation composition.
European dry heaths [4030]	To maintain the favourable conservation condition of European dry heaths in Howth Head SAC, which is defined by the following list of attributes and targets: Habitat area, Habitat distribution, Ecosystem function, Community diversity, Vegetation composition, Vegetation structure, Physical structure, Indicators of local distinctiveness.
Bray Head SAC [000714]	
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Bray Head SAC, which is defined by the following list of attributes and targets: Habitat length, Habitat distribution, Physical structure, Vegetation structure and Vegetation composition.
European dry heaths [4030]	To maintain the favourable conservation condition of European dry heaths in Bray Head SAC, which is defined by the following list of attributes and targets: Habitat area, Habitat distribution, Ecosystem function, Community diversity, Vegetation composition, Vegetation structure, Physical structure, Indicators of local distinctiveness.
Irelands Eye SAC [002193]	
Perennial vegetation of stony banks [1220]	To maintain the favourable conservation condition of Perennial vegetation of stony banks

SAC Site Name and Code Qualifying Interests	Objectives and Targets
	<p>in Ireland's Eye SAC, which is defined by the following list of attributes and targets:</p> <p>Habitat area, Habitat distribution, Physical structure, Vegetation structure and Vegetation composition.</p>
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	<p>To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Ireland's Eye SAC, which is defined by the following list of attributes and targets:</p> <p>Habitat length, Habitat distribution, Physical structure, Vegetation structure and Vegetation composition.</p>
Wicklow reef SAC [002274]	
Reefs [1170]	<p>To maintain the favourable conservation condition of Reefs in Wicklow reef SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent area is stable or increasing, subject to natural processes.</p> <p>The distribution of reefs is stable or increasing, subject to natural processes.</p> <p>Conserve the following community types in a natural condition: Intertidal reef community complex and Subtidal reef community complex.</p>
Malahide Estuary SAC [000205]	
Mudflats and sandflats not covered by seawater at low tide [1140]	<p>To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Malahide Estuary SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent habitat area is stable or increasing, subject to natural processes.</p> <p>Conserve the following community types in a natural condition: Fine sand dominated by <i>Angulus tenuis</i> community complex; and Estuarine sandy mud with <i>Pygospio elegans</i> and <i>Tubificoides benedii</i> community complex.</p>
Salicornia and other annuals colonising mud and sand [1310]	(Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]	

SAC Site Name and Code Qualifying Interests	Objectives and Targets
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	
Rogerstown Estuary SAC [000208]	
Mudflats and sandflats not covered by seawater at low tide [1140]	<p>To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Rogerstown Estuary SAC, which is defined by the following list of attributes and targets:</p> <p>The permanent habitat area is stable or increasing, subject to natural processes.</p> <p>Conserve the following community types in a natural condition: Fine sand dominated by <i>Angulus tenuis</i> community complex; and Estuarine sandy mud with <i>Pygospio elegans</i> and <i>Tubificoides benedii</i> community complex.</p>
Salicornia and other annuals colonising mud and sand [1310]	<p>(Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)</p>
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]	
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]	
Magherabeg Dunes SAC [001766]	
Annual vegetation of drift lines [1210]	No site-specific objectives available.
Slaney River SAC [000781]	
<p><i>Salmo salar</i> (Salmon) [1106]</p> <p>Harbour Seal</p>	<p>To restore the favourable conservation condition of Salmon in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:</p> <p>Distribution/ extent of species: 100% of river channels down to second order accessible from estuary;</p> <p>Adult spawning fish: Conservation Limit (CL) for each system consistently exceeded;</p> <p>Salmon fry abundance: maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/ 5 min sampling;</p> <p>Out-migrating smolt abundance: no significant decline;</p> <p>Number and distribution of redds: no decline in number and distribution of spawning redds due to anthropogenic causes;</p> <p>Water quality: at least Q4 at all sites sampled by EPA</p>

SAC Site Name and Code Qualifying Interests	Objectives and Targets
	<p>To maintain the favourable conservation condition of Harbour Seal in the Slaney River Valley SAC, which is defined by the following list of attributes and targets:</p> <p>Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use;</p> <p>Breeding behaviour: The breeding sites should be maintained in a natural condition;</p> <p>Moulting behaviour: The moult haul-out sites should be maintained in a natural condition;</p> <p>Resting behaviour: The resting haul-out sites should be maintained in a natural condition;</p> <p>Disturbance: Human activities should occur at levels that do not adversely affect the harbour seal population at the site.</p>
<p>Buckroney-Brittas Dunes And Fen SAC [000729]</p>	
<p>Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) [2150] Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170] Humid dune slacks [2190] Alkaline fens [7230]</p>	<p>(Generic CO): To maintain or restore the favourable conservation condition of the Annex I habitat or Annex II species for which the SAC has been selected. (NPWS, 2020)</p>

