

Dublin Array Offshore Wind Farm

Annex F: Applicant's Natura Impact Statement

Site Investigation and Ecological Monitoring Works

Date: September 2021

Revision: Final

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Acronyms

Term	Definition
2DUHRS	2D Ultra High Resolution Seismic
AEoI	Adverse Effect on the Integrity
CPT	Cone Penetration Test
DHLGH	Department of Housing, Local Government and Heritage
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
FL	Foreshore Licence
GNSS	Global Navigation Satellite System
HDD	Horizontal Directional Drilling
IROPI	imperative reasons of overriding public interest
MAG	Magnetometer
MBES	Multi-beam Echosounder
MHW	Mean High Water
MMO	Marine Mammal Observer
NMS	National Monuments Service
NOAA	National Oceanographic Atmospheric Administration
NPWS	National Parks and Wildlife Service
LAT	Lowest Astronomical Tide
LSE	Likely Significant Effect
NIS	Natura Impact Statement
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

Term	Definition
WWT	Water Water Treatment
Zol	Zone of Influence

1 Introduction

- 1.1.1 RWE Renewables Ireland Limited (RWE) are applying for authorisation 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. A summary of the proposed works is defined in Section 2 of this report with full details provided within Annex E: Report to Inform Appropriate Assessment Screening. 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 (DHLGH). 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 2). 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 189 km², 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.

1.2 Purpose of the Document

- 1.2.1 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, 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). The report aims to inform and assist the competent authority in carrying out the AA. This NIS has been prepared, taking into account the Conservation Objectives of all relevant European sites and qualifying interests identified within Annex E: Report to Inform Appropriate Assessment Screening.

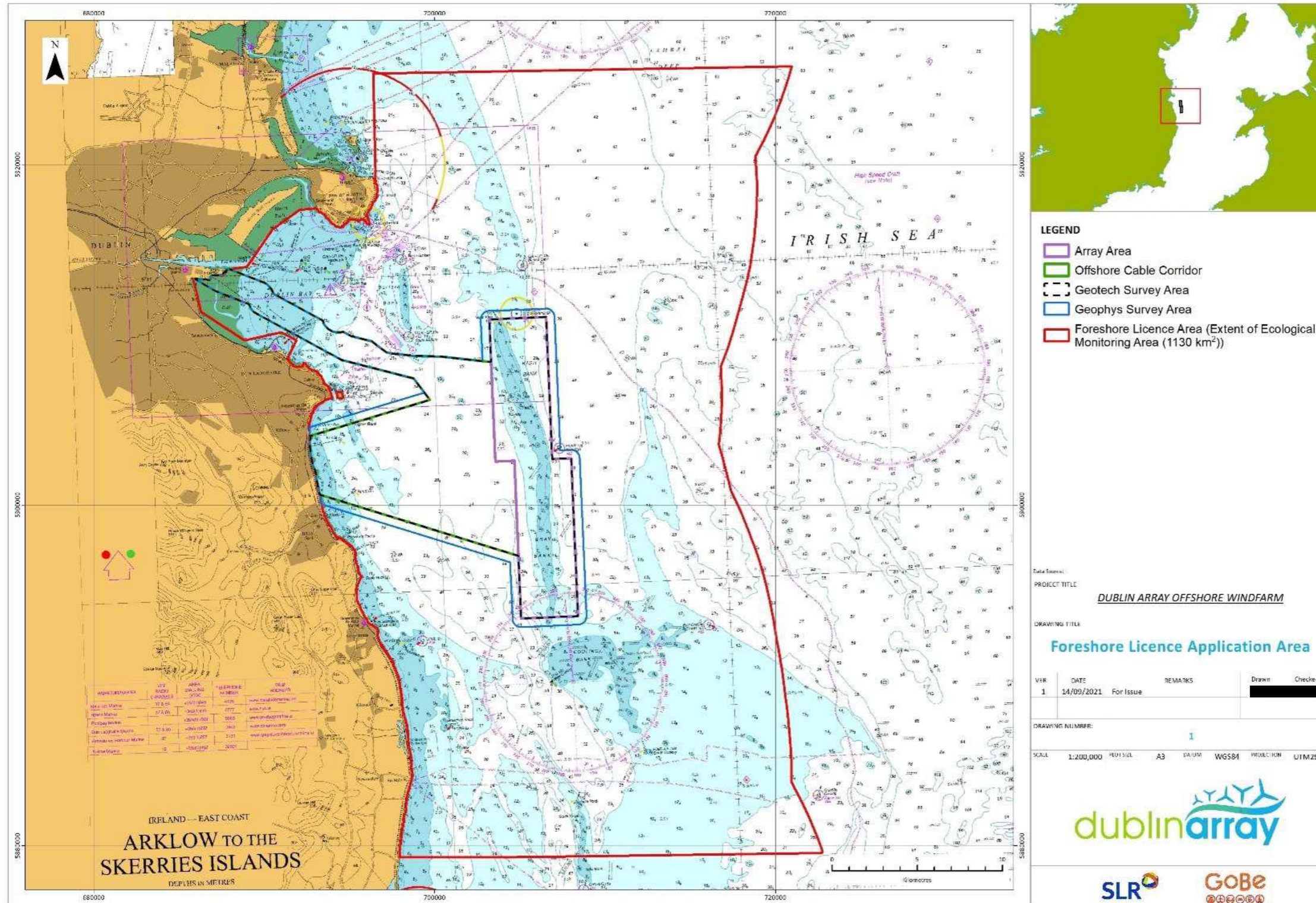


Figure 1 Foreshore Licence Application Area

1.3 Appropriate Assessment Process

- 1.3.1 The requirements of the 'AA Process' are generally satisfied through a progressive four-stage assessment process (DEHLG, 2009 as amended 2010). 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'.
- 1.3.2 Annex E of this Foreshore Licence application: Report to Inform Appropriate Assessment Screening, has been provided to assist the Minister of Housing, Local Government and Heritage (the Competent Authority) to undertake Stage 1: Screening for AA. A summary of the findings of the Applicant's screening process are provided in Section 3. Information pertaining to the AA required by the competent authority to undertake and inform their AA is detailed within this report, the Applicant's Natura Impact Statement (NIS).

Appropriate Assessment

- 1.3.3 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 Adverse Effect on the Integrity (AEoI) of a European site. Where AEoI are identified or where an adverse effect is uncertain, mitigation will be required. Mitigation measures will 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. 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.
- 1.3.4 The approach taken to preparing this NIS can be broadly summarised as follows:
- ▲ Set out information on the European sites identified at Stage 1 screening as likely to be significantly affected by the proposed works;
 - ▲ Describe the elements of the proposed licenced works (alone or in-combination with other projects or plans) that are likely to give rise to significant effects on the environment;
 - ▲ Set out the Conservation Objectives of the site(s);
 - ▲ Describe how the proposed works will affect key species and key habitats; and
 - ▲ Describe how the integrity of the site (determined by structure and function and Conservation Objectives) is likely to be affected by the proposed works (e.g. loss of habitat, disturbance, disruption, chemical changes, hydrological changes and geological changes).

- 1.3.5 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

- 1.3.6 The potential need for Stage 3 is informed by the conclusions of Stage 2, with no such requirement identified within the Applicant's NIS. 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

- 1.3.7 The potential need for Stage 4 is informed by the conclusions of stages 3, 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 Project Information

2.1 Overview

2.1.1 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. This will, in turn, inform detailed design decisions 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.

- ▲ Geotechnical surveys - to provide further understanding of ground conditions including soil stability to refine the foundation type, sizing and installation methodology and to finalise cable route and landfall detailed design and installation methodology.
- ▲ Geophysical surveys - to provide further detail regarding the variability of seabed features across the site and seabed mobility to inform detailed foundation and cable burial design and installation methodologies.
- ▲ Wind and metocean monitoring – to provide additional data regarding wind, wave and currents across the proposed site to assist with detailed wind farm design and layout optimisation.
- ▲ Ecological monitoring – to collate data on the pre-construction baseline against which to monitor change in the environment.

2.1.2 The full scope of works is provided in Annex E: Screening for AA with a summary provided in Table 1. The indicative locations of the survey areas which form the scope of the proposed works are shown in Figure 3 to Figure 6.

Table 1 Proposed survey elements

Location	Survey techniques
Geotechnical survey	
Array Area, proposed foundation locations	Up to 61 geotechnical boreholes with wireline logging to an approximate depth of 80m below seafloor and an outside diameter of up to 254 mm.
Array Area, proposed foundation locations	Up to 61 Deep push seafloor Cone Penetration Tests (CPT) to an approximate depth of 80m below seafloor, with a diameter of approximately 40mm.
Along proposed export cable routes extending into the array	Up to 31 Seafloor CPTs with a diameter of approximately 40mm and 48 vibrocores with a diameter of approximately 150 mm diameter. The target depth of each technique will be approximately 6 m below seafloor. Up to five of each type may be located within the intertidal area.
Proposed export cable landfall locations extending into the array	Up to 12 nearshore geotechnical boreholes with wireline logging and Rotary Cored Drilling, approximately 100 mm diameter to

Location	Survey techniques
	target depth of 45 m below seafloor (four at each landfall option).
Geophysical survey	
Proposed export cable landfall locations	Refraction survey in nearshore & intertidal
Array Area, to cover proposed foundation locations	2D UHR & geophysical survey including Bathymetric Survey, Side Scan Sonar, Shallow Reflection Seismic (Sub-bottom Profiling) and Marine Magnetometer
Along proposed export cable routes	Geophysical survey including Bathymetric Survey, Side Scan Sonar, Shallow Reflection Seismic (Sub-bottom Profiling) and Marine Magnetometer;
Wind and metocean monitoring	
Array Area	Up to two buoy mounted Floating Lidar (FLiDAR) Units and up to two buoys incorporating wave and current measurement devices.
Ecological monitoring	
Foreshore Licence Area	Up to 10 static acoustic monitoring devices (SAM)
Foreshore Licence Area	Up to three annual subtidal benthic ecology surveys comprising drop down video, grab sampling and epibenthic trawls
Foreshore Licence Area	Up to three annual potting survey and 12 seasonal trawl surveys (four/year)
Intertidal area at landfall locations	Up to three annual benthic ecology survey

