CP1146 CARRICKMINES TO POOLBEG PROJECT

Supporting Information for Screening for Appropriate Assessment (SISAA)

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EXECUTIVE SUMMARY

The CP1146 Carrickmines to Poolbeg project is a proposed new underground electricity cable from the Carrickmines 220 kV substation to the Poolbeg 220 kV substation and includes a section of marine cable. The marine section is located between Blackrock Park and Shelley Banks car-park on the Poolbeg peninsula, Co. Dublin.

There is currently insufficient baseline geophysical, geotechnical and environmental information available to fully inform the preliminary and detailed design of the marine elements of the CP1146 Carrickmines to Poolbeg project. In order to progress the design elements of the project and carry out the necessary environmental assessments, further baseline data must be obtained. Therefore, further SI information and environmental surveys must be undertaken.

This report has been prepared by RPS, on behalf of EirGrid, in support of the Maritime Usage Licence Application (MULA) to the Maritime Area Regulatory Authority (MARA). The MULA is for site survey and investigation works (the 'SI Works') to inform engineering design. The results of these surveys will also provide baseline data for subsequent environmental assessments, e.g. Appropriate Assessment (AA).

The SI works include geophysical, geotechnical and environmental investigations in the marine environment as summarised below.

- Marine geophysical surveys.
- Marine environmental/ ecological surveys.
- Metocean surveys.
- Marine geotechnical investigations.

This Supporting Information for Screening for Appropriate Assessment (SISAA) report has been prepared by RPS, on behalf of EirGrid, in order to provide a sufficient level of information to MARA for them to complete a Screening for Appropriate Assessment of the potential for Likely Significant Effects (LSE) on European sites, in view of their conservation objectives, arising from the site investigation (SI) works either individually or in combination with other plans or projects.

The overall findings of this SISAA are as follows.

1. The SI works are not connected with or necessary to the management of the nature conservation interest of any European site.
2. Surveys undertaken within the intertidal zone have the potential to disturb wintering bird species that may be within the immediate vicinity of the survey area and surveys undertaken within the subtidal area have the potential to disturb seabirds and breeding seabirds (i.e., Tern species) that may utilise South Dublin Bay.
3. There is potential for the SI works to lead to habitat loss and continued disturbance in the absence of mitigation on the South Dublin Bay and River Tolka Estuary SPA (004024), as the proposed cable route corridor overlaps four roost sites. Two of these roost sites are located to the south between Blackrock and Booterstown: NK14 for common gull (*Larus canus)* and black headed gull (*Chroicocephalus ridibundus*); and NK09 for oystercatcher (*Haematopus Ostralegus*). Two of these roost sites are located to the north along south-wall at Poolbeg: SMAC2 for Purple Sandpiper (*Calidris maritima*), Dunlin (*Calidris alpina*) and Turnstone (*Arenaria)*; and SMAC1 for turnstone.
4. The intrusive geotechnical investigations and environmental grab/core sampling will take place in the intertidal and subtidal zones. Sampling locations will be discrete and confined to the area of investigation. There is no potential for LSE on the Annex I mudflats and sandflat habitat of the South Dublin Bay SAC (000210) as the total disturbed area which equates to 164 m^2 (0.002%) of the 720 Ha habitat area will rapidly recover due to tidal influences. There is no potential LSE to the annual vegetation of drift lines, embryonic shifting dunes and salicornia and other annuals colonising mud and sand as the proposed SI works do not overlap with these habitats and as annual vegetation of drift lines and embryonic shifting dunes are above the high-water mark (HWM).
5. Small amounts of suspended sediments may be released into the water column while the intertidal and subtidal geotechnical and environmental grab samples/ cores are being conducted. Relative to background levels and the turbid nature of the bay the SI works will not give rise to any LSE on the

Annex I habitats of South Dublin Bay SAC or those wintering and seabird species that may utilise the surrounding habitats.

6. The geophysical and geotechnical surveys will introduce subsea noise that has the potential to impact on harbour porpoise (*Phocoena phocoena)*, grey seal (*Halichoerus grypus)* and harbour seal (*Phoca vitulina)* that may utilise the area from the nearby SACs for which they are designated: Rockabill to Dalkey Island SAC (003000) and Lambay Island SAC (000204). In the absence of mitigation measures, LSE on these species are uncertain.
7. It is our opinion that without the implementation of mitigation measures it cannot be excluded on the basis of objective scientific information that the project, individually or in combination with other plans or projects, will have a significant effect on the following European sites:
    - Rockabill to Dalkey Island SAC
    - Lambay Island SAC
    - South Dublin Bay and River Tolka Estuary SPA
    - North Bull Island SPA
    - North-West Irish Sea SPA
    - Dalkey Island SPA

It is respectfully submitted that MARA should carry out an Appropriate Assessment (AA) and a Natura Impact Statement (NIS) has therefore been submitted with this MULA.