SAC Site Name and Code Qualifying Interests	Objectives and Targets
North Anglesey Marine SAC [UK0030398]	
Harbour porpoise	To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.
West Wales Marine SAC [UK0030397]	
Harbour porpoise	To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.
North Channel SAC [UK0030399]	
Harbour porpoise	To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.
Bristol Channel Approaches SAC [UK0030396]	
Harbour porpoise	To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.
Strangford Lough SAC [UK0016618]	
Grey seal	To maintain (or restore where appropriate) the features to favourable condition
Pen Llyn a'r Sarnau SAC[UK0013117]	
Bottlenose dolphin Grey seal	The varied physical character and processes in different parts of the SAC will operate without any undue interference, this includes the natural processes of tides, waves and currents and the associated processes of sediment erosion and deposition. The quality of water in the SAC will be maintained or restored to a level necessary to maintain the features in favourable condition for the foreseeable future. The health and quality of the 12 SAC features are inter-related and will also

SAC Site Name and Code Qualifying Interests	Objectives and Targets
	<p>depend on the state of other non SAC feature marine habitats within the site, as well as structural and functional components of the marine ecosystem.</p> <p>The SAC will continue to provide a productive and supportive marine area for bottlenose dolphins and grey seals. Otters will continue to be widespread throughout the SAC both in areas of open coast and within the estuaries</p>
Cardigan Bay SAC [UK0012712]	
Bottlenose dolphin Grey seal	To achieve favourable conservation status all the habitat features and species, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status
Pembrokeshire Marine SAC [UK0013116]	
Grey seal	
Saltee Islands SAC [000707]	
Grey seal	<p>To maintain the favourable conservation condition of Grey Seal in the Saltee Islands SAC, which is defined by the following list of attributes and targets:</p> <p>Access to suitable habitat: species range within the site should not be restricted by artificial barriers to site use;</p> <p>Breeding behaviour: the breeding sites should be maintained in a natural condition;</p> <p>Moulting behaviour: the moult haul-out sites should be maintained in a natural condition;</p> <p>Resting behaviour: the resting haul-out sites should be maintained in a natural condition;</p> <p>Population composition: the grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually;</p> <p>Disturbance: human activities should occur at levels that do not adversely affect the grey seal population.</p>
Murlough SAC [UK0016612]	
Harbour seal	To maintain the favourable conservation condition of the Harbour seal in the Murlough SAC, which is defined by the following list of attributes and targets subject to natural variation:

SAC Site Name and Code Qualifying Interests	Objectives and Targets
	Maintain (and if feasible enhance) population numbers and distribution; Maintain and enhance, as appropriate, physical features used within the site.

Table 13 -Site specific conservation objectives and targets for SPAs identified for Screening

SPA Site Name and Code Qualifying Interests			Objectives and Targets
South Dublin Bay and River Tolka Estuary SPA [004024]			
Light-bellied Brent Goose	Knot	Black-headed Gull	<p>To maintain the favourable conservation condition of the QI species in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:</p> <ul style="list-style-type: none"> ▪ Long term population trend stable or increasing ▪ No significant decrease in the range, timing or intensity of use of areas by the SI species, other than that occurring from natural patterns of variation.
Oystercatcher	Bar-tailed Godwit	Dunlin	
Ringed Plover	Redshank	Sanderling	
Roseate Tern			<p>To maintain the favourable conservation condition of Roseate Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:</p> <ul style="list-style-type: none"> ▪ No significant decline in individuals of passage population. ▪ No significant decline in number, location or area of roosting areas. ▪ No significant decline in the prey biomass available. ▪ No significant increase in barriers to connectivity. ▪ Disturbance at roosting site - Human activities should occur at levels that do not adversely affect the numbers of roseate tern among the post-breeding aggregation of terns.
Common Tern			<p>To maintain the favourable conservation condition of Common Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:</p> <ul style="list-style-type: none"> ▪ Breeding population abundance: No significant decline in number of apparently occupied nests (AONs). ▪ No significant decline in mean number of fledged young per breeding pair. ▪ Passage population: No significant decline in number of individuals. ▪ Distribution: No significant decline in number, location or area of breeding colonies. ▪ No significant decline in number, location or area of roosting areas. ▪ No significant decline in the prey biomass available.