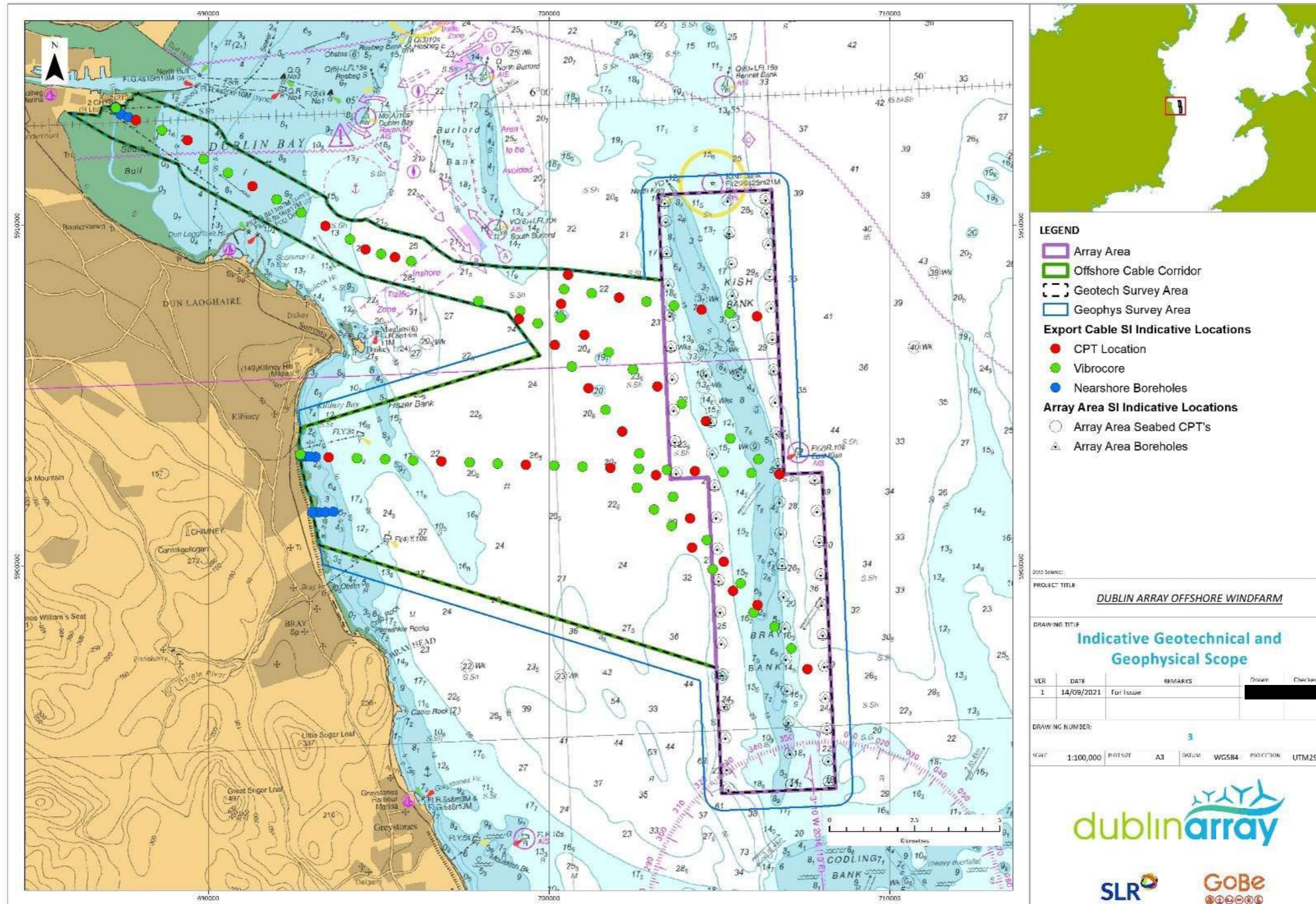


Figure 2 Indicative Geotechnical and Geophysical Scope

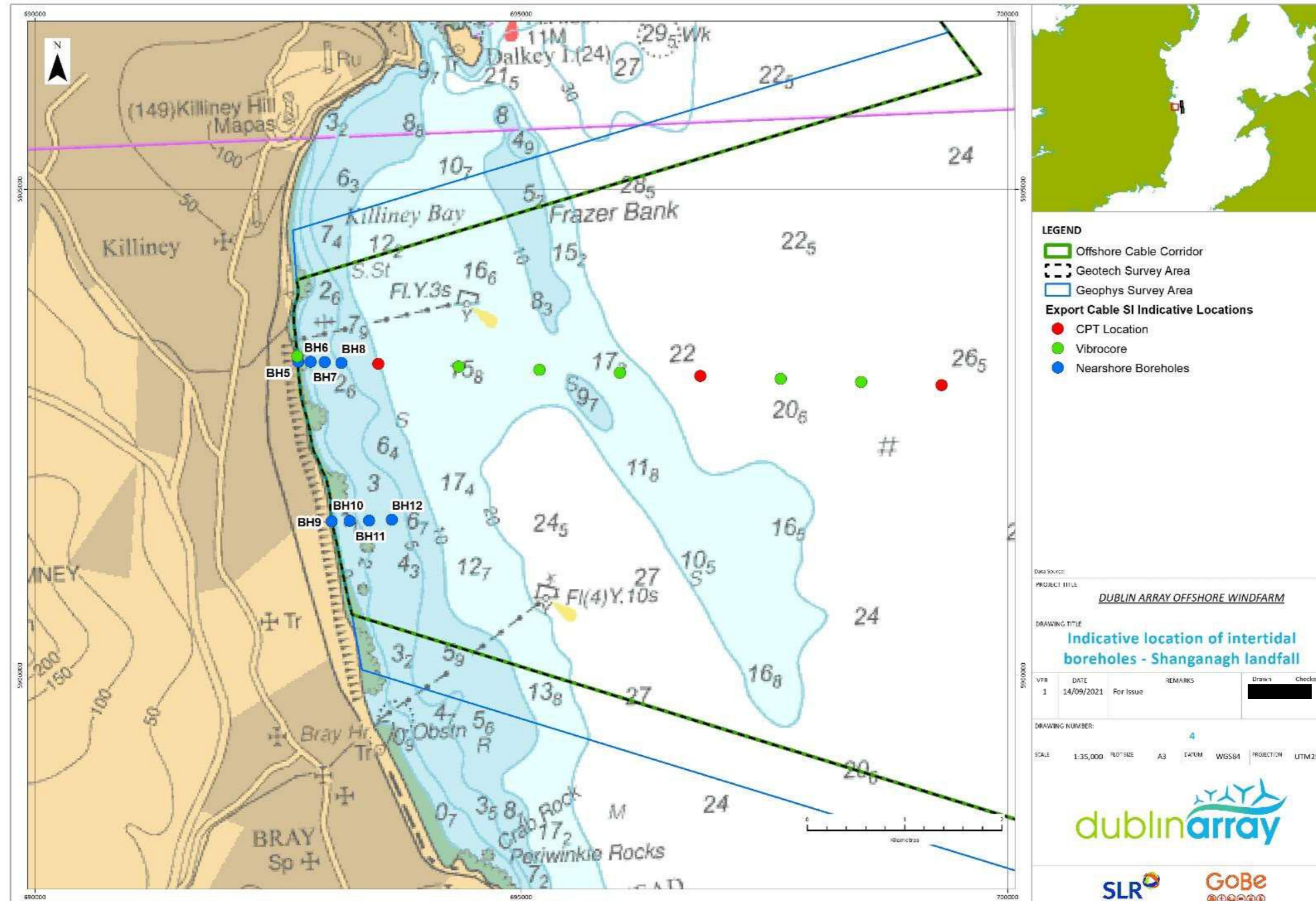


Figure 3 Indicative Locations of the intertidal boreholes – Shanganagh landfall

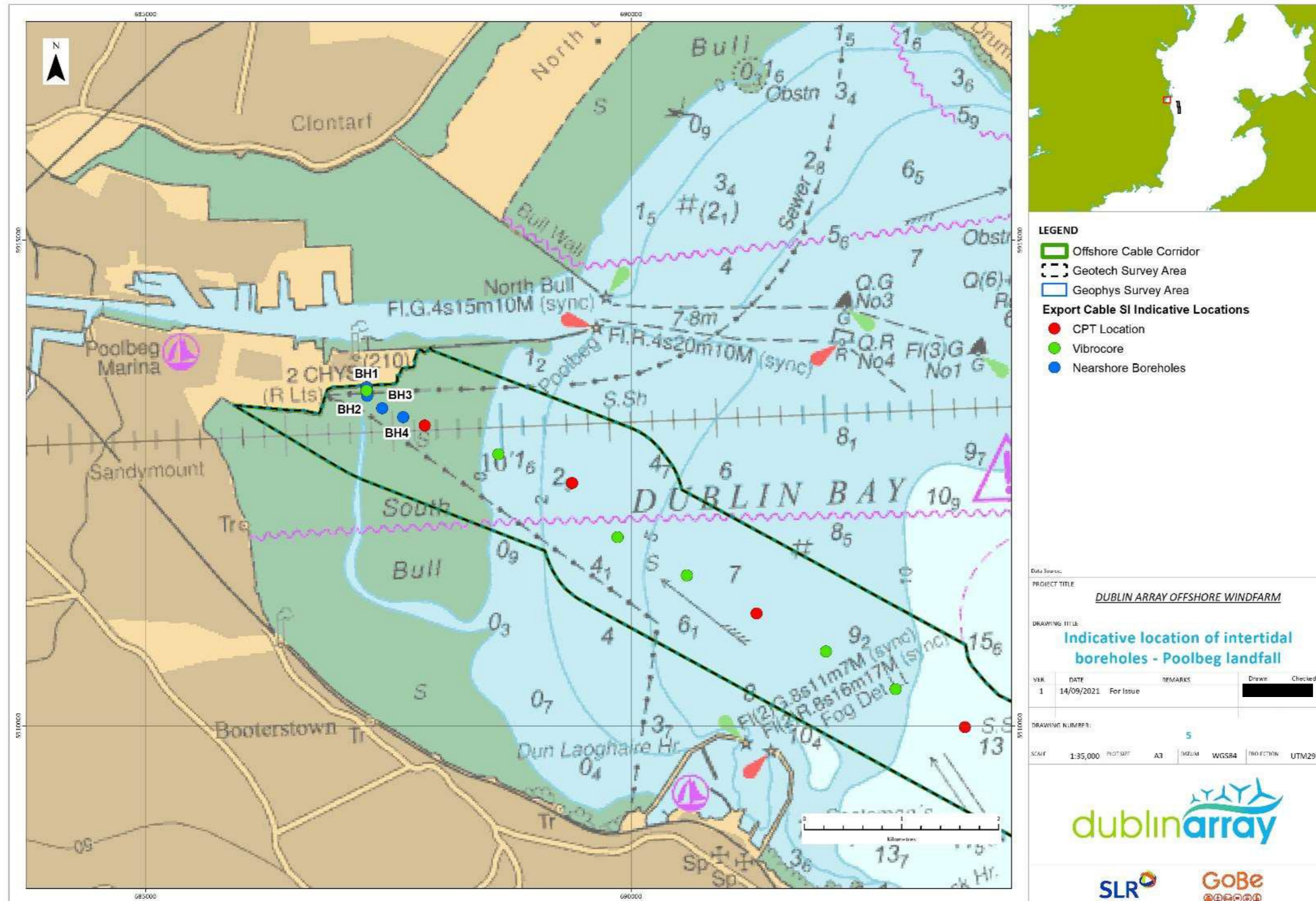


Figure 4 Indicative Locations of the intertidal boreholes – Poolbeg landfall

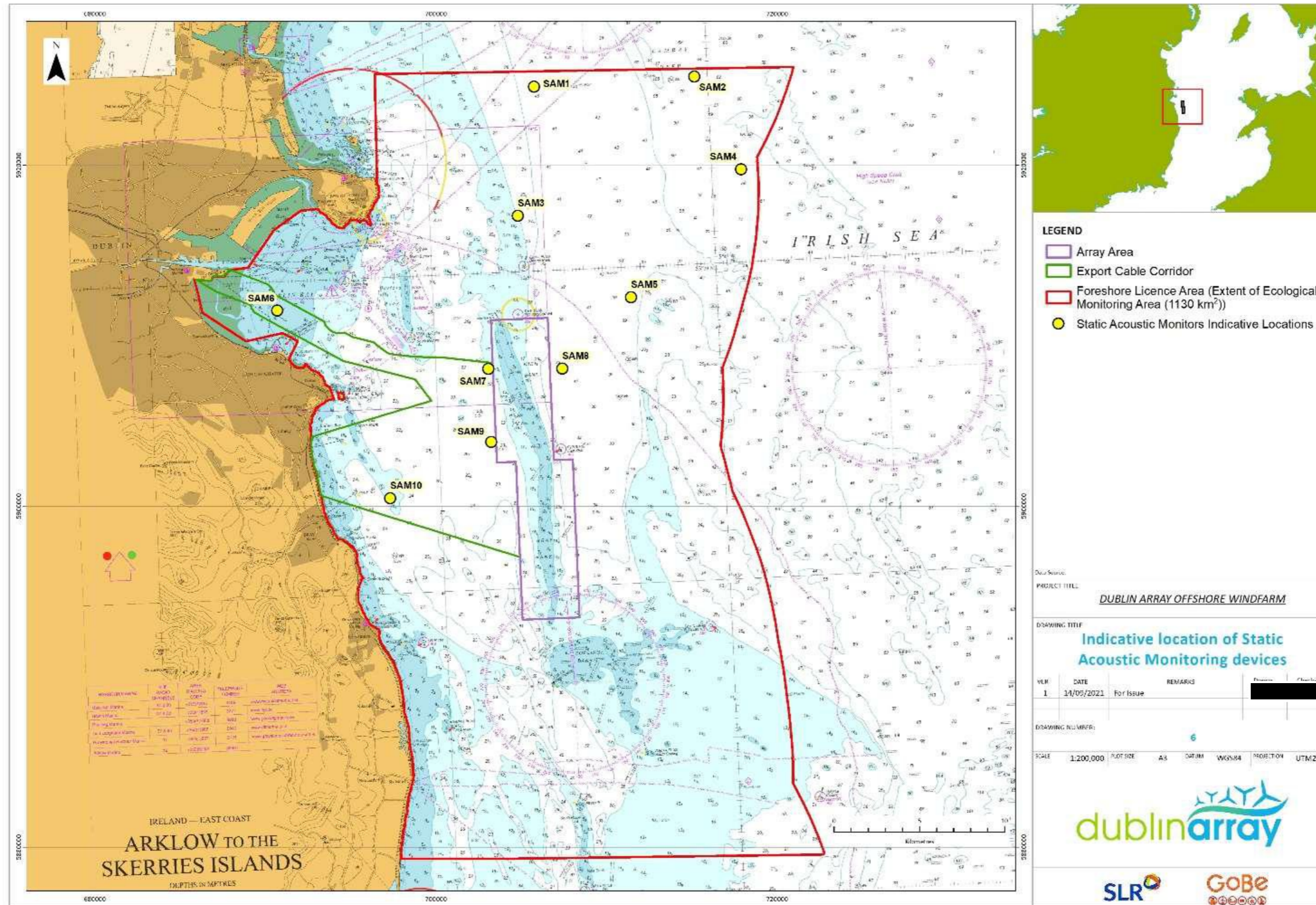


Figure 5 Indicative Locations of Static Acoustic Monitoring devices

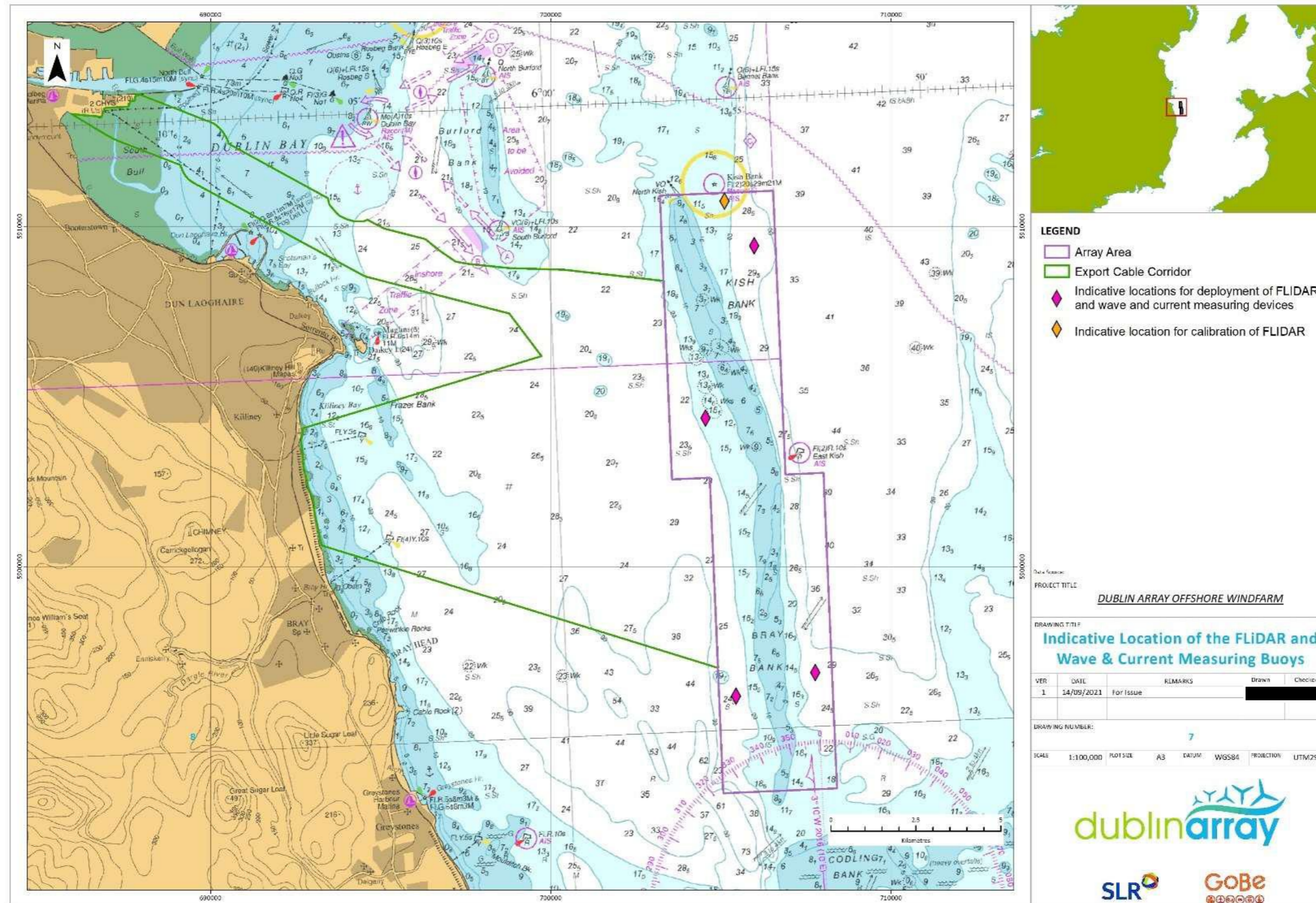


Figure 6 Indicative Locations of the FLiDAR and Wave & Current Measuring Buoys

3 Screening Summary

3.1.1 This section of the report presents the outcome of the screening process, for which the full and detailed process is presented in Annex E: Report to inform Appropriate Assessment Screening. Twenty six SACS and eighteen SPAs were considered for the potential for LSE to arise via the identified source-receptor-pathways. The potential impacts for those SAC and SPA's identified within the ZOI are presented in Table 2 and Table 3, with focussed consideration made on the Qualifying Features of these designated sites. With reference to the QI, QI sensitivities and the Conservation Objectives for the sites, it was 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].