1 INTRODUCTION

1.1 Overview

EirGrid was established to act as the independent Transmission System Operator (TSO), in line with the requirements of the EU Electricity Directive. EirGrid became operational as the TSO on 1 July 2006 and is a public limited company, registered under the Companies Acts.

While EirGrid operates the flow of power on the grid and plans for its future, ESB Networks is responsible for carrying out maintenance, repairs and construction on the grid as the Distribution System Operator. ESB is the licenced Transmission System Owner pursuant to the Electricity Regulation Act, 1999. EirGrid uses the grid to supply power to industry and businesses that use large amounts of electricity. The grid also powers the distribution network. This supplies the electricity used every day in homes, businesses, schools, hospitals, and farms.

Dublin's electricity infrastructure is ageing and reaching its end of life. Work must be done to transform and modernise the city's electricity infrastructure, so Dublin can continue to develop and thrive, while increasingly using power from renewable sources.

The Powering Up Dublin Programme is a critical programme that will strengthen key electricity infrastructure in Dublin and the surrounding areas, making the city 'renewable ready.' This programme is set to replace and upgrade five 220kV circuits across Dublin city and the surrounding areas.

As part of the ongoing upgrade and development of Ireland’s electrical grid, EirGrid are undertaking a programme to replace and upgrade a number of 220kV circuits across Dublin city and the surrounding areas. This is part of EirGrid’s wider Dublin programme, to ensure continued reliability of electrical supply across the city, while also enabling future development and possible offshore wind farm development.

Replacing the existing circuits in an offline route means the new circuit follows a separate route to the existing circuit. The advantage of this is that there are minimal disruptions to the existing circuit and no, or very few, planned outages would be needed during construction.

Due to the electricity needs of Dublin, an online replacement is not feasible. For this reason, offline installation will be considered for the replacement of this circuit. EirGrid proposes to replace all the existing circuits with cross-linked polyethylene (XLPE) cable primarily on an offline route. These XLPE cables are more efficient and robust, which will enable the grid to carry more power, making the city ‘renewable ready’.

The programme will replace and upgrade five 220kV circuits across Dublin city, with this report focusing on the marine section of one of the cable circuits to be replaced, i.e., CP1146 Carrickmines to Poolbeg project.

1.2 Purpose of the Report

This report has been prepared by RPS, on behalf of the EirGrid, to provide information on the marine site investigation (SI) works proposed to be undertaken for the CP1146 Carrickmines to Poolbeg project in support of the Maritime Usage Licence Application (MULA) to MARA. The MULA is for site survey and investigation works to inform engineering design and environmental assessment. The results of these surveys will also provide baseline data for any subsequent environmental assessments, e.g., Appropriate Assessment (AA).

This SISAA report provides the necessary information to MARA for them to complete a Screening for Appropriate Assessment of the potential for likely significant effects (LSE) on European sites, in view of their conservation objectives, arising from the SI works either individually or in combination with other plans or projects.

1.3 Statement of Authority

The technical competence of the authors is outlined below:

[redacted] is a Senior Scientist in the Environmental Services Business Unit in RPS. She has over 10 years’ experience in the marine ecology field. She holds an honours degree in Marine Science from NUI, Galway, and a master’s in marine biology from UCC. [redacted] has contributed to numerous marine environmental projects including appropriate assessments, Annex IV species reports, natura impact statements and EIA chapters.

[redacted] is a Scientist in the Environmental Services Business Unit in RPS. She holds a Bachelor's Degree in Marine Science from the University of Galway and Master's Degree in Climate Change and Managing the Marine Environment from Heriot-Watt University Edinburgh. She has three years' experience working in consultancy, assisting on a wide range of projects from offshore renewable energy projects to flood relief schemes, including marine and terrestrial surveys. She is a qualifying CIEEM member.

[redacted] s Technical Director in the Environmental Services Business Unit in RPS. He has over 24 years' experience. He holds an honours degree in Civil Engineering (B.E.) from NUI, Galway, a postgraduate diploma in Environmental Sustainability from NUI, Galway, and a Master's in Business Studies from the Irish Management Institute/ UCC. [redacted] is also a Chartered Engineer and Project Management Professional with the Project Management Institute (PMI-PMP). He has managed the delivery of numerous environmental projects including marine and terrestrial projects that have required environmental impact assessment, appropriate assessment, and Annex IV species reports.

This SISAA report has been prepared in compliance with the legislative and policy requirements described in Section 1.4 below.