SPA Site Name and Code			Objectives and Targets
Qualifying Interests			
			<ul style="list-style-type: none"> No significant increase in barriers to connectivity. Disturbance at breeding site - Human activities should occur at levels that do not adversely affect the breeding common tern population. Disturbance at roosting site - Human activities should occur at levels that do not adversely affect the numbers of roseate tern among the post-breeding aggregation of terns.
Arctic Tern			<p>To maintain the favourable conservation condition of Arctic Tern in South Dublin Bay and River Tolka Estuary SPA, which is defined by the following list of attributes and targets:</p> <ul style="list-style-type: none"> No significant decline in individuals of passage population. No significant decline in number, location or area of roosting areas. No significant decline in the prey biomass available. No significant increase in barriers to connectivity. Disturbance at roosting site - Human activities should occur at levels that do not adversely affect the numbers of roseate tern among the post-breeding aggregation of terns.
Grey Plover			No site-specific objectives available.
North Bull Island SPA [004006]			
Light-bellied Brent Goose	Redshank	Shoveler	<p>To maintain the favourable conservation condition of the non-breeding waterbird Special Conservation Interest species listed for North Bull Island SPA which is defined by the following list of attributes and targets:</p> <ul style="list-style-type: none"> The long term population trend for each waterbird Special Conservation Interest species should be stable or increasing. There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest, other than that occurring from natural patterns of variation.
Shelduck	Turnstone	Oystercatcher	
Teal	Black-headed Gull	Golden Plover	
Pintail	Dunlin	Grey Plover	
Bar-tailed Godwit	Black-tailed Godwit	Knot	
Curlew	Sanderling	-	

SPA Site Name and Code Qualifying Interests			Objectives and Targets
Dalkey Islands SPA [004172]			
Roseate Tern	Common Tern	Arctic Tern	No site-specific objectives available.
Howth Head Coast SPA [004113]			
Kittiwake			No site-specific objectives available.
Ireland's Eye SPA [004117]			
Cormorant	Kittiwake	Razorbill	No site-specific objectives available.
Herring Gull	Guillemot	-	
The Murrough SPA [004186]			
Red throated diver	Greylag goose	Light bellied Brent goose	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.
Wigeon	Teal	Black headed gull	
Herring gull	Little tern	Wetland and waterbird	
Malahide Estuary SPA [004025]			
Great crested grebe	Light bellied brent goose	Shelduck	To maintain the favourable conservation conditions of species in Malahide Estuary SPA defined by population trend and distribution.
Pintail	Goldeneye	Red breasted merganser	
Oystercatcher	Golden plover	Grey plover	
Knot	Dunlin	Black tailed godwit	
Bar tailed godwit	Redshank		
Baldoyle Bay SPA [004016]			
Light bellied brent goose	Shelduck	Ringed plover	To maintain the favourable conservation conditions of species in Baldoyle Bay SPA defined by population trend and distribution.

SPA Site Name and Code			Objectives and Targets
Qualifying Interests			
Golden plover	Grey plover	Bar tailed godwit	
Lambay Island SPA [004069]			
Fulmar	Cormorant	Shag	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.
Greylag Goose	Lesser Black-backed Gull	Herring Gull	
Kittiwake	Guillemot	Razorbill	
Puffin			
Wicklow Head SPA [004127]			
Kittiwake			To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Rogerstown Estuary SPA [004015]			
Greylag Goose	Light-bellied Brent Goose	Shelduck	To maintain the favourable conservation condition of the bird species in Rogerstown Estuary SPA, which is defined by the attributes of population trend and distribution,
Shoveler	Oystercatcher	Ringed Plover	
Grey Plover	Knot	Dunlin	
Black-tailed godwit	Redshank	Wetlands and waterbirds	
Rockabill SPA [004014]			
Purple Sandpiper	Roseate Tern	Common Tern	To maintain the favourable conservation condition of the bird species in Rockabill SPA, which is defined by the attributes of population trend and distribution
Arctic Tern			
Skerries Islands SPA [004122]			
Cormorant	Shag	Light-bellied Brent Goose	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Purple Sandpiper	Turnstone	Herring Gull	
Saltee Islands SPA			

SPA Site Name and Code Qualifying Interests			Objectives and Targets
Fulmar	Gannet	Cormorant	To maintain the favourable conservation condition of bird species which is defined by the following list of attributes and targets that includes: <ul style="list-style-type: none"> ▪ Breeding population abundance ▪ Productivity rates ▪ Barriers to connectivity ▪ Disturbance at marine areas immediately adjacent to the colony
Shag	Lesser black backed gull	Herring gull	
Kittiwake	Guillemot	Razorbill	
Puffin			
Grassholm SPA			
Gannet			To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island			
Manx shearwater			To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Copeland Islands			
Manx shearwater			To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro			
Manx shearwater			To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA
Storm petrel			

7.3 Consideration of Likely Significant Effects

- 7.3.1 The assessment of LSE has been informed by identifying the potential impacts associated with the proposed works, and subsequently considering those impacts in light of the Conservation Objectives of the relevant European sites. An LSE is an effect that may reasonably be predicted as a consequence of the proposed works that would result in more than a '*de minimis*' change and that may affect the conservation objectives of a QI for which a European site is designated. The terms 'likely' and 'significant' have been interpreted with reference to case law, including the Waddenzee³ and Sweetman⁴ rulings.
- 7.3.2 Screening is a relatively coarse filter to identify those sites and features for which an LSE cannot be discounted. Should no LSE be concluded for a site then subsequent stages of the AA Process do not need to be progressed. The results of the screening are provided in Table 14 and Table 15.