3.1.2 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.

Table 2 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 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 potential	Screened in.

SAC Site Name and Code Qualifying Interests	Closest distance (km) to		Potential Impacts	LSE Result - Screened in / out
	Geophysical boundary	Ecological boundary		
			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-Brittas 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>	
Slaney River Valley SAC [000781]				
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.
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 3 Screening outcomes for SPAs

SPA Site Name and Code Qualifying Interests			Closest distance (km) to geophysical boundary / ecological boundary	Potential Impacts	LSE Result - Screened in / out
South Dublin Bay and River Tolka Estuary SPA [004024]					
Light-bellied Brent Goose	Arctic Tern	Black-headed Gull	Overlaps	Overlaps	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	Screened in.
Shelduck	Turnstone	Oystercatcher			
<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> <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 link between the works and the European site features.</p>					

SPA Site Name and Code Qualifying Interests			Closest distance (km) to geophysical boundary / ecological boundary		Potential Impacts	LSE Result - Screened in / out
Teal	Black-headed Gull	Golden Plover				
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 geophysical boundary / ecological boundary	Potential Impacts	LSE Result - Screened in / out	
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 geophysical boundary / ecological boundary	Potential Impacts	LSE Result - Screened in / out	
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 geophysical boundary / ecological boundary	Potential Impacts	LSE Result - Screened in / out	
Lambay Island SPA [004069]						
Fulmar	Cormorant	Shag	18.2	14.2	<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 operations will be a minimum of 14.2 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.
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	<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 17.3 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.
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 geophysical boundary / ecological boundary		Potential Impacts	LSE Result - Screened in / out
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 geophysical boundary / ecological boundary	Potential Impacts	LSE Result - Screened in / out	
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 geophysical boundary / ecological boundary		Potential Impacts	LSE Result - Screened in / out
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 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 geophysical boundary / ecological boundary		Potential Impacts	LSE Result - Screened in / out	
Grassholm SPA [UK9014041]						
Gannet			157	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 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	55.9	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 disturbance will be temporary with birds able to return to the area post survey.	Screened out.

SPA Site Name and Code Qualifying Interests			Closest distance (km) to geophysical boundary / ecological boundary		Potential Impacts	LSE Result - Screened in / out
Copeland Islands						
Manx shearwater			153	137.9	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 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	139.4	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 disturbance will be temporary with birds able to return to the area post survey	Screened out.
Storm petrel						

4 Relevant Characteristics of European Sites with Potential for LSE

4.1.1 The European sites that have been taken through to Stage 2 of the AA Process are shown relative to the proposed Foreshore Licence area boundary in Figure 7 and listed in Table 4. The Conservation Objectives are provided for the relevant sites and qualifying features screened in for AA in Table 5 and Table 6. Where site or feature specific Conservation Objectives are not available, generic objectives as published by the National Parks and Wildlife Service (NPWS) have been considered (NPWS, 2020).

Table 4 Sites screened in for Stage 2

European site screened in	QI Screened in
Rockabill to Dalkey Island SAC	Reefs Harbour porpoise
South Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonising mud and sand Atlantic salt meadows Mediterranean salt meadows
Lambay Island SAC	Grey seal Harbour seal
South Dublin Bay and River Tolka Estuary SPA	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
North Bull Island SPA	Light bellied Brent goose, Redshank, Shoveler, Shelduck, Turnstone, Oystercatcher, Teal, Black headed gull, Golden plover, Pintail, Dunlin, Grey plover

Table 5 Conservation Objectives for the SACs screened in for AA

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>(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]	

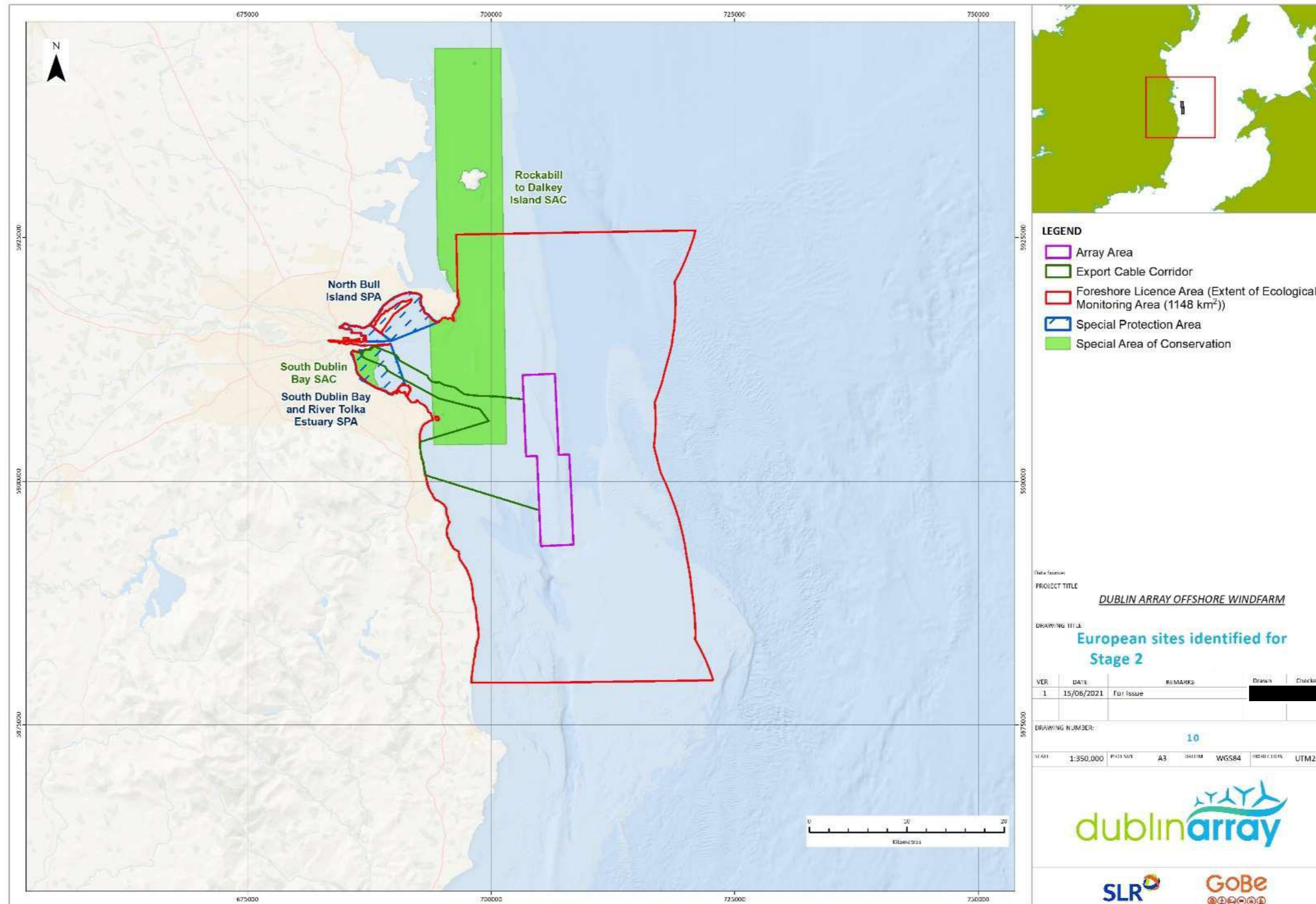
SAC Site Name and Code Qualifying Interests	Objectives and Targets
Lambay Island SAC [000204]	
Grey seal	To maintain the favourable conservation condition of Grey Seal in Lambay Island SAC which is defined by the following list of attributes and targets: Access to suitable habitat, breeding behaviour, 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.

Table 6 Conservation Objectives for the SPAs screened in for AA

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.

SPA Site Name and Code Qualifying Interests			Objectives and Targets
			<ul style="list-style-type: none"> ▪ 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 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.
Shelduck	Turnstone	Oystercatcher	
Teal	Black-headed Gull	Golden Plover	
Pintail	Dunlin	Grey Plover	
Bar-tailed Godwit	Black-tailed Godwit	Knot	

SPA Site Name and Code Qualifying Interests			Objectives and Targets
Curlew	Sanderling	-	<ul style="list-style-type: none"> 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.



AA

Figure 7 European sites identified for Stage 2: AA.

Rockabill to Dalkey Island SAC

4.1.2 The aspects outlined in the Site Synopsis (NPWS, 2014) and Natura 2000 Standard Data Form (NPWS, 2019) which are most relevant to the features of the Rockabill to Dalkey SAC and have been carried through to Stage 2 (AA) are as follows:

- ▲ The selected site forms a strip of dynamic inshore and coastal waters in the western Irish Sea, extending approximately 40 km in length and encompassing a range of comparatively shallow marine habitats, including diverse seabed structures, reefs, islets and islands. The site borders existing designated sites for Annexed species and habitats and is adjacent to a wide array of coastal features, e.g., mudflats, lagoons, estuaries, coastal cliffs, sea caves, several of which are also designated. Extending east from Dublin Bay towards the offshore Kish Bank, the site contains the entire Burford Bank, a sedimentary seabed structure (i.e. fine sand) at the mouth of Dublin Bay, that on its north side is flanked by gravel and coarse sand deposits. The site also contains the northern segment of the Frazer Bank (i.e. fine sand) off Dalkey Island and Killiney Bay. Reef habitats within the site occur at Dalkey Island, Maiden Rock and Muglins in the southern portion, off Howth Head, Ireland’s Eye and Lambay Island in the central portion, and Rockabill in North Dublin.
- ▲ Reef is uncommon due to prevailing geology and hydrographical conditions. Expansive surveys of the Irish coast have indicated that the greatest resource of this habitat within the Irish Sea is found fringing offshore islands which are concentrated along the Dublin coast. A detailed survey of selected suitable islands has shown areas with typical biodiversity for this habitat both intertidally and subtidally. These Reefs are subject to strong tidal currents with an abundant supply of suspended matter resulting in good representation of filter feeding fauna such as sponges, anemones and echinoderms.
- ▲ The area selected for designation represents a key habitat for the Annex II species - harbour porpoise, within the Irish Sea. Population survey data show that porpoise occurrence within the site boundary meets suitable reference values for other designated sites in Ireland. The species occurs year-round within the site and comparatively high group sizes have been recorded. Porpoises with young (i.e. calves) are observed at favourable, typical reference values for the species. Casual and effort-related sighting rates from coastal observation stations are significant for the east coast of Ireland and the latter appear to be relatively stable across all seasons. The selected site contains a wide array of habitats believed to be important for harbour porpoise including inshore shallow sand and mud-banks and rocky reefs scoured by strong current flow.
- ▲ “This site is of conservation importance for reefs, listed on Annex I, and Harbour Porpoise, listed on Annex II, of the E.U. Habitats Directive.”

South Dublin Bay SAC

4.1.3 The aspects outlined in the Site Synopsis (NPWS, 2015b) and Natura 2000 Standard Data Form (NPWS, 2015c) which are most relevant to the features of the site carried through to Stage 2 (AA) are as follows:

- ▲ “This site lies south of the River Liffey in Co. Dublin, and extends from the South Wall to the west pier at Dun Laoghaire. It is an intertidal site with extensive areas of sand and mudflats. The sediments are predominantly sands but grade to sandy muds near the shore at Merrion Gates. The main channel which drains the area is Cockle Lake”.
- ▲ “The bed of Dward Eelgrass (*Zostera noltii*) found below Merrion Gates is the largest stand on the east coast.”
- ▲ “Several small, sandy beaches with incipient dune formation occur in the northern and western sectors of the site, notably at Poolbeg, Irishtown and Merrion/ Booterstown. The formation at Booterstown is very recent. Drift line vegetation occurs in association with the embryonic and incipient fore dunes. Typically drift lines occur in a band approximately 5 m wide, though at Booterstown this zone is wider in places. The habitat occurs just above the High Water Mark and below the area of embryonic dune. Species present are Sea Rocket (*Cakile maritima*), Frosted Orache (*Atriplex laciniata*), Spear-leaved Orache (*A. prostrata*), Prickly Saltwort (*Salsola kali*) and Fat Hen (*Chenopodium album*). Also occurring is Sea Sandwort (*Honkenya peploides*), Sea Beet (*Beta vulgaris subsp. maritima*) and Annual Sea-blite (*Suaeda maritima*). A small area of pioneer saltmarsh now occurs in the lee of an embryonic sand dune just north of Booterstown Station. This early stage of saltmarsh development is here characterised by the presence of pioneer stands of glassworts (*Salicornia spp.*) occurring below an area of drift line vegetation. As this is of very recent origin, it covers a small area but ample areas of substrate and shelter are available for the further development of this habitat.”
- ▲ “Lugworm (*Arenicola marina*), Cockles (*Cerastoderma edule*) and annelids and other bivalves are frequent throughout the site. The small gastropod *Peringia ulvae* occurs on the muddy sands off Merrion Gates.”
- ▲ “At low tide the inner parts of the south bay are used for amenity purposes. Bait digging is a regular activity on the sandy flats. At high tide some areas have windsurfing and jet-skiing. This site is a fine example of a coastal system, with extensive sand and mudflats, and incipient dune formations. South Dublin Bay is also an internationally important bird site.”