1.4 Legislation

1.4.1 European Legislation

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as amended) (the Habitats Directive) provides protection for habitats and species of European importance; Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Codified version) (the Birds Directive) aims to protect all of the 500 wild bird species naturally occurring in the European Union (EU). Areas designated for protection under the Habitats Directive are described as Special Areas of Conservation (SAC) and those designated under the Birds Directive, as Special Protection Areas (SPA) and the sites are known collectively as Natura 2000 sites. As each member of the EU is required to designate areas in their jurisdictions, the establishment of this network of Natura 2000 sites under Articles 3 to 9 the Habitats Directive is the key measure to protect nature and biodiversity in the EU.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of Natura 2000 sites. Article 7 of the Habitats Directive extends the scope of its articles 6(3) and 6(4) to the Birds Directive.

Article 6(3) establishes the requirement for Appropriate Assessment (AA):

> "*Any plan or project not directly connected with or necessary to the management of the* [Natura 2000] *site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. Considering the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the public.*"

Further detail on the stages of AA is provided in Section 3.2.

The Habitats and Birds Directives have been transposed into Irish Legislation under, amongst other things, the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended. In Irish legislation, the term "European site" is used to describe sites protected under the Habitats Directive and includes Natura 2000 sites. Further detail on these definitions is provided in section 1.4.2.4.

Each European site has assigned Conservation Objectives (COs) and a list of Qualifying Interests (QI). The CO concept appears in the eighth recital of Habitats Directive which reads:

> *"whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued". Article 1 then explains that "conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status".*

The National Parks and Wildlife Service (NPWS) has established COs for each European site in Ireland. These are published on their website. NPWS advise in the general introductory notes of their site-specific

conservation objectives (SSCO) series publications, that an appropriate assessment based on their *"published conservation objectives will remain valid even if the CO targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out".* NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.4.2 National Legislation

1.4.2.1 Maritime Area Planning Act

The following definitions in relation to Appropriate Assessment (AA) are included in Section 2(1) of the Maritime Area Planning Act, 2021 (as amended), hereafter the "MAP Act":

> *"screening for appropriate assessment" shall be construed in accordance with, as appropriate—*
>
> > *(a) section 177U of the Act of 2000, or*
> >
> > *(b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)*
>
> *"appropriate assessment" shall be construed in accordance with, as appropriate—*
>
> > *(a) section 177V of the Act of 2000, or*
> >
> > *(b) Part 5 of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011);*

where the Act of 2000 refers to the Planning and Development Act 2000 (as amended).

The European Communities (Birds and Natural Habitats) Regulations 2011 has also been amended.

Under Section 112 of the MAP Act, MARA has been designated as a competent authority for the purposes of Part 5 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011)*;* and appropriate assessments to which that Part applies.

MARA is required to carry out a screening for Appropriate Assessment (AA) in accordance with Section 117(4)(a) of the MAP Act.

"As soon as is practicable after it receives a licence application and if it considers it necessary to do so in its capacity as the competent authority referred to in section 112, carry out screening for appropriate assessment in respect of the proposed maritime usage the subject of the application."

Where MARA determines that an AA is required it shall carry out the AA in accordance with Section 117(7)(a) of the MAP Act.

1.4.2.2 Screening Out for Appropriate Assessment

Under Regulation 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the competent authority shall determine that an AA of a project *is not required* where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening that the project, individually or in combination with other plans or projects, will have a significant effect on a European site.

1.4.2.3 Screening In for Appropriate Assessment

Under Regulation 42(6) of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) the competent authority shall determine that an AA of a plan or project *is required* where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

Where the competent authority determines that an AA is required, they shall make a determination under Article 6(3) of the Habitats Directive as to whether or not the proposed development would adversely affect

the integrity of a European site and an appropriate assessment shall be carried out by the competent authority before consent is given for the proposed development – see Regulation 42(11) European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

1.4.2.4 European Sites and Natura 2000 Sites

The term European site is defined in the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) as:

> *"European Site" means—*
> *(a) a candidate site of Community importance,*
> *(b) a site of Community importance,*
> *(c) a candidate special area of conservation,*
> *(d) a special area of conservation,*
> *(e) a candidate special protection area, or*
> *(f) a special protection area;*

The term Natura 2000 is defined in the same Regulations as:

> *"Natura 2000" means the European network of special areas of conservation under the Habitats Directive and special protection areas under the Birds Directive, provided for by Article 3(1) of the Habitats Directive and, for the purposes of these Regulations, includes European Sites.*

As such, and as adopted in this report, the term European site refers to one of the sites comprising the Natura 2000 network.

2 PROJECT DESCRIPTION

2.1 Location

The CP1146 Carrickmines to Poolbeg project is a proposed new underground electricity cable from the Carrickmines 220 kV substation to the Poolbeg 220 kV substation and includes a section of marine cable as shown in Figure 2.1. The cable route for the CP1146 Carrickmines to Poolbeg project traverses the administrative areas of two local authorities: Dun Laoghaire Rathdown County Council and Dublin City Council.