³ Case C-127/02 Waddenzee, para 45.

⁴ Case C-258/11 Sweetman, para 47

Table 14 Screening outcomes for SACs

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Rockabill to Dalkey Island SAC [003000]				
Reefs [1170]	overlaps	overlaps	The extent of the known reefs within the SAC have been mapped and are presented within the Conservation objectives supporting document (NPWS, 2013a). Neither the intertidal nor subtidal community complex is currently mapped within the Foreshore Licence area, and it cannot be discounted that this feature does not exist within the survey area. Given that the proposed survey spatially overlaps with a proportion of the SAC, under the precautionary principle, without the use of mitigation measures, there is potential pathways for effects on the QI of the SAC.	Screened in.
Harbour Porpoise (<i>Phocoena phocoena</i>) [1351]			Harbour porpoise are very high frequency cetaceans which means this species hears most at high frequencies and are therefore less prone to disturbance by the low frequency sounds that are predicted to result from the geotechnical borehole drilling works. The primary frequencies associated with the geophysical survey works (6.2) fall outside the hearing threshold of harbour porpoise. Combined with the rapid attenuation of the sound from geophysical surveys, it is therefore considered that there will be no potential for significant disturbance from this equipment. The	Screened in.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			potential for injury can therefore be easily ruled out, and any possible disturbance from the works would be contained within the very limited local disturbance from up to two vessels. The noise associated with the proposed works will be short term, temporary and intermittent, however a pathway exists for impact on the QI, in addition, given the potential for the presence of calves during the survey period, taking a precautionary approach this QI is screened in.	
South Dublin Bay SAC [000210]				
Mudflats and sandflats not covered by seawater at low tide [1140]	overlaps	overlaps	In the process of removing the boreholes, vibrocores and CPTs, a small area of the sediment surface within the QI will be removed. There will also be a small area of seabed disturbance within the footprint of the steel frame. Physical disturbance to benthic habitats and communities would be short term, temporary and over a negligible footprint in the context of large site, however, taking the precautionary approach this QI is screened in.	Screened in.
Salicornia and other annuals colonising mud and sand [1310]			No habitats or species of conservation importance are noted in the precise location of the sampling sites, however, access to the beach by track	Screened in.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]			<p>machine could have potential to impact, areas of <i>Zostera noltii</i>, marram grass (<i>Ammophila arenaria</i>) and Annual vegetation of drift lines. Machinery is planned to be lowered to the sampling locations by crane from Shelly Banks Road, or brought to shore by barge. In the unlikely event that access is not possible without traversing these habitats with machinery, NPWS would be consulted.</p> <p>Physical disturbance to these more sensitive habitats and communities would be short term, temporary and over a small footprint in the context of the site. However, without the presence of mitigation measures there is a potential for minor localised effects if the site is accessed over the sensitive habitats. Therefore, under the precautionary principle, without the use of mitigation measures, a pathway exists for potential effects on the QI of the SAC.</p>	
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				
North Dublin Bay SAC [000206]				
Mudflats and sandflats not covered by seawater at low tide [1140]	1.2	overlaps	This community lies outside the area of any direct impact from geophysical, geotechnical and metocean surveys, any indirect effects are limited to seabed disturbance from ecological sampling, given the total area of seabed disturbed will be highly localised, no pathway of effect exists.	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Baldoyle Bay SAC [000199]				
Mudflats and sandflats not covered by seawater at low tide [1140]	9.0	2.0	These communities are not found within the Foreshore Licence area and indirect effects are limited to seabed disturbance from ecological sampling, given the total area of seabed disturbed will be highly localised, no pathway of effect exists	Screened out.
The Murrough Wetlands SAC [002249]				
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]	8.0	overlaps	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				Screened out.
Bray Head SAC [000714]				
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]	1.5	overlaps	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				Screened out.
Ireland's Eye SAC [002193]				
Perennial vegetation of stony banks [1220]	9.0	0.9	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]				Screened out.
Codling Fault Zone SAC [003015]				

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Submarine structures made by leaking gases [1180]	14.0	2.0	This community is not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to this receptor does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Malahide Estuary SAC [000205]				
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]	11.0	5.0	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				Screened out.
Annual vegetation of drift lines [1210], Perennial vegetation of stony banks [1220], Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davalliana</i> [7210], Alkaline fens [7230]				Screened out.
Lambay Island SAC [000204]				
Reefs [1170]	18.5	4.5	This community is not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists	Screened out.
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]				Screened out.
<i>Halichoerus grypus</i> (Grey Seal) [1364]			Screened in.	
<i>Phoca vitulina</i> (Harbour Seal) [1365]			Screened in.	