- ▲ “This intertidal site extends from the South Wall at Dublin Port to the West Pier at Dun Laoghaire, a distance of circa 5 km. At their widest, the intertidal flats extend for almost 3 km. The seaward boundary is marked by the low tide mark, while the landward boundary is now almost entirely artificially embanked. Several permanent channels exist, the largest being Cockle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs near Dun Laoghaire. A number of small streams and drains flow into the site. The proximity of the site to Dublin City results in it being a very popular recreational area. It is also important for educational and research purposes.”
- ▲ “The site possesses a fine and fairly extensive example of intertidal flats. Sediment type is predominantly sand, with muddy sands in the more sheltered areas. A typical macro-invertebrate fauna exists. Has the largest stand of *Zostera* on the east coast. Supports part of the important wintering waterfowl populations of Dublin Bay. Regularly has an internationally population of *Branta bernicila horta*, plus nationally important numbers of at least a further 6 species, including *Limosa lapponica*. Regular autumn roosting ground for significant numbers of *Sterna terns*, including *S. dougallii*. The scientific interests of the site have been well documented.”

Lambay Island SAC

- 4.1.4 The aspects outlined in the Site Synopsis (NPWS, 2014a) most relevant to the features of the site which have been carried through to Stage 2 (AA) are as follows:
- ▲ “Lambay supports the principal breeding colony of Grey Seal on the east coast of Ireland, numbering 196 - 252 seals, across all ages. It also contains regionally significant numbers of Common Seal, of which up to 47 individuals have been counted at the site. Grey Seals and Common Seals occur year-round and the island’s intertidal shorelines, coves and caves are used by resting and moulting seals.”
 - ▲ This site provides year-round haul-out habitat for the Annex II seal species *Halichoerus grypus* and *Phoca Vitulina*, and includes regionally significant breeding and moulting sites.

South Dublin Bay and River Tolka Estuary SPA

- 4.1.5 The aspects outlined in the Site Synopsis (NPWS, 2015d) and Natura 2000 Standard Data Form for the SPA (2015e) most relevant to the features of the site which have been carried through to Stage 2 (AA) are as follows:

- ▲ “The South Dublin Bay and River Tolka Estuary SPA comprises a substantial part of Dublin Bay. It includes the intertidal area between the River Liffey and Dun Laoghaire, and the estuary of the River Tolka to the north of the River Liffey, as well as Booterstown Marsh. A portion of the shallow marine waters of the bay is also included”.
- ▲ “The site is a SPA under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Oystercatcher, Ringed Plover, Grey Plover, Knot, Sanderling, Dunlin, Bar-tailed Godwit, Redshank, Black-headed Gull, Roseate Tern, Common Tern and Arctic Tern. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of the SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.”
- ▲ “The site is an important site for wintering waterfowl, being an integral part of the internationally important Dublin Bay complex – all counts for wintering waterbirds are five year mean peaks for the period 1995/96 to 1999/2000. Although birds regularly commute between the south bay and the north bay, recent studies have shown that certain populations which occur in the south bay spend most of their time there. An internationally important population of Light-bellied Brent Goose (368) occurs regularly and newly arrived birds in the autumn feed on the Eelgrass bed at Merrion. At the time of designation, the site supported nationally important numbers of a further nine species: Oystercatcher (1,145), Ringed Plover (161), Grey Plover (45), Knot (548), Sanderling (321), Dunlin (1,923), Bar-tailed Godwit (766), Redshank (260) and Black-headed Gull (3,040). Other species occurring in smaller numbers include Great Crested Grebe (21), Curlew (127) and Turnstone (52). Little Egret, a species which has recently colonised Ireland, also occurs at this site.”
- ▲ “South Dublin Bay is a significant site for wintering gulls, with a nationally important population of Black-headed Gull, but also Common Gull (330) and Herring Gull (348). Mediterranean Gull is also recorded from here, occurring through much of the year, but especially in late winter/spring and again in late summer into winter.”
- ▲ “Both Common Tern and Arctic Tern breed in Dublin Docks, on a man-made mooring structure known as the E.S.B. dolphin – this is included within the site. Small numbers of Common Tern and Arctic Tern were recorded nesting on this dolphin in the 1980s. A survey in 1995 recorded nationally important numbers of Common Tern nesting here (52 pairs). The breeding population of Common Tern at this site has increased, with 216 pairs recorded in 2000. This increase was largely due to the ongoing management of the site for breeding terns. More recent data highlights this site as one of the most important Common Tern sites in the country with over 400 pairs recorded here in 2007.”

- ▲ “South Dublin Bay is an important staging/passage site for a number of tern species in the autumn (mostly late July to September). The origin of many of the birds is likely to be the Dublin breeding sites (Rockabill and the Dublin Docks) though numbers suggest that the site is also used by birds from other sites, perhaps outside the state. This site is selected for designation for its autumn tern populations: Roseate Tern (2,000 in 1999), Common Tern (5,000 in 1999) and Arctic Tern (20,000 in 1996).”
- ▲ “The South Dublin Bay and River Tolka Estuary SPA is of ornithological importance as it 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 internationally important passage/staging site for three tern species. It is of note that four of the species that regularly occur at this site are listed on Annex I of the E.U. Birds Directive, i.e. Bar-tailed Godwit, Common Tern, Arctic Tern and Roseate Tern. Sandymount Strand/Tolka Estuary is also a Ramsar Convention site.”
- ▲ “This site comprises a substantial part of Dublin Bay. It includes virtually all of the intertidal area in the south bay, as well as much of the Tolka Estuary to the north of the River Liffey. A portion of the shallow bay waters is also included. In the south bay, the intertidal flats extend for almost 3 km at their widest. The sediments are predominantly well-aerated sands. The sands support the largest stand of *Zostera noltii* on the East Coast. Several permanent channels exist, the largest being Cockle Lake. A small sandy beach occurs at Merrion Gates, while some bedrock shore occurs near Dun Laoghaire. The landward boundary is now almost entirely artificially embanked. Sediments in the Tolka Estuary vary from soft thixotropic muds with a high organic content in the inner estuary to exposed, well aerated sands off the Bull Wall. The proximity of the site to Dublin City results in it being a very popular recreational area. It is also important for educational and research purposes. The site possesses extensive intertidal flats which support wintering waterfowl which are part of the overall Dublin Bay population. It regularly has an internationally important population of *Branta bernicla hrota*, which feeds on *Zostera noltii* in the autumn. It has nationally important numbers of a further 6 species: *Haematopus ostralegus*, *Charadrius hiaticula*, *Calidris canutus*, *Calidris alba*, *Calidris alpina* and *Limosa lapponica*. It is an important site for wintering gulls, especially *Larus ridibundus* and *Larus canus*. South Dublin Bay is the premier site in Ireland for *Larus melanocephalus*, with up to 20 birds present at times. Is a regular autumn roosting ground for significant numbers of terns, including *Sterna dougallii*, *S. hirundo* and *S. paradisaea*.”

North Bull Island SPA

4.1.6 The aspects outlined in the Site Synopsis (NPWS, 2015f) and Natura 2000 Standard Data Form (NPWS, 2015g) which are most relevant to the features of the site which have been carried through to Stage 2 (AA) are as follows:

- ▲ “This site covers all of the inner part of north Dublin Bay, with the seaward boundary extending from the Bull Wall lighthouse across to Drumleck Point at Howth Head. The North Bull Island sand spit is a relatively recent depositional feature, formed as a result of improvements to Dublin Port during the 18th and 19th centuries. It is almost 5 km long and 1 km wide and runs parallel to the coast between Clontarf and Sutton. Part of the interior of the island has been converted to golf courses.”
- ▲ “Saltmarsh extends along the length of the landward side of the island and provides the main roost site for wintering birds in Dublin Bay. The island shelters two intertidal lagoons which are divided by a solid causeway. These lagoons provide the main feeding grounds for the wintering waterfowl.”
- ▲ “The North Bull Island SPA is a regular site for passage waders, especially Ruff, Curlew Sandpiper and Spotted Redshank. These are mostly observed in single figures in autumn but occasionally in spring or winter.”
- ▲ “The site formerly had an important colony of little tern but breeding has not occurred in recent years. Several pairs of Ringed Plover breed, along with Shelduck in some years.”
- ▲ “The North Bull Island SPA is an excellent example of an estuarine complex and is one of the top sites in Ireland for wintering waterfowl. It is of international importance on account of both the total number of waterfowl and the individual populations of Light-bellied Brent Goose, Black-tailed Godwit and Bar-tailed Godwit that use it. Also of significance is the regular presence of several species that are listed on Annex I of the E.U. Birds Directive, notably Golden Plover and Bar-tailed Godwit, but also Ruff and Short-eared Owl. North Bull Island is a Ramsar Convention site, and part of the North Bull Island SPA is a Statutory Nature Reserve and a Wildfowl Sanctuary.”

- ▲ “The site is a SPA under the E.U. Birds Directive, of special conservation interest for the following species: Light-bellied Brent Goose, Shelduck, Teal, Pintail, Shoveler, Oystercatcher, Golden Plover, Grey Plover, Knot, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone and Black-headed Gull. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.” “The North Bull Island SPA is of international importance for waterfowl on the basis that it regularly supports in excess of 20,000 waterfowl. The site supports internationally important populations of three species, Light-bellied Brent Goose (1,548), Black-tailed Godwit (367) and Bar-tailed Godwit (1,529) - all figures are mean peaks for the five winters between 1995/96 and 1999/2000. The site is one of the most important in the country for Light-bellied Brent Goose. A further 14 species have populations of national importance – Shelduck (1,259), Teal (953), Pintail (233), Shoveler (141), Oystercatcher (1,784), Grey Plover (517), Golden Plover (2,033), Knot (2,837), Sanderling (141), Dunlin (4,146), Curlew (937), Redshank (1,431), Turnstone (157) and Black-headed Gull (2,196). The populations of Pintail and Knot are of particular note as they comprise 14% and 10% respectively of the all-Ireland population totals. Other species that occur regularly in winter include Grey Heron, Little Egret, Cormorant, Wigeon, Goldeneye, Red-breasted Merganser, Ringed Plover and Greenshank. Gulls are a feature of the site during winter and, along with the nationally important population of Black-headed Gull (2,196), other species that occur include Common Gull (332) and Herring Gull (331). While some of the birds also frequent South Dublin Bay and the River Tolka Estuary for feeding and/or roosting purposes, the majority remain within the site for much of the winter. The wintering bird populations have been monitored more or less continuously since the late 1960s and the site is now surveyed each winter as part of the larger Dublin Bay complex.”
- ▲ “The site is among the top ten sites for wintering waterfowl in the country. It supports internationally important populations of *Branta bernicila hrota* and *Limosa lapponica* and is the top site in the country for both of these species. A further 14 species have populations of national importance, with particular notable numbers of *Tadorna tadorna* (8.5% of national total), *Anas acuta* (11.6% of national total), *Pluvialis squatarola* (6.9% of national total), *Calidris canutus* (10.5% of national total). North Bull Island SPA is a regular site for passage waders such as *Philomachus pugnax*, *Calidris ferruginea* and *Tringa erythropus*. The site supports *Asio flammeus* in winter. Formerly the site had an important colony of *Sterna albifrons* but breeding has not occurred in recent years. The site provides both feeding and roosting areas for the waterfowl species. Habitat quality for most of the estuarine habitats is very good. The site has a population of the rare *Petalophyllum ralfsii* which is the only known station away from the western seaboard as well as five Red Data Book vascular plant species and four bryophyte species. It is nationally important for three insect species. Wintering bird populations have been monitored more or less continuously since the late 1960s, and the other scientific interests of the site have also been well documented. Future prospects are good owing to various designations assigned to site.”

4.2 Impact Assessment

Predicted Effects

4.2.1 The AEoI on the Conservation Objectives of the European sites which may occur as a result of the proposed works without mitigation are discussed in relation to each site screened-in for assessment below:

Rockabill to Dalkey Island SAC

4.2.2 The Conservation Objectives to maintain the favourable conservation condition of Reefs [1170] within the Rockabill to Dalkey Island SAC are defined by the following list of attributes and targets:

- ▲ The permanent area is stable or increasing, subject to natural processes;
- ▲ The distribution of reefs is stable or increasing, subject to natural processes; and
- ▲ The intertidal reef community complex and subtidal reef community complex is conserved in a natural condition.

4.2.3 The Conservation Objectives to maintain the favourable conservation condition of Harbour Porpoise (*Phocoena phocoena*) [1351] within the Rockabill to Dalkey Island SAC, are defined by the following list of attributes and targets:

- ▲ Species range within the site should not be restricted by artificial barriers to site use; and
- ▲ Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site.

4.2.4 A proportion of the proposed works area overlaps with the SAC. The extent of the known geogenic reefs within the SAC have been mapped and are presented within the Conservation Objectives supporting document (NPWS, 2013a). No reef features of conservation importance are noted at the location of the proposed sampling sites. Neither the intertidal nor subtidal community complex is currently mapped within the Foreshore Licence area. However, it cannot be discounted that this feature may exist elsewhere within the survey area and has not been mapped. Therefore, under the precautionary principle, without the use of mitigation measures, there is potential for adverse effects on the QIs of the SAC.

4.2.5 With regards the harbour porpoise feature and the temporary overlap with the calving period of harbour porpoise (May to August) within Rockabill to Dalkey SAC, the noise associated with the proposed works described in Section 6.2 and 6.3 of Annex E: Report to Inform AA Screening have the potential for localised disturbance and have potential to disturb and/or displace fish prey items of all cetacean and pinniped species resulting in localised indirect effects.

4.2.6 The geotechnical works fall outside the range of hearing thresholds for harbour porpoise but there is a potential for disturbance from geophysical works and a risk of injury due to collision and under the precautionary principle, there is potential for adverse effects on the QIs of the SAC. However, given that any noise impacts on cetaceans and their prey would be short term, temporary and intermittent and the best practice mitigation measures in relation to geophysical acoustic surveys as specified in the DAHG Guidance (2014) or other updated guidance as agreed with NPWS, outlined in Appendix A will be followed at all times, the potential for disturbance to the species will be minimised and no impacts on the Conservation Objectives of the SAC are predicted.

South Dublin SAC

4.2.7 Site specific objectives do not exist for the Mudflats and sandflats not covered by seawater at low tide [1140], 'Salicornia and other annuals colonising mud and sand [1310]', 'Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) [1330]' and 'Mediterranean salt meadows (*Juncetalia maritimi*) [1410]' communities. The generic targets have therefore been considered in this case, these are that the favourable conservation status of a habitat is achieved when:

- ▲ Its natural range, and area it covers within that range, are stable or increasing;
- ▲ The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- ▲ The conservation status of its typical species is favourable.

4.2.8 A small proportion of the proposed survey area overlaps with the SAC. In the process of removing the vibrocores, boreholes, CPTs and undertaking the benthic sampling and cores, a small area of the sediment surface within the QI for mudflats and sandflats not covered by seawater at all times will be removed. There will also be a small area of seabed disturbance within the footprint of the steel frame. The proposed refraction survey will be non-intrusive and have no contact with the seafloor and therefore there will be no impact on the protected features of this site.

4.2.9 The total area of seabed removed and the area of physical disturbance would be highly localised, especially when set within the context of the scale of the total available intertidal feature and physical processes present within the site. Physical disturbance to benthic habitats and communities would be short term, temporary and over a negligible footprint in the context of large site, therefore no potential for adverse effects are predicted for this QI.

- 4.2.10 Access to the beach by track machine could have potential to impact the designated sensitive habitats of Salicornia and other annuals colonising mud and sand, 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and 'Mediterranean salt meadows (*Juncetalia maritimi*) communities. Although physical disturbance to these more sensitive habitats and communities would be short term and temporary, without the presence of mitigation measures there is a potential for minor localised effects producing source-pathway-receptor links between the works and the European site. Therefore, under the precautionary principle, without the use of mitigation measures, there is potential for adverse effects on these QIs of the SAC.
- 4.2.11 With the implementation of mitigation outlined in Section 4.4 no adverse effect on the QI of the SAC is predicted.

Lambay Island SAC

- 4.2.12 The Conservation Objectives to maintain the favourable conservation condition of grey seal and harbour seal are defined by the following attributes and targets:
- ▲ Access to suitable habitats: Species range within the site should not be restricted by artificial barriers to site use;
 - ▲ Breeding behaviour: the breeding sites should be maintained in a natural condition;
 - ▲ Moulting behaviour: the moult haul out sites should be maintained in a natural condition;
 - ▲ Resting behaviour: the resting haul out sites should be maintained in a natural condition;
 - ▲ Disturbance: human activities should occur at levels that do not adversely affect the grey/harbour seal population at the site.
- 4.2.13 The proposed development site is located 18.4 km from the SAC. This site has been screened in based upon the extension of the Dublin Array boundary to include ecological surveys, including the deployment of SAM devices to the north of the project boundary and the potential for grey and harbour species to forage in the area. The geotechnical and geophysical survey activities will not overlap with the breeding and haul out sites within the SAC and no pathway exists to disturb seals on land or access to suitable habitat, breeding, resting or moulting behaviour. The potential for disturbance to the features is limited to the presence of vessels for the proposed works and deployment of buoys and underwater noise generated by acoustic surveys.

4.2.14 The proposed works have the potential to be within the hearing threshold of grey and harbour seals, there is also a risk of injury due to collision. Therefore, under the precautionary principle, without the use of mitigation measures, there is potential for adverse effects on the QIs of the SAC. However, given that any noise impacts on seals and their prey would be short term, temporary and intermittent and the best practice measures in relation to geophysical acoustic surveys as specified in the DAHG Guidance (2014) or other updated guidance as agreed with NPWS will be followed at all times, the potential for disturbance to the species will be minimised and no impacts on the Conservation Objectives of the SAC are predicted.

South Dublin Bay and River Tolka Estuary SPA

4.2.15 The Conservation Objectives to maintain the favourable conservation condition of: Light-bellied Brent goose (*Branta bernicla hrota*) [A046], oystercatcher (*Haematopus ostralegus*) [A130], ringed plover (*Charadrius hiaticula*) [A137], knot (*Calidris canutus*), bar-tailed godwit (*Limosa lapponica*) [A157], redshank (*Tringa totanus*) [A162], black-headed gull (*Larus ridibundus*) [A179], sanderling (*Calidris alba*) [A144] and dunlin (*Calidris alpina*) [A149] within the South Dublin Bay and River Tolka Estuary SPA, are defined by the following list of attributes and targets:

- ▲ Long term population trend stable or increasing; and
- ▲ No significant decrease in the range, timing or intensity of use of areas other than that occurring from natural patterns of variation.

4.2.16 The Conservation Objectives to maintain the favourable conservation condition of Roseate tern (*Sterna dougallii*) [A192] within the South Dublin Bay and River Tolka Estuary SPA, are defined by the following list of attributes and targets:

- ▲ 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; and
- ▲ 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.

4.2.17 The Conservation Objectives to maintain the favourable conservation condition of: common tern (*Sterna hirundo*) [A193] within the South Dublin Bay and River Tolka Estuary SPA, are defined by the following list of attributes and targets:

- ▲ Productivity rate: No significant decline in mean number of fledged young per breeding pair;

- ▲ Breeding population abundance: No significant decline in number of apparently occupied nests (AONs);
- ▲ Passage population: No significant decline in number of individuals;
- ▲ 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;
- ▲ No significant increase in barriers to connectivity;
- ▲ Disturbance at breeding site - Level of impact Human activities should occur at levels that do not adversely affect the breeding common tern population; and
- ▲ Disturbance at roosting site - Human activities should occur at levels that do not adversely affect the numbers of common tern among the post-breeding aggregation of terns.

4.2.18 The Conservation Objectives to maintain the favourable conservation condition of: Arctic tern (*Sterna paradisaea*) [A194] within the South Dublin Bay and River Tolka Estuary SPA, are defined by the following list of attributes and targets:

- ▲ 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; and
- ▲ Disturbance at roosting site - Human activities should occur at levels that do not adversely affect the numbers of arctic tern among the post-breeding aggregation of terns.

4.2.19 No specific Conservation Objectives exist for grey plover (*Pluvialis squatarola*)¹.

4.2.20 A proportion of the proposed works area overlaps with the SPA. Although impacts upon supporting habitats are expected to be *de minimus*, noise and disturbance would be generated from the survey activities producing source-pathway-receptor links between the works and the European site.

4.2.21 The primary QIs of the SPAs in Dublin Bay are related to over-wintering and passage birds. The period September – March covers the main wintering period when many species occur in their largest concentrations, with the autumn passage period occurring between July – September.

¹ NPWS (2015) states that grey plover is proposed for removal from the list of special conservation interests for this SPA and as a result no site specific conservation objective have been set for this species.

- 4.2.22 The proposed works within South Dublin Bay and River Tolka SPA are anticipated to be conducted outside of the over-wintering season, when the QI species are likely to be absent. However, overlap will occur with the passage period for tern species designated within the SPA. The Conservation Objectives for tern species refer specifically to disturbance at roosting sites, with all tern species known to roost primarily in the intertidal exposed sandbanks of Dublin Bay. There is a potential for localised disturbance of roosting birds within these intertidal areas should the works overlap temporally with their presence.
- 4.2.23 The nature of the works and noise effects would be short term, temporary and localised in nature, the SPA is in close proximity to a high amenity area and the species would be accustomed to a high level of noise and visual disturbance. Nonetheless, under the precautionary principle, without the implementation of mitigation measures within the immediate vicinity of the works there is a potential for localised displacement effects which, although unlikely to be significant in the context of European site condition, could result in AEol on the QIs of the SPA. With the implementation of mitigation outlined in Section 4.4, no adverse effect on the QI of the SAC is predicted.

North Bull Island SPA

- 4.2.24 The Conservation Objectives to maintain the favourable conservation condition of: oystercatcher (*Haematopus ostralegus*) [A130], Light-bellied Brent Goose (*Branta bernicla hrota*) [A046], Shelduck (*Tadorna tadorna*) [A048], Teal (*Anas crecca*) [A052], Pintail (*Anas acuta*) [A054], Shoveler (*Anas clypeata*) [A056], Golden Plover (*Pluvialis apricaria*) [A140], Grey Plover (*Pluvialis squatarola*) [A141], Knot (*Calidris canutus*) [A143], Sanderling (*Calidris alba*) [A144], Dunlin (*Calidris alpina*) [A149], Black-tailed Godwit (*Limosa limosa*) [A156], Bar-tailed Godwit (*Limosa lapponica*) [A157], Curlew (*Numenius arquata*) [A160], Redshank (*Tringa totanus*) [A162], Turnstone (*Arenaria interpres*) [A169] and Black-headed Gull (*Larus ridibundus*) [A179] within the North Bull Island SPA, are defined by the following list of attributes and targets:
- ▲ 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.
- 4.2.25 To maintain the favourable conservation condition of the wetland habitat at North Bull Island SPA as a resource for the regularly occurring migratory waterbirds that utilise these areas:
- ▲ The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 3,904 ha, other than that occurring from natural patterns of variation.

4.2.26 The proposed development site is located 1.2 km from the SPA. However, the foraging range of many of the QI species is likely to extend over the Foreshore Licence area consequently producing a source-pathway-receptor link between the works and the European site features. Although impacts upon supporting habitats are expected to be *de minimus*, noise disturbance would be generated from the survey activities therefore producing source-pathway-receptor links between the works and the European site. Given the nature of the works noise effects would be short term, temporary and localised in nature. Nonetheless, under the precautionary principle, without the implementation of mitigation measures within the immediate vicinity of the works to affect birds that may be associated with this site there is a potential for localised displacement effects which, although unlikely to be significant in the context of European site condition, could result in AEol on the QIs of the SPA. With the implementation of mitigation outlined in Section 4.4 no adverse effect on the QI of the SAC is predicted.

4.3 In-combination assessment

- 4.3.1 The outcomes of the screening for in-combination undertaken within Annex E: Report to inform Appropriate Assessment Screening are shown in Table 7 with the assessment for the relevant sites screened in detailed below.

Table 7 Outcomes of the screening for the potential of in-combination effects to arise

Project	Timescales	Location	Additional info	Assessment outcomes	Screened In/Out
Celtix Connect Limited	Consultation for the application closed in February 2020 and a determination is awaited.	23km to the north of the proposed survey area	Installation and maintenance of the fibre-optic Havhingsten Telecommunications Cable; the cable landing site is at Loughshinny, Fingal, Co Dublin.	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	Screened out.
Dublin Port Company Maintenance Dredge Campaigns	Maintenance dredging campaigns required approximately every 18 months	Navigation channel, basins and berthing for	The most recent application was submitted in February 2021	Given the potential for overlap both temporally and spatially within Rockabill to Dalkey SAC, the potential for an LSE for underwater noise on the QI for Rockabill to Dalkey SAC and Lambay Island exists.	Screened in.

	between 2022 and 2029	vessels to and from the Port	(Application: FS007132).	Water quality and habitat deterioration at South Dublin SPA and North Bull Island SPA were also identified as potential issues of the maintenance dredging. The Applicant's AA concluded that the proposed mitigation measures would not result in an adverse effect upon the integrity of any European site, with no scientific doubt as to the conclusions. 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 water quality and habitat deterioration.	Screened out.
Ringsend Waste Water Treatment (WWT)	Works ongoing		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.	Screened in.
Irish Water Greater Dublin Bay Drainage	Three year period commencing in Q1 2022, marine works on the outfall pipeline scheduled to commence in Q2 2022		Construction of a 5.9 km outfall pipeline with two piled structures. Includes a multiport marine diffuser as part of the Greater Dublin Drainage Project.	Given the potential for overlap temporally with the project, there is potential for LSE when considering the precautionary principle, and without the use of mitigation measures.	Screened in.

<p>Codling Bank windfarm: site investigation studies</p>	<p>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 concurrent with activities proposed under this Foreshore licence application</p>	<p>Codling Bank offshore windfarm array and cable corridors (including potential landfall at Poolbeg)</p>		<p>The exact timings for site investigation or ecological surveys is unknown and as such the potential for these surveys to overlap with those outlined for Dublin Array is unknown. Further, the spatial 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.</p>	<p>Screened in.</p>
<p>North Irish Sea Array (NISA) site investigation works</p>	<p>Application for Foreshore Licence submitted in January 2020 and a determination is awaited.</p>			<p>For the 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 there is 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.</p>	<p>Screened in.</p>

Rockabill to Dalkey Island SAC

Dublin Port Maintenance Dredging Campaigns

- 4.3.2 Dublin Port maintenance was screened into the in combination assessment for consideration of impacts on harbour porpoise from underwater noise. McKeown (2016) carried out underwater noise measurements during the 2016 Dublin Port maintenance dredging campaign. Sound levels for the dredging operations were recorded at ranges of 213 and 268 m were below the disturbance threshold for harbour porpoise of 140 dB re 1 μPa SPL_{RMS} and 140 dB re 1 μPa^2 s SEL. Increased noise was recorded as restricted to <100 m from the dredger during dredging (McKeown 2016).
- 4.3.3 Maintenance dredging, if required, within the Rockabill to Dalkey SAC area is expected to be limited to less than one day per annum. Whilst exposing porpoises within the SAC to increased noise and disturbance, this will only occur for one day which will not lead to any significant impact. Given that noise from dredging vessels will not be any greater than background shipping noise, disturbance and displacement upon the harbour porpoise community within this European Site was not predicted. The project concluded that it will not adversely affect the integrity of the site and no reasonable scientific doubt remains as to the absence of such effects. Given these findings and the lack of LSE for the works proposed under this Foreshore Licence application alone, no in-combination effect is predicted with the Dublin port maintenance dredging campaigns.