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works, however, taking the precautionary approach this QI is screened in.	
Rogerstown Estuary SAC [000208]				
Estuaries [1130]	17.0	7.0	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				Screened out.
Mudflats and sandflats not covered by seawater at low tide [1140]				Screened out.
Salicornia and other annuals colonising mud and sand [1310]				Screened out.
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]				Screened out.
Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]				Screened out.
Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]				Screened out.
Howth Head SAC [000202]				

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	5.0	overlaps	These communities are not found within the Foreshore Licence area and the potential for direct or indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
European dry heaths [4030]				Screened out.
Wicklow Reef SAC [002274]				
Reefs [1170]	17.5	4.0	These communities are not found within the Foreshore Licence area and indirect effects are limited to seabed disturbance from ecological sampling and the total area of seabed disturbed will be highly localised, therefore no pathway of effect exists.	Screened out.
Magherabeg Dunes SAC [001766]				
Annual vegetation of drift lines [1210]	24.0	10.0	These communities are not found within the Foreshore Licence area and the potential for indirect effects with regard to these receptors r does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Embryonic shifting dunes [2110]				Screened out.
Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]				Screened out.
Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]				Screened out.
Petrifying springs with tufa formation (Cratoneurion) [7220]				Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Buckroney-Brittis Dunes And Fen SAC [000729]				
Annual vegetation of drift lines [1210]	28.0	14.0	These communities are not found within the Foreshore Licence area and the potential for indirect effects with regard to these receptors does not extend beyond the Foreshore Licence boundary; therefore no pathway of effect exists.	Screened out.
Perennial vegetation of stony banks [1220]				
Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]				
Embryonic shifting dunes [2110]				
Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]				
Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]				
Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) [2150]				
Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170]				
Humid dune slacks [2190]				
Alkaline fens [7230]				
North Anglesey Marine SAC [UK0030398]				

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Harbour porpoise	38.0	23.0	While the sound levels from the proposed works may result in some degree of localised disturbance to harbour porpoise (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works. The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.	Screened out.
West Wales Marine SAC [UK0030397]				
Harbour porpoise	75.0	56.0	While the sound levels from the proposed works may result in some degree of localised disturbance to harbour porpoise (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.	
North Channel SAC [UK0030399]				
Harbour porpoise	100.5	83.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to harbour porpoise (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	Screened out.
Bristol Channel Approaches SAC [UK0030396]				
Harbour porpoise	178.0	159.5	While the sound levels from the proposed works may result in some degree of localised disturbance to harbour porpoise (masking or behavioural impacts, for example), noise associated with the	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			<p>proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	
<u>Slaney River Valley SAC [000781]</u>				
Harbour seal	95.0	32.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	Screened out.
<i>Salmo salar</i> (Salmon)				Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Pen Lyn a'r Sarnau SAC [UK0013117]				
Grey seal	77.5	60.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	Screened out.
Bottlenose dolphin			<p>While the sound levels from the proposed works may result in some degree of localised disturbance to bottlenose dolphins (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p>	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.	
Cardigan Bay SAC [UK0012712]				
Bottlenose dolphin	119.0	100.0	While the sound levels from the proposed works may result in some degree of localised disturbance to bottlenose dolphin and grey seal (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works. The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.	Screened out.
Grey seal				Screened out.
Pembrokeshire Marine SAC [UK0013116]				
Grey seal	136.0	120.0	While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			<p>example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	
Saltee Islands SAC [000707]				
Grey seal	113.0	98.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	Screened out.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
Murlough SAC [UK0016612]				
Harbour seal	89.0	76.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p> <p>The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.</p>	Screened out
Strangford Loch SAC [UK0016618]				
Grey seals	112.0	97.0	<p>While the sound levels from the proposed works may result in some degree of localised disturbance to pinnipeds (masking or behavioural impacts, for example), noise associated with the proposed works is not expected to result in either PTS or TTS impacts (i.e. injury). Any disturbance would be expected to be small-scale and short-term, with no effects lasting beyond the period of the works.</p>	Screened out

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			The pathway for effects is localised and no impact on the features of interest of this SAC is foreseen, due to the limited nature of the works in both area and temporal extent and the distance between the works and this SAC.	