Irish Water Greater Dublin Bay Drainage

- 4.3.4 The Irish Water Greater Dublin Bay Drainage project has been screened into the in combination assessment to assess impacts of underwater noise of the harbour porpoise QI for Rockabill to Dalkey Island SAC. The Irish Water construction of a pipeline to the north of Dublin Bay, including a section of the Baldoyle Estuary, will involve excavation of a trench 5m deep, installation of the pipeline and backfilling with previously excavated material, together with the installation of two piled structures. Whilst there is no spatial overlap, there is potential to overlap temporally with the proposed works at Dublin Array.
- 4.3.5 The Applicant's NIS for the Greater Dublin Bay Drainage project concluded that the overall level of dredging noise is expected to be low but may induce some behavioural responses by harbour porpoises when in close proximity (<1 km). Although the majority of these works are carried out outside the SAC, the impact pathway is open and additional mitigation methods were deemed to be required to ensure that effects on harbour porpoise do not compromise the Conservation Objectives for the SAC.

4.3.6 The noise impacts from piling were noted as significantly greater than noise from the dredging and whilst both potential piling locations are located outside the boundary of the SAC, a high level of mitigation was proposed to ensure that harbour porpoise are not found within close proximity to piling when operational. Given the localised nature of any effects from survey activities at Dublin Array and that both projects are committed to mitigation in line with the DAHG guidance it can be concluded that no adverse effects upon site integrity as a result of the proposed works in-combination with the Greater Dublin Bay Drainage project will occur.

Codling Bank windfarm site investigation studies

4.3.7 The NIS for the Codling Bank windfarm Foreshore Licence application concluded no/negligible potential for the (pulsed) sound emitted by the geophysical survey and positioning equipment likely to be used to induce the onset of either permanent threshold shift (PTS) or Temporary Threshold Shift (TTS), respectively, i.e. auditory injury on the harbour porpoise qualifying interest. Additionally, the (non-pulsed) sound produced as a result of the proposed geotechnical survey work does not have the potential to induce the onset of either PTS or TTS, i.e. auditory injury. This is because the source pressure levels (a maximum of 187.4 dB re 1 μ Pa at 1 m for vibrocoring fall below the threshold for PTS onset (230 dB re 1 μ Pa for cetaceans; 218 dB re 1 μ Pa for seals; Southall et al., 2007²). There is no/negligible potential for the sound emitted by the check-shot logging to induce the onset of either PTS or TTS, respectively. Therefore, no LSE as a result of auditory injury was concluded for the Codling Bank windfarm site investigation alone.

4.3.8 The works were concluded to have potential for disturbance of a very small number of individuals, but any effects were likely to be temporary and reversible with suitable alternative local habitat being available in the meantime. Given these findings and the lack of LSE predicted for the works which are the subject of this Foreshore Licence application alone, no in-combination effect is predicted with the Codling Bank windfarm surveys. Furthermore, whilst none of the equipment proposed for use have the potential to induce the onset of auditory injury, mitigation measures based on those detailed in the 'Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters' (DAHG, 2014) will be employed for the UHRS survey and check-shot logging work for surveys for Codling Bank.

4.3.9 Given the localised nature of any effects from survey activities and that both projects are committed to mitigation in line with the DAHG guidance it can be concluded that no adverse effects upon site integrity as a result of the proposed works in-combination with Codling will occur.

² The Southall *et al* 2007 guidance and thresholds have been used for this assessment as the more recent Southall *et al*, 2019 report does not include SPL peak for non impulsive sounds, instead they detail SELcum thresholds and it is not possible to make comparisons of different metrics. The use of Southall *et al*, 2007 in line with the DAHG, 2014 guidance.

North Irish Sea Array site investigation works

- 4.3.10 The NISA site investigation works were screened into the in combination assessment for consideration of the harbour porpoise QI of the Rockabill to Dalkey SAC. The NIS for NISA Foreshore Licence application submitted by Statkraft Ltd concluded no LSE for geotechnical, metocean and benthic surveys occurring within the site boundary. Further the effects are very localised (immediate footprint of the equipment or in the case of drilling within 100 m of the drilling equipment). Given that the application has yet to be determined and details on the exact timing of the intended works are unknown, there is a potential for temporal overlap of the NISA geophysical survey with the surveys for Dublin Array.
- 4.3.11 The site investigation works at NISA will be undertaken over 20 km from the survey activities at Dublin Array, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and limited to the immediate ZOI all of which are considered above, therefore no adverse effects are predicted. Given the localised nature of any effects from survey activities and that both projects are committed to mitigation in line with the DAHG guidance it can be concluded that no adverse effects upon site integrity as a result of the proposed works in-combination with NISA will occur.

South Dublin Bay SAC

Codling Bank windfarm site investigation studies

- 4.3.12 The Codling Bank site investigation studies were screened into the in combination assessment for consideration of the benthic and intertidal habitats of the QIs for mudflats and sandflats not covered by seawater at low tide; annual vegetation of drift lines; Salicornia and other annuals and embryonic shifting dunes. The NIS for the Codling Bank windfarm site investigation studies concluded negligible to no potential for any significant effects on these benthic and intertidal habitats from the small scale and temporary activities proposed. Furthermore, the NIS concluded there will therefore be no adverse impacts upon the site integrity associated with the proposed works either alone or in-combination with other activities and developments. Given the localised nature of the works and with the implementation of the mitigation measures it can be concluded that no adverse effects upon site integrity, with regard to benthic and intertidal habitats, as a result of the proposed works which are the subject of this Foreshore Licence application in-combination with Codling Bank windfarm will occur.

Lambay Island SAC

North Irish Sea Array site investigation works

4.3.13 NISA site investigation works were screened into the in combination assessment for consideration of underwater noise on the QIs of grey seal and harbour seal. The NIS for NISA Foreshore Licence application submitted by Statkraft Ltd concluded no LSE for geotechnical, metocean and benthic surveys occurring within the site boundary. Further the effects are very localised (immediate footprint of the equipment or in the case of drilling within 100 m of the drilling equipment). Given that the application has yet to be determined and details on the exact timing of the intended works are unknown, there is a potential for temporal overlap of the NISA geophysical survey with the surveys for Dublin Array. The site investigation works at NISA will be undertaken over 20 km from the survey activities at Dublin Array, any noise generated will attenuate rapidly to within background levels, the effect and therefore assessment is localised and limited to the immediate ZoI, therefore no adverse effects are predicted. Given the localised nature of any effects from survey activities and that both projects are committed to mitigation in line with the DAHG guidance it can be concluded that no adverse effects upon site integrity as a result of the proposed works which are the subject of this Foreshore Licence application in-combination with NISA will occur.

South Dublin and River Tolka SPA

Ringsend Waste Water Treatment

4.3.14 Ringsend WWT works have been screened into the in combination assessment for consideration of impacts from disturbance on the wintering birds for which South Dublin and River Tolka SPA is designated. The potential for in-combination effects with the Ringsend WWT upgrade has been considered given the spatial overlap with the South Dublin and River Tolka Estuary SPA and that temporary construction noise generated has the potential to cause disturbance to wintering waterbirds and nesting terns within this SPA. The NIS concluded that the construction noise will not be threatening to birds and as such they will not be disturbed thus resulting in imperceptible impacts on the Conservation Objectives of the European site. The works will be carried out outside of the wintering period when Brent geese are absent from the SPA with grassland reinstated prior to their return. The NIS also concluded the potential for indirect effects from disturbance to waterbird populations on the grassland immediately adjacent to the works, due to the activity of construction workers on the site. Mitigation measures include the screening around the southern perimeter to prevent any visual disturbance on the grassland area. With the implementation of these mitigation measures, it can be concluded that no adverse effects upon site integrity as a result of the proposed works which are the subject of this Foreshore Licence application in-combination with Ringsend WWT upgrade.

Codling Bank windfarm site investigation studies

4.3.15 Codling site investigation studies have been screened into the in combination assessment for consideration of impacts from disturbance on the wintering birds for which South Dublin and River Tolka SPA is designated. The potential for in-combination effects with the surveys planned under the Foreshore Licence application for Codling Bank windfarm site investigations has been assessed, particularly for works in the intertidal areas where visual and noise impacts could lead to disturbance of qualifying species. The NIS for Codling Bank concluded that, with proposed mitigation measures, in an already industrialised, urban area, no potential adverse effects to any Conservation Objectives are identified for the wintering, staging or breeding features. Therefore, there will be no adverse effects upon site integrity as a result of the proposed works either alone or in-combination with other activities and developments. Similarly, with the implementation of mitigation measures outlined below for the proposed works subject to this NIS, it can be concluded that there are no adverse effects upon site integrity as a result of the proposed works which are the subject of this Foreshore Licence application in-combination with planned surveys of Codling Bank windfarm.

Appropriate Assessment Conclusions – In-Combination

4.3.16 Further to the assessments above, it can be concluded there will be no AEoI upon any of the site's Conservation Objectives in-combination with the projects listed. Consideration has been given to the likelihood for all projects to be undertaken sequentially or simultaneously, for each of the projects no significant impacts were predicted. Further all the projects are committed to implementing a suite of mitigation measures. Therefore, it can be concluded that there are no adverse effects upon the European Site's integrity as a result of the in-combination proposed works.

4.3.17 Therefore, subject to natural change, the objectives and targets for each of the QIs considered will be maintained in the long term.

4.4 Mitigation Measures

4.4.1 The mitigation measures that will be implemented within each of the Dublin Array surveys that are subject to this Foreshore Licence application, are presented in the following sections.

Geophysical Surveys

4.4.2 The mitigation measures to be carried out as part of the proposed works have been developed, following the precautionary principle and the DAHG Guidance (2014)³, to minimise disturbance of the QI of the Rockabill to Dalkey Island SAC and Lambay Island SAC.

4.4.3 The measures below identified within the DAHG guidance are applicable for all subtidal geophysical acoustic surveys.

- ▲ Marine Mammal Observers - A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals;
- ▲ Pre start monitoring - In waters up to 200 m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO
- ▲ Ramp up procedure; and
- ▲ Break in outputs.

A detailed synopsis of these mitigation measures is presented in Appendix A

4.4.4 In addition to the requirements outlined above and in Appendix A, additional mitigation is proposed to allow for the presence of harbour porpoise calves during the months of May to September inclusive. This mitigation measure specifies that sound-producing activity shall not commence until at least 45 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO. This requirement was raised during consultation with NPWS in relation to survey works proposed under Foreshore Licence FS007029 and will also be implemented for all Dublin Array geophysical surveys determined in this Foreshore Licence.

Geotechnical Surveys

4.4.5 The measures below are identified within the DAHG guidance (2014) are applicable for all geotechnical surveys:

³ The Applicant will implement mitigation measures for geophysical and geotechnical surveys in accordance with Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters, DAHG Guidance (2014) or other updated guidance as agreed with the National Parks and Wildlife Service (NPWS).

- ▲ Marine Mammal Observers - A qualified and experienced MMO shall be appointed to monitor for marine mammals
- ▲ Pre start monitoring - In waters up to 200 m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30⁴ minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.
- ▲ Drilling operations - Once normal drilling operations commence, there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500 m radial distance of the sound source, i.e., within the Monitored Zone
- ▲ Breaks in sound output

The full suite of mitigation measures is presented in Appendix A.

Micro-siting of Sampling Locations

- ▲ The inter-tidal and sub-tidal geotechnical sampling locations will be selected after review of the geophysical and environmental data collected during the 2020 Site Investigation campaign. The data will be reviewed for the presence of potential ecological features such as subtidal geogenic reef. Sampling locations will then be micro-sited where necessary to avoid ecological (as well as archaeological) impacts, specifically with reference to potential subtidal geogenic reef features within the Rockabill to Dalkey SAC which may not have been previously mapped or identified.

Poolbeg Intertidal

- ▲ To prevent damage to saltmarsh and sand dune habitat (SAC), all access to the Poolbeg intertidal by track machine will be supervised by an ecologist to ensure these sensitive areas are avoided; and
- ▲ The inter-tidal survey is proposed to be carried out outside the over-wintering period (Sept - Mar) to avoid disturbance to bird QIs of SPA.

⁴ Given the findings of the assessment that the geotechnical proposed works fall outside the range of hearing thresholds for harbour porpoise, in line with the guidance the use of 30 mins for geotechnical works is considered sufficient.

All Intertidal Locations

4.4.6 In order to minimise disturbance of bird receptors within the intertidal areas of the Foreshore Licence area, the following mitigation measures will be implemented:

- ✦ An ecologist would be employed to ensure disturbance is minimised and site integrity is maintained. If roosting birds are present on the shore during intertidal works, the nearby sample stations will be postponed until the birds depart, without provocation;
- ✦ Drift lines in close proximity to the proposed route would contain the highest proportion of potential food source for bird species. If present, these will be avoided by machinery and personnel;
- ✦ If for any reason access by sea to the near-shore or intertidal sample locations is not possible, any temporary access arrangements or structures that are put in place to allow machinery access to the beach area will be prepared in consultation with an ecologist and the site should be fully reinstated post works;
- ✦ Reinstatement of the intertidal habitat will be carried out to pre-survey conditions. Spoil from boreholes will be contained and removed off site. Should the boreholes be close to the HDD cable route, the boreholes will be filled with grout to prevent weakness during drilling operations during construction.

Stage 2: Appropriate Assessment Conclusions - Predicted Effects with Mitigation

- 4.4.7 This NIS has evaluated all relevant information including a description of the proposed survey and methods, the environment in which the survey would be conducted and identification of all relevant European sites (and their individual QIs) within the ZOI of the proposed Foreshore Licence boundary.
- 4.4.8 The Conservation Objectives of each of the European sites that have been taken forward to Stage 2 (NIS) have been considered in turn (where site specific Conservation Objectives are not available, generic ones have been applied). This has informed an assessment of the potential for pathways of effect to exist between the European site QIs and the proposed works. Conservation Objectives
- 4.4.9 Based on the assessment of the proposed surveys alone and in-combination with other projects and plans, including the implementation of mitigation measures, it can be concluded that no adverse effects on the integrity of the European sites will arise, in view of the site's Conservation Objectives.
- 4.4.10 This report presents a Stage 2 Natura Impact Statement (NIS) for the proposed survey, providing the information required for the competent authority to undertake an appropriate assessment and to determine whether or not the proposed surveys, either alone or in-combination with other plans and projects, in view of best scientific knowledge, will adversely affect the integrity of European sites.