Table 15 - Screening outcomes for SPAs

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
South Dublin Bay and River Tolka Estuary SPA [004024]						
Light-bellied Brent Goose	Arctic Tern	Black-headed Gull	Overlaps	Overlaps	<p>A proportion of the proposed survey area overlaps with the SPA. Source-pathway-receptor links therefore exist between the works and the European site. Although impacts upon supporting habitats are expected to be <i>de minimus</i>, access to the site generating noise and a physical presence from equipment, surveyors and vessels could impact on the QI of the SPA. Under the precautionary principle, without the use of mitigation measures, a pathway exists for potential effects on the QI of the SPA.</p> <p>Further information is therefore required to determine the potential for LSE in the absence of mitigation measures.</p>	Screened in.
Oystercatcher	Bar-tailed Godwit	Roseate Tern				
Ringed Plover	Redshank	Common Tern				
Grey Plover	Knot	Sanderling				
Dunlin						
North Bull Island SPA [004006]						
Light-bellied Brent Goose	Redshank	Shoveler	1.2	Overlap	<p>The SPA overlaps the Foreshore Licence area but lies 1.2 km outside of the geophysical licence boundary. The foraging range of many of the QI species is likely to extend over the Foreshore Licence area consequently producing a source-pathway-receptor</p>	Screened in.
Shelduck	Turnstone	Oystercatcher				

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
Teal	Black-headed Gull	Golden Plover			link between the works and the European site features.	
Pintail	Dunlin	Grey Plover				
Bar-tailed Godwit	Black-tailed Godwit	Knot				
Curlew	Sanderling	-				
Dalkey Islands SPA [004172]						
Roseate Tern	Common Tern	Arctic Tern	0.9	Overlap	<p>No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 0.9 km from the SPA boundary in an area that has existing regular levels of vessel traffic.</p> <p>Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.</p>	Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
Howth Head Coast SPA [004113]						
Kittiwake			6.1	Overlap	<p>No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 6.2 km from the SPA boundary in an area that has existing regular levels of vessel traffic.</p> <p>Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.</p>	Screened out.
Ireland's Eye SPA [004117]						
Cormorant	Kittiwake	Razorbill	9.0	0.4	<p>The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 9.0 km from the SPA boundary in an area that has existing regular levels of vessel traffic.</p> <p>Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.</p>	Screened out.
Herring Gull	Guillemot					

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
Baldoyle Bay SPA [004016]						
Light bellied brent goose	Shelduck	Ringed plover	6.9	2.4	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be a minimum of 2.4 km from the SPA boundary in an area that has existing regular levels of vessel traffic. Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.	Screened out.
Golden plover	Grey plover	Bar tailed godwit				Screened out.
Rockabill SPA [004014]						
Purple sandpiper	Roseate tern	Common tern	26.2	13.9	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be a minimum of 13.9 km from the SPA boundary in an area that has existing regular levels of vessel traffic. Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible, therefore no potential for LSE are predicted.	Screened out.
Arctic tern						Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
Lambay Island SPA [004069]						
Fulmar	Cormorant	Shag	18.2	14.2	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be a minimum of 14.2 km from the SPA boundary in an area that has existing regular levels of vessel traffic. Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.	Screened out.
Greylag goose	Lesser black backed gull	Herring gull				Screened out.
Kittiwake	Guillemot	Razorbill				Screened out.
Puffin						Screened out.
Rogerstown Estuary SPA [004015]						
Greylag goose	Light bellied brent goose	Shelduck	17.3	6.3	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 17.3 km from the SPA boundary in an area that has existing regular levels of vessel traffic. Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed	Screened out.
Shoveler	Oystercatcher	Ringed plover				Screened out.
Grey plover	Knot	Dunlin				Screened out.
Black tailed godwit	Redshank					Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
					works would be negligible; therefore no potential for LSE are predicted.	
Malahide Estuary SPA [001025]						
Great crested grebe	Light bellied brent goose	Shelduck	11.7	5.1	<p>The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 11.7 km from the SPA boundary in an area that has existing regular levels of vessel traffic.</p> <p>Any disturbance impacts or effects upon supporting habitats for QI species that result from the proposed works would be negligible; therefore no potential for LSE are predicted.</p>	Screened out.
Pintail	Goldeneye	Red breasted merganser				Screened out.
Oystercatcher	Golden plover	Grey plover				Screened out.
Knot	Dunlin	Black tailed godwit				Screened out.
Bar tailed godwit	Redshank					Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
The Murrough SPA [004186]						
Red-throated Diver	Greylag Goose	Light-bellied Brent Goose	8	Overlap	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 8 km from the SPA boundary in an area that has existing regular levels of vessel traffic.	Screened out.
Wigeon	Teal	Black-headed Gull				Screened out.
Herring Gull	Little Tern	Wetland and Waterbirds				Screened out.
Wicklow Head SPA [004127]						
Kittiwake			19.4	5.4	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All geophysical and geotechnical operations will be a minimum of 19.4 km from the SPA boundary in an area that has existing regular levels of vessel traffic.	Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
Skerries Islands SPA [004122]						
Cormorant	Shag	Light-bellied Grey Goose	25.9	14.4	The SPA lies outside of the Foreshore License area. No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be a minimum of 14 km from the SPA boundary in an area that has existing regular levels of vessel traffic.	Screened out.
Purple Sandpiper	Turnstone	Herring Gull				Screened out.
Saltee Island SPA [004002]						
Fulmar	Gannet	Cormorant	113	98	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be in an area that has existing regular levels of vessel traffic. Based on the ranges provided by Woodward <i>et al.</i> , (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and any disturbance will be temporary with birds able to return to the area post survey	Screened out.
Shag	Lesser black backed gull	Herring gull				
Kittiwake	Guillemot	Razorbill				
Puffin						