5 Article 12 Assessment for Relevant Annex IV species

- 5.1.1 All cetaceans are European Protected Species (EPS) listed under Annex IV of the Habitats Directive, which means that they are protected wherever they occur and it is an offence to deliberately capture, kill, injure or disturb animals classed as EPS. Article 12 of the Habitats Directive is aimed at the establishment and implementation of a strict protection regime for animal species listed in Annex IV of the Habitats Directive within the whole territory of Member States.
- 5.1.2 The Habitats Directive has been transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) and establishes a system of strict protection for animal species listed in Annex IV(a) to the Habitats Directive in their natural range pursuant to Article 12 of the Habitats Directive. These Regulations provide for the protection of cetacean and marine turtle fauna and as such it is an offence to:
- ▲ Deliberately capture or kill any specimen of these species in the wild;
 - ▲ Deliberately disturb these species particularly during the period of breeding, rearing, hibernation and migration;
 - ▲ Deliberately take or destroys eggs of those species from the wild;
 - ▲ Damage or destroy a breeding site or resting place of such an animal; or
 - ▲ Keep, transport, sell, exchange, offer for sale or offer for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive.
- 5.1.3 Of the 24 cetacean species reported in Ireland, the species that have been recorded in the area and are considered in this assessment are harbour porpoise, bottlenose dolphin, minke whales (*Balaenoptera acutorostrata*), Risso's dolphins (*Grampus griseus*) and common dolphins (*Delphinus delphis*).
- 5.1.4 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 conducted between June 2019 and April 2021. 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. Harbour porpoise is also listed under Annex II and are QI for a number of sites within the Foreshore Licence application area.

- 5.1.5 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. As for harbour porpoise, bottlenose dolphins are also Annex II species.
- 5.1.6 Minke whales are observed throughout Irelands coastal and offshore waters, and both the continental slope and shelf. A total of 28 to 50 minke whales were sighted during the Dublin Array site specific surveys, all of which were sighted in the spring and summer months. Minke whales were also the most frequently sighted mysticete species during the ObSERVE surveys from 2015 to 2016.
- 5.1.7 Risso's dolphin occurrence is described as wide and frequent throughout Irish waters, sighted in both the continental shelf and slope as well as the margins of deeper ocean basins (NPWS 2019). No Risso's dolphins were sightings during the site specific surveys
- 5.1.8 Common dolphins are one of the most frequently recorded dolphin species in Irish waters, occurring in group sizes ranging from a few individuals to over a thousand individuals in the open sea (NPWS 2019). They have a wide distribution and occur in both coastal and offshore waters off Ireland. A total of five groups (21 individuals) of common dolphins were sighted during the site-specific surveys.
- 5.1.9 Five species of marine turtles have been recorded in Irish waters including leatherback turtle *Dermochelys coriacea*, loggerhead turtle (*Caretta caretta*) and Kemp's Ridley turtle (*Lepidochelys kempii*) (King and Berrow, 2009). Of these, leatherback turtle is the most regularly reported around the coast of Ireland, accounting for just over 80% of all records (King and Berrow, 2009). The majority of turtle sightings or stranding records are along the south and west coasts of Ireland, however, there are records of leatherback turtles along the east coast of Ireland suggesting that this species may occur within the Irish Sea (King & Berrow 2009).
- 5.1.10 No turtles were recorded during the site specific surveys. Given this, it is proposed that marine turtles not be considered further in this assessment. However, any mitigation proposed for cetacean species will also be applied to any turtles encountered.

5.2 Impact Assessment

The main impacts as a result of the site investigation and monitoring surveys proposed under the Foreshore Licence on EPS will be:

- ▲ Disturbance from underwater noise from geophysical and geotechnical surveys; and
- ▲ Vessel collision.

- 5.2.1 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.
- 5.2.2 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.
- 5.2.3 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 8.
- 5.2.4 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 where possible. The Southall *et al* 2007 guidance and thresholds for non impulsive sounds have been used for this assessment as the more recent Southall *et al*, 2019 report does not include SPL peak for non impulsive sounds, instead they detail SELcum thresholds and it is not possible to make comparisons of different metrics. The use of Southall *et al*, 2007 in in line with the DAHG, 2014 guidance.

Table 8 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

5.2.5 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.

5.2.6 The available noise data on SBPs such as those proposed for the UHRS survey are also determined primarily in SPLrms rather than SPLpeak. 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). 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. However, for all types of SBP proposed for use herein, the impact ranges for potential disturbance are expected to be very minor. 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).

- 5.2.7 The noise associated with 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).
- 5.2.8 The Foreshore Licence application 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.
- 5.2.9 Survey vessels will be operated at slow speeds and also be stationary for a large portion of the time, 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.
- 5.2.10 Given the existing vessel levels within the site and that the noise associated with the survey vessels will 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.

Conclusions

- 5.2.11 Given the short duration and temporary nature of the survey works, the fact that the best practice measures in relation to geophysical acoustic surveys as specified in Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG, 2014) will be followed at all times, with pre-monitoring by a qualified and experienced MMO followed by the use of the 'soft-start' procedure, there will be minimal disturbance to EPS species. In addition, the survey vessels will be slow moving and therefore any risk due to collision is unlikely. These measures ensure that no marine mammals (non-qualifying interests), whose range overlap the survey area will be impacted by the proposed marine survey.

6 References

- Amaral, J.L., Beard, R., Barham, R.J., Collett, A.G., Elliot, J., Frankel, A. S., Gallien, D., Hager, C., Khan, A.A., Lin, Y.T., Mason, T., Miller, J.H., Newhall, A.E., Potty, G.R., Smith, K., and Vigness-Raposa, K.J. (2018). Field Observations During Wind Turbine Foundation Installation at the Block Island Wind Farm, Rhode Island, Appendix D: Underwater Sound Monitoring Reports. OCS Study, BOEM 2018-029.
- Aquafact (2017). JN1445 Marine ecology Baseline Chapter 1.
- Austin, M., Hannay, D., and Bröker, K., (2018). Acoustic characterization of exploration drilling in the Chukchi and Beaufort seas. *The Journal of the Acoustical Society of America* 144, 115 (2018)
- Bach, Steffen & Skov, Henrik & Piper, Werner. (2013). Acoustic Monitoring of Marine Mammals around Offshore Platforms in the North Sea and Impact Assessment of Noise from Drilling Activities. 10.2118/126651-MS.
- Beck, S., O'Connor, I., Berrow, S.D. and O'Brien. J. (2013) Assessment and Monitoring of Ocean Noise in Irish Waters. STRIVE Report, Environmental Protection Agency, Johnstown Castle Estate, Wexford, Ireland (2011-W-MS 6), pp 1-86.
- Blackwell,, S.B., Lawson, J.W. & Williams, M.T. (2004). Tolerance by ringed seals (*Phoca hispida*) to impact pipe-driving and construction sounds at an oil production island. *J. Acoust. Soc. Am.* 115 (5) pp. 2346 – 2357.
- Bracciali, C., Campobello, D., Giacomina, C., Sara, G (2012) Effects of nautical traffic and noise on foraging patterns of Mediterranean damselfish (*Chromis chromis*) *PLoS One*, 7 (7) (2012), Article e40582
- Chan, A., Giraldo-Perez, P., Smith, S., Blumstein, D., (2010) Anthropogenic noise affects risk assessment and attention: the distracted prey hypothesis *Biol. Lett.*, 6 (2010), pp. 458-461
- Codarin, L.E. Wysocki, F. Ladich, M. Picciulin (2009) Effects of ambient and boat noise on hearing and communication in three fish species living in a marine protected area (Miramare, Italy) *Mar. Pollut. Bull.*, 58 (2009), pp. 1880-1887
- Coull, K.A., Johnstone, R., and S.I. Rogers. (1998). Fisheries Sensitivity Maps in British Waters.
- CSA Ocean Sciences Inc. (2020). Application for Incidental Harassment Authorization for the Non-lethal Taking of Marine Mammals: Site Characterization Surveys Lease OCS-A 0486, 0517, 0487, 0500 and Associated Export Cable Routes.
- CSTP (2016). Celtic Sea Trout Project Technical report [Online] [URL:http://celticseatrout.com/wp-content/uploads/2017/11/CSTP_FINAL_REPORT_2016_26MB_cover_13092017.pdf](http://celticseatrout.com/wp-content/uploads/2017/11/CSTP_FINAL_REPORT_2016_26MB_cover_13092017.pdf)
- Department of Arts, Heritage and the Gaelacht (DAHG). (2014). Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters.
- Department of the Environment, Climate and Communications (DECC). (2017). Guidance on EIS and NIS preparation for Offshore Renewable Energy Projects.
- Department of the Environment, Heritage and Local Government (DEHLG). (2009, revised 11/02/10). Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. Department of the Environment Heritage and Local Government (Ireland).
- Department of the Environment, Heritage and Local Government (DEHLG). (2010). NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities.
- DHPLG (2020). Foreshore Applications and Determinations. [Online] URL: https://www.housing.gov.ie/planning/foreshore/applications/overview?title_1=&field_date_r

- received_value%5Bvalue%5D%5Byear%5D=2019&field_application_status_tid=All&field_fa_c
 ounty_tid=537&items_per_page=20. [Accessed July 2020]
- Dukas, R. (2004). Causes and consequences of limited attention Brain Behav. Evol., 63 (2004), pp. 197-210
- Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. (2012). Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56pp.
- Ellis, J.R., Milligan, S.P., Readdy, L., Taylor, N. and Brown, M.J. (2012). Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147: 56 pp.
- Erbe, C., C, Marley, S., Schoeman, R., Smith, J., Trigg, L., Embling, C., (2019). The Effects of Ship Noise on Marine Mammals—A Review. [Online] URL: <https://www.frontiersin.org/article/10.3389/fmars.2019.00606> [Accessed July 2020]
- Erbe, Christine & Mcpherson, Craig. (2017). Underwater noise from geotechnical drilling and standard penetration testing. The Journal of the Acoustical Society of America. 142. 10.1121/1.5003328.
- Fließbach, K.L., Borkenhagen, K., Guse, N., Markones, N., Schwemmer, P. and Garthe, S., (2019). A ship traffic disturbance vulnerability index for Northwest European seabirds as a tool for marine spatial planning. *Frontiers in Marine Science*, 6, p.192.
- Furness, R.W., Wade, H.M. and Masden, E.A., (2013). Assessing vulnerability of marine bird populations to offshore wind farms. *Journal of environmental management*, 119, pp.56-66.
- Gavin and Doherty Geosolutions Ltd. (2019). Geophysical and Geotechnical Desk Study for Dublin Array Wind Farm
- GoBe (in draft) The Dublin Array Scoping Report.
- Guan, S. 2020. Interim recommendations for sound source level and propagation analysis for high resolution geophysical (HRG) sources. Available at: https://www.researchgate.net/profile/Shane_Guan/publication/341822965_INTERIM_RECOMMENDATION_FOR_SOUND_SOURCE_LEVEL_AND_PROPAGATION_ANALYSIS_FOR_HIGH_RESOLUTION_GEOPHYSICAL_HRG_SOURCES/links/5ed63acf299bf1c67d329fe9/INTERIM-RECOMMENDATION-FOR-SOUND-SOURCE-LEVEL-AND-PROPAGATION-ANALYSIS-FOR-HIGH-RESOLUTION-GEOPHYSICAL-HRG-SOURCES.pdf. (Accessed: 13 April 2021).
- Henry, E. and Hammill, M. O. (2001). Impact of small boats on the haul-out activity of harbour seals (*Phoca vitulina*) in Metis Bay, Saint Lawrence Estuary, Quebec, Canada. *Aquatic Mammals* 27(2): 140-148.
- Holmes, T., Gargan, P & Roche, W (2014). An Assessment of Juvenile Salmonid Abundance and Distribution in the River Feale Catchment 2013 & Comparison with Previous Surveys. Inland Fisheries Ireland unpublished report, Dublin.
- J. Greene and R. Charles (1987) "Characteristics of oil industry dredge and drilling sounds in the Beaufort Sea," *J. Acoust. Soc. Am.* 82(4), 1315–1324.
- JNCC, Natural England and CCW (2010). The protection of marine European Protected Species from injury and disturbance - Guidance for the marine area in England and Wales and the UK offshore marine area. By Joint Nature Conservation Committee, Natural England and Countryside Council for Wales June 2010.
- Johnson, A. and Acevedo-Gutiérrez, A. (2007). Regulation compliance by vessels and disturbance of harbour seals (*Phoca vitulina*). *Canadian Journal of Zoology* 85(2): 290-294.
- Konsberg (2010), Underwater noise propagation modelling and estimate of impact zones for seismic operations in the Moray Firth.
- Kyhn, L. A. Sveegaard, S. and Tougaard J. (2014) "Underwater noise emissions from a drillship in the Arctic," *Mar. Pollut. Bull.* 86(1), 424–433. 6

- Lurton, X (2016) Modelling of the sound field radiated by multibeam echosounders for acoustical impact assessment. [Online] URL: <https://doi.org/10.1016/j.apacoust.2015.07.012>. [Accessed July 2020]
- Marine Institute (2020). The Stock Book 2020: Annual Review of Fish Stocks in 2020 with Management Advice for 2021. Marine Institute, Galway, Ireland. [Online] URL: <http://hdl.handle.net/10793/1660> [Accessed May 2021].
- Millot, M.-L. Bégout, B. Chatain (1995) Exploration behaviour and flight response toward a stimulus in three sea bass strains (*Dicentrarchus labrax* L.) Appl. Anim. Behav. Sci., 119 (2009), pp. 108-114
- NPWS (2012) Conservation Objectives for Baldoyle Bay SAC [000199]. [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000199.pdf [Accessed July 2020]
- Lettrich, M. D., M. J. Asaro, D. L. Borggaard, D. M. Dick, R. B. Griffis, J. A. Litz, C. D. Orphanides, D. L. Palka, D. E. Pendleton, and M. S. Soldevilla. (2019). A Method for Assessing the Vulnerability of Marine Mammals to a Changing Climate. NOAA Tech. Memo. NMFSF/SPO-196, 73 p.
- NPWS (2013) Conservation Objectives for North Dublin Bay SAC [000206]. [Online] URL: [https://www.npws.ie/sites/default/files/publications/pdf/North%20Dublin%20Bay%20SAC%20\(000206\)%20Conservation%20Objectives%20supporting%20document%20-%20marine%20habitats%20%5BVersion%201%5D.pdf](https://www.npws.ie/sites/default/files/publications/pdf/North%20Dublin%20Bay%20SAC%20(000206)%20Conservation%20Objectives%20supporting%20document%20-%20marine%20habitats%20%5BVersion%201%5D.pdf) [Accessed July 2020]
- NPWS (2013a) Conservation Objectives for Rockabill to Dalkey Island SAC [003000] [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO003000.pdf [Accessed July 2020]
- NPWS (2013b) Rockabill to Dalkey Island SAC Site Synopsis [003000]. [Online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY003000.pdf> [Accessed May 2021]
- NPWS (2013c) Rockabill to Dalkey Island SAC Standard Data Form [003000]. [Online] URL: <https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF003000.pdf> [Accessed May 2021]
- NPWS (2013) Conservation Objectives for South Dublin Bay SAC [000210]. [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000210.pdf [Accessed July 2020]
- NPWS (2014a). Conservation Objectives for North Bull Island SPA [004006] [Online] URL: [https://www.npws.ie/sites/default/files/publications/pdf/North%20Bull%20Island%20SPA%20\(004006\)%20Conservation%20Objectives%20supporting%20document%20-%20\[Version%201\].pdf](https://www.npws.ie/sites/default/files/publications/pdf/North%20Bull%20Island%20SPA%20(004006)%20Conservation%20Objectives%20supporting%20document%20-%20[Version%201].pdf) [Accessed July 2020]
- NPWS (2014b) Conservation Objectives for Lambay Island SAC [Online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000204.pdf>
- NPWS (2014c) Lambay Island SPA Site Synopsis [004069]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004069.pdf> [Accessed May 2021]
- NPWS (2015a) Conservation Objectives for South Dublin Bay and River Tolka Estuary SPA [004024]. [online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004024.pdf. [Accessed July 2020]
- NPWS (2015b) South Dublin Bay SAC Site Synopsis [000210]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000210.pdf>. [Accessed May 2021]
- NPWS (2015c) South Dublin Bay SAC Standard Data Form [000210]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF000210.pdf>. [Accessed May 2021]

- NPWS (2015d) South Dublin Bay and River Tolka Estuary Site Synopsis [004024]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004024.pdf> [Accessed May 2021]
- NPWS (2015e) South Dublin Bay and River Tolka Estuary Data Form[004024]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004024.pdf> [Accessed May 2021]
- NPWS (2015f) North Bull Island SPA Site Synopsis [004006]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004006.pdf> [Accessed May 2021]
- NPWS (2015g) North Bull Island SPA Standard Data Form [004006]. [online] URL: <https://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004006.pdf> [Accessed May 2021]
- NPWS (2020) Conservation Objectives for Codling Fault Zone SAC [003015] [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO003015.pdf [Accessed July 2020]
- NPWS (2020) Conservation Objectives for The Murrough Wetlands SAC [002249] [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002249.pdf [Accessed July 2020]
- NPWS (2020). Conservation Objectives for Dalkey Islands SPA [004172]. [Online] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004172.pdf [Accessed July 2020]
- NPWS (2020). Conservation Objectives for Howth Head Coast SPA [004113]. [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004113.pdf [Accessed July 2020]
- NPWS (2020). Conservation Objectives for Ireland's Eye SPA [004117] [Online] URL: https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004117.pdf. [Accessed July 2020]
- O'Brien, J. and Berrow, S.D. (2016). Harbour porpoise surveys in Rockabill to Dalkey Island SAC, 2016. Report to the National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. Irish Whale and Dolphin Group. pp. 23.
- OSPAR. (2009a). Assessment of the environmental impact of underwater noise. London: OSPAR Commission Biodiversity Series. Publication no. 436/2009. 43 pp.
- OSPAR. (2009b). Overview of the impacts of anthropogenic underwater sound in the marine environment. London: OSPAR Commission Biodiversity Series. Publication no. 441/2009. 133 pp. 5
- Palka, D., & Hammond, P. S. (2001). Accounting for responsive movement in line transect estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences* 58(4): 777-787. Published and distributed by UKOOA Ltd.
- Picciulin, L. Sebastianutto, A. Codarin, A. Farina, E.A. Ferrero (2010). In situ behavioural responses to boat noise exposure of *Gobius cruentatus* (Gmelin, 1789; fam. Gobiidae) and *Chromis chromis* (Linnaeus, 1758; fam. Pomacentridae) living in a marine protected area *J. Exp. Mar. Biol. Ecol.*, 386 (2010), pp. 125-132
- Popper, A., and Fay, R. (2011). Rethinking sound detection by fishes *Hear. Res.*, 273 (2011), pp. 25-36
- Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., Løkkeborg, S., Rogers, P., Southall, B., Zeddies, D and Tavalga, W. (2014). Sound Exposure Guidelines. [Online] URL:

- https://www.researchgate.net/publication/279347068_Sound_Exposure_Guidelines
[Accessed August 2020].
- Purser, R., and Radford, A., (2011). Acoustic noise induces attention shifts and reduces foraging performance in three-spined sticklebacks (*Gasterosteus aculeatus*) PLoS One, 6 (2) (2011), Article e17478
- Raleigh (2020). Appropriate Assessment Screening & Natura Impact Statement - Information for a Stage 1 (AA Screening) and Stage 2 (Natura Impact Statement) AA for the Foreshore Licence for Site Investigation of Dublin Array site and cable corridors and Metocean Data Collection. ALTEMAR
- Richardson, W. J., Greene, C. R., Jr., Malme, C. I., & Thomson, D. H. (1995). Marine mammals and noise. New York: Academic Press. 576 pp.
- Scally, L., Pfeiffer, N.J., & Hewitt, E. (in prep.) The monitoring and assessment of six Annex I marine habitats. Irish Wildlife Manuals, No. 1XX. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- Shannon, M.F. McKenna, L.M. Angeloni, K.R. Crooks, K.M. Fristrup, E. Brown, K.A. Warner, M.D. Nelson, C. White, J. Briggs, S. McFarland, G. Wittemyer (2016). A synthesis of two decades of research documenting the effects of noise on wildlife. Biol. Rev., 91 (2016), pp. 982-1005
- Simpson, S., J. Purser, A.N. Radford (2015) Anthropogenic noise compromises antipredator behaviour in European eels. Glob. Chang. Biol., 21 (2015), pp. 586-593
- Slabbekoorn, H., N. Bouton, I. van Opzeeland, A. Coers, C. ten Cate, A.N. Popper (2010) A noisy spring: the impact of globally rising underwater sound levels on fish. Trends Ecol. Evol., 25 (2010), pp. 419-427
- SMRU. (2011). Sea Mammal Research Unit (SMRU) Summary of seal count and telemetry data from the Humber area. Report to SMart Wind.
- Southall, BL, Bowles, AE, Ellison, WT, Finneran, JJ, Gentrym RL, Greene, CR, Kastak, D, Ketten, DR, Miller, JH, Nachtigall, PE, Richardson, WJ, Thomas, JA and Tyack, PL (2007). Marine Mammal Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, Volume 33, Number 4, 2007.
- Southall, B., Finneran, J., Reichmuth, C., Nachtigall, P., Ketten, D., Bowles, A., Ellison, W., Nowacek, D., and Tyack, P., (2019) Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. Aquatic Mammals, Volume 45, Number 2, 2019.
- Spiga, I., Aldred, N., and Caldwell, G. (2017) Anthropogenic noise compromises the anti-predator behaviour of the European seabass, *Dicentrarchus labrax* (L.). Marine Pollution Bulletin, 2017; 122 (1-2): 297 DOI: 10.1016/j.marpolbul.2017.06.067
- Voellmy, K., J. Purser, D. Flynn, P. Kennedy, S.D. Simpson, A.N. Radford (2014). Acoustic noise reduces foraging success in two sympatric fish species via different mechanisms. Anim. Behav., 89 (2014), pp. 191-198
- Wardle, C.S., Carter, T.J., Urquhart, G.G., Johnstone A.D.F., Siolkowski, A.M., Hampson, G., and Mackie, D. (2001). Effects of seismic air guns on marine fish. Continental Shelf Research, 21.
- Webb, P., (1986). Effect of body form and response threshold on the vulnerability of four species of teleost prey attacked by largemouth bass (*Micropterus salmoides*). Can. J. Fish. Aquat. Sci., 43 (1986), pp. 763-771

Appendix A

A.1.1 Mitigation measures outlined with DAHG (2014) relative to geophysical acoustic and geotechnical surveys are provided below in full.

Geophysical Acoustic Surveys

A.1.2 The measures outlined below are applicable to:

- ▲ (ii) all seismic surveys (including the testing and full operational use of airguns, water guns, sparkers, boomers and vertical seismic profiling [VSP] or checkshot systems) in inshore^{††} ⁵and offshore Irish waters;
- ▲ (iii) all multibeam, single beam, side-scan sonar and sub-bottom profiler (e.g., pinger or chirp system) surveys within bays, inlets or estuaries⁶ and within 1,500m of the entrance of enclosed bays/inlets/estuaries;
- ▲ (iii) or as advised by the relevant Regulatory Authority.

4.3.4 (i). Seismic surveys

A.1.3 A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms (Appendix 6).

A.1.4 Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, seismic surveying shall not commence if marine mammals are detected within a 1,000m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

⁵ Seismic survey activity in coastal waters should be planned to commence at the innermost part of any bay, inlet or estuary to be surveyed and thereafter work outwards, to ensure that marine mammals are not driven into or artificially confined within an enclosed comparatively shallow area.

⁶ Survey activity should be planned to commence at the innermost part of any bay, inlet or estuary to be surveyed and thereafter work outwards, to ensure that marine mammals are not driven into or artificially confined within an enclosed comparatively shallow area.

Pre-Start Monitoring

- A.1.5 Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.
- A.1.6 An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.
- A.1.7 In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.
- A.1.8 This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.
- A.1.9 In addition to the requirements outlined above, additional mitigation is proposed to allow for the presence of harbour porpoise calves during the months of May to September inclusive. This mitigation measure specifies that sound-producing activity shall not commence until at least 45 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO. This requirement was raised during consultation with NPWS in relation to survey works proposed under Foreshore Licence FS007029 and will also be implemented for all Dublin Array geophysical surveys determined in this Foreshore Licence.

Ramp-Up Procedure

- A.1.10 In commencing a seismic survey operation, the following Ramp-up Procedure (i.e., “soft-start”) must be used, including during any testing of seismic sound sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1 μ Pa @1m:
- ▲ (a) Seismic energy output shall commence from a lower energy start-up (i.e., starting with a single seismic device/airgun which is the smallest in the array and gradually adding others; In the case of sparkers/boomers, starting with the lowest electric discharge possible) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 40 minutes.
 - ▲ (b) This controlled build-up of seismic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.
- A.1.11 In all cases the delay between the end of ramp-up (i.e., the necessary full seismic output) and the start of a survey line or station must be minimised to prevent unnecessary high-level sound introduction into the environment.

A.1.12 Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 1,000m radial distance of the sound source, i.e., within the Monitored Zone.

Line Changes

A.1.13 Where the duration of a survey line or station change will be greater than 40 minutes the activity shall, on completion of the line/station being surveyed, either

- (a) shut down and undertake full Pre-Start Monitoring, followed by a Ramp-Up Procedure for recommencement, or
- (b) undergo a major reduction in seismic energy output to a lower energy state*** where the output peak sound pressure level from any operating source is 165-170 dB re: 1µPa @1m, and then undertake a full Ramp-Up Procedure for recommencement.

A.1.14 Where the duration of a survey line or station change will be less than 40 minutes the activity may continue as normal (i.e., under full seismic output).

Breaks in sound output

A.1.15 If there is a break in sound output for a period of 5-10 minutes (e.g., due to equipment failure, shut-down, survey line or station change), MMO monitoring must be undertaken to check that no marine mammals are observed within the Monitored Zone prior to recommencement of the sound source at full power.

A.1.16 Where a marine mammal is observed within the Monitored Zone during such a break of 5-10 minutes, then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as in a normal start-up operation.

A.1.17 In any case, if there is a break in sound output for a period greater than 10 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

Reporting

A.1.18 16. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority as outlined in Appendix 6 of DAHG., 2014.

Geotechnical surveys

A.1.19 The measures outlined below are applicable to:

- ▲ (i) conventional coastal and marine drilling operations [with the exception of drilling activity undertaken as part of offshore petroleum exploration and appraisal operations. Such drilling projects are risk assessed and risk managed on a case-by-case, context-specific basis by the appropriate Regulatory Authority due to the operational nature of such activity in the open ocean].
- ▲ (ii) or as advised by the relevant Regulatory Authority.

Marine Mammal Observers

A.1.20 A qualified and experienced marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms.

A.1.21 Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, drilling activity shall not commence if marine mammals are detected within a 500m radial distance of the drilling sound source, i.e., within the Monitored Zone.

Pre-start Monitoring

A.1.22 Drilling activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.

A.1.23 An agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.

A.1.24 In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30⁷ minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.

⁷ Given the findings of the assessment that the geotechnical proposed works fall outside the range of hearing thresholds for harbour porpoise, in line with the guidance the use of 30 mins for geotechnical works is considered sufficient.

A.1.25 This prescribed Pre-Start Monitoring shall subsequently be followed immediately by normal drilling operations. The delay between the end of Pre-Start Monitoring and the necessary full drilling output must be minimised.

Drilling operations

A.1.26 Once normal drilling operations commence, there is no requirement to halt or discontinue the activity at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

Breaks in sound output

A.1.27 If there is a break in drilling sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down or location change) then all Pre-Start Monitoring must be undertaken in accordance with the above conditions prior to the recommencement of drilling activity.