SPA Site Name and Code Qualifying Interests		Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out	
		geophysical boundary	ecological boundary			
Grassholm SPA [UK9014041]						
Gannet			158	142	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be in an area that has existing regular levels of vessel traffic. Based on the ranges provided by Woodward <i>et al.</i> , (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and any disturbance will be temporary with birds able to return to the area post survey	Screened out.
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island						
Manx shearwater			74	56	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be in an area that has existing regular levels of vessel traffic. Based on the ranges provided by Woodward <i>et al.</i> , (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area, any noise generated will attenuate rapidly to within background levels, the	Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
			geophysical boundary	ecological boundary		
					effect and therefore assessment is localised and any disturbance will be temporary with birds able to return to the area post survey	
Copeland Islands						
Manx shearwater			153	138	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be in an area that has existing regular levels of vessel traffic. Based on the ranges provided by Woodward <i>et al.</i> , (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and any disturbance will be temporary with birds able to return to the area post survey	Screened out.
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro						
Manx shearwater	Puffin	kittiwake	156	140	No impact on the QI of this SPA is foreseen due to the limited nature of the works in terms of both spatial and temporal extent. All operations will be in an area that has existing regular levels of vessel	Screened out.

SPA Site Name and Code Qualifying Interests		Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
		geophysical boundary	ecological boundary		
Storm petrel				traffic. Based on the ranges provided by Woodward <i>et al.</i> , (2019), there is a significant amount of alternative foraging habitat with each species-specific range which seabirds can exploit if they are disturbed from an area, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and any disturbance will be temporary with birds able to return to the area post survey	

7.4 Likely Significant Effects – In-combination

- 7.4.1 To undertake the in combination assessment, a search of publicly available information, including applications and determinations for Foreshore Licenses listed on the Department of Housing, Local Government and Heritage website (DHLGH, 2021) and EPA Dumping at Sea Register.
- 7.4.2 A search of foreshore applications and determinations (DHLGH, 2021) indicate that several projects are either within, or are associated with ancillary activities within the Foreshore Licence application area, and therefore have the potential to lead to in-combination effects. Consideration has also been given to projects located further afield within a 30 km buffer, given the localised and temporary nature of the survey works proposed in the Foreshore Licence application, this buffer is considered precautionary. Each of these projects are described and assessed below:
- ▲ Celtix Connect Limited, is proposing the installation and maintenance of the fibre-optic Havhingsten Telecommunications Cable; the cable landing site is at Loughshinny, Fingal, Co Dublin. Consultation for the application closed in February 2020 and a determination is awaited. The area is 23km to the north of the proposed survey area. Given the temporary and highly localised nature and scale of effects predicted from the proposed works alone, effects would not be expected to contribute towards any in-combination impacts. Therefore, there is **no potential for LSE in-combination** with regards to the proposed works;
 - ▲ Dublin Port Company (DPC) undertakes regular maintenance dredging of the navigation channel, basins and berthing pockets in order to maintain the charted depths and provide safe navigation for vessels to and from the Port. Maintenance dredging campaigns are required approximately every 18 months but may need to be carried out more regularly as a result of extreme weather events causing excessive siltation in the channel. The most recent application was submitted in February 2021 (Application: FS007132). The Applicant's report to inform the Minister's AA screening for the maintenance dredging project identified the potential for LSE for underwater noise on Lambay Island and Rockabill to Dalkey SAC and water quality and habitat deterioration at South Dublin SPA and North Bull Island SPA. The Applicant's AA concluded taking into account mitigation measures proposed that no adverse effect upon the integrity of any European site would arise with no scientific doubt as to the conclusions. Neither the maintenance dredging area or dump site is within the proposed Foreshore Licence area and, given the temporary and highly localised nature and scale of effects predicted from the proposed works alone, effects would not be expected to contribute towards any in-combination impacts. Taking the precautionary approach, the potential for effects on harbour porpoise from underwater noise are taken forward for assessment, however for all other effects, there is **no potential for LSE in-combination** with regards to the proposed works;

- ▲ In 2019 Ringsend WWTP was granted permission to upgrade its facilities. Work on the upgrade is ongoing and has the potential to temporally overlap with the survey works outlined in this report. Given that the project spatially overlaps with a proportion of the South Dublin Bay and River Tolka Estuary SPA there is **potential for LSE** when considering the precautionary principle, and without the use of mitigation measures. Potential LSE on features of the SPA in combination will be assessed in the Applicant's NIS (Annex F); ;
- ▲ Irish Water submitted an application in April 2020 to enable the construction of a 5.935 km outfall pipeline, including a multiport marine diffuser as part of the Greater Dublin Drainage Project. The construction period for the project is anticipated to occur over a three year period commencing in Q1 2022 with marine works on the outfall pipeline scheduled to commence in Q2 2022. Given this potential for overlap temporally with the survey works this will be assessed in the Applicant's NIS (Annex F);
- ▲ A Foreshore licence application FS007045 was determined February 2021 for site investigation works on Codling Bank in connection with the proposed Codling Bank offshore windfarm, including geophysical surveys, geotechnical campaign, fish and shellfish surveys, benthic and intertidal surveys and metocean deployment, with the works taking place across the project site, plus corridors for export cable routes to shore and several potential grid connection corridors close to Poolbeg, Shanganagh, Wicklow Town and Greystones (<https://codlingwindpark.ie/environmental-studies/>). Marine notices have been issued for the geophysical and geotechnical works and for deployment of wave and ADCP buoys, no indication of timings for pre construction site investigation works or ecological surveys is available. Therefore, an assumption has been made that these activities could occur simultaneously or sequentially with activities proposed under this Foreshore licence application. Given the potential for these surveys to overlap with those outlined for Dublin Array and given that the proposed surveys spatially overlap at Poolbeg landfall with a proportion of the South Dublin Bay and River Tolka Estuary SPA and Rockabill to Dalkey Island SAC under the precautionary principle, without the use of mitigation measures, potential LSE on features of the SPA and SAC in combination will be assessed in the Applicant's NIS (Annex F);
- ▲ North Irish Sea Array (NISA) submitted a foreshore licence to undertake a suite of site investigation surveys in January 2020 and this licence is yet to be determined. There is no spatial overlap with this project, however given the absence of exact timings there is potential for the surveys to overlap temporally. The Applicant's AA screening and NIS for NISA concludes that the effects of geotechnical, metocean and benthic ecology surveys are considered to be localised (immediate footprint of the equipment or in the case of drilling within 100m of the drilling equipment). Therefore, in combination effects between the surveys at Dublin Array and NISA due to geotechnical, ecological or metocean activities are not considered likely.

- ▲ For the NISA geophysical surveys, the Applicant's NIS identified the potential for disturbance from noise on marine mammals and risk of collision for the QIs of Rockabill to Dalkey Island SAC and Lambay Island SAC. Given that the potential for overlap with mobile QI species of Rockabill to Dalkey Island SAC and Lambay Island SAC there is potential for LSE when considering the precautionary principle, and without the use of mitigation measures. Potential LSE on features of the SACs in combination will be assessed in the Applicant's NIS (Annex F).

7.5 Screening statement

7.5.1 Twenty six SACS and eighteen SPAs were considered for the potential for LSE to arise via the identified source-receptor-pathways (see Table 14 and Table 15). With reference to the QI, QI sensitivities and the Conservation Objectives for the sites, this Screening assessment has found that it is not possible to discount LSE with respect to three SACS and two SPAs these are:

- ▲ Rockabill to Dalkey Island SAC [003000];
- ▲ South Dublin Bay SAC [000210];
- ▲ Lambay Island SAC [000204];
- ▲ South Dublin Bay and River Tolka Estuary SPA [004024]; and
- ▲ North Bull Island SPA [004006].

7.5.2 The pathways for which LSEs could not be discounted for these five sites were limited to potential disturbance effects upon QIs resulting from physical disturbance, or noise and vessel disturbance. These sites will therefore require further information to be provided within a Natura Impact Statement (NIS) to support a Stage 2 AA (See Annex F: Applicant's Natura Impact Statement).

8 References

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