A site location map of the marine section of the CP1146 Carrickmines to Poolbeg project, showing the MULA area (redline boundary), is presented in Figure 2.2 below. Note that the cable route element shown in the figure below represents a 500m wide routing corridor and that final routing will be determined following the surveys being described in this project description. More detailed drawings are provided in Appendix A.

The Area of Interest (AoI) of this report is an area of 2101 Ha extending from Blackrock Park to the Shelley Banks car park on the Poolbeg peninsula. The majority of geophysical and geotechnical surveys will be conducted within the 500m wide corridor, however, some addition surveys may be required within the wider South Dublin Bay area, e.g. environmental walk-over surveys. Therefore the entire 2101 Ha area is the subject of the MULA.

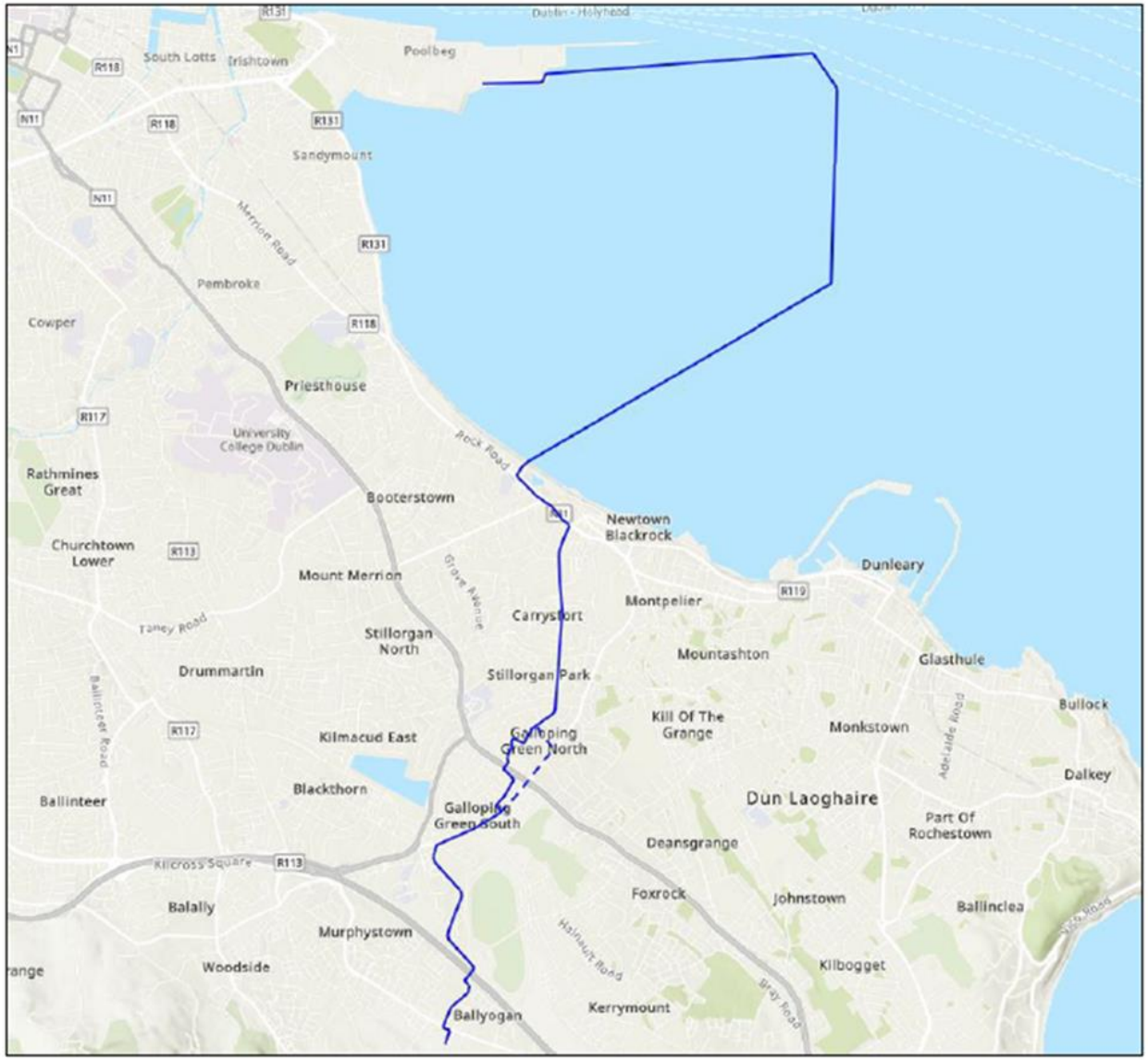

Figure 2.1 Proposed Entire Route of CP1146 Carrickmines to Poolbeg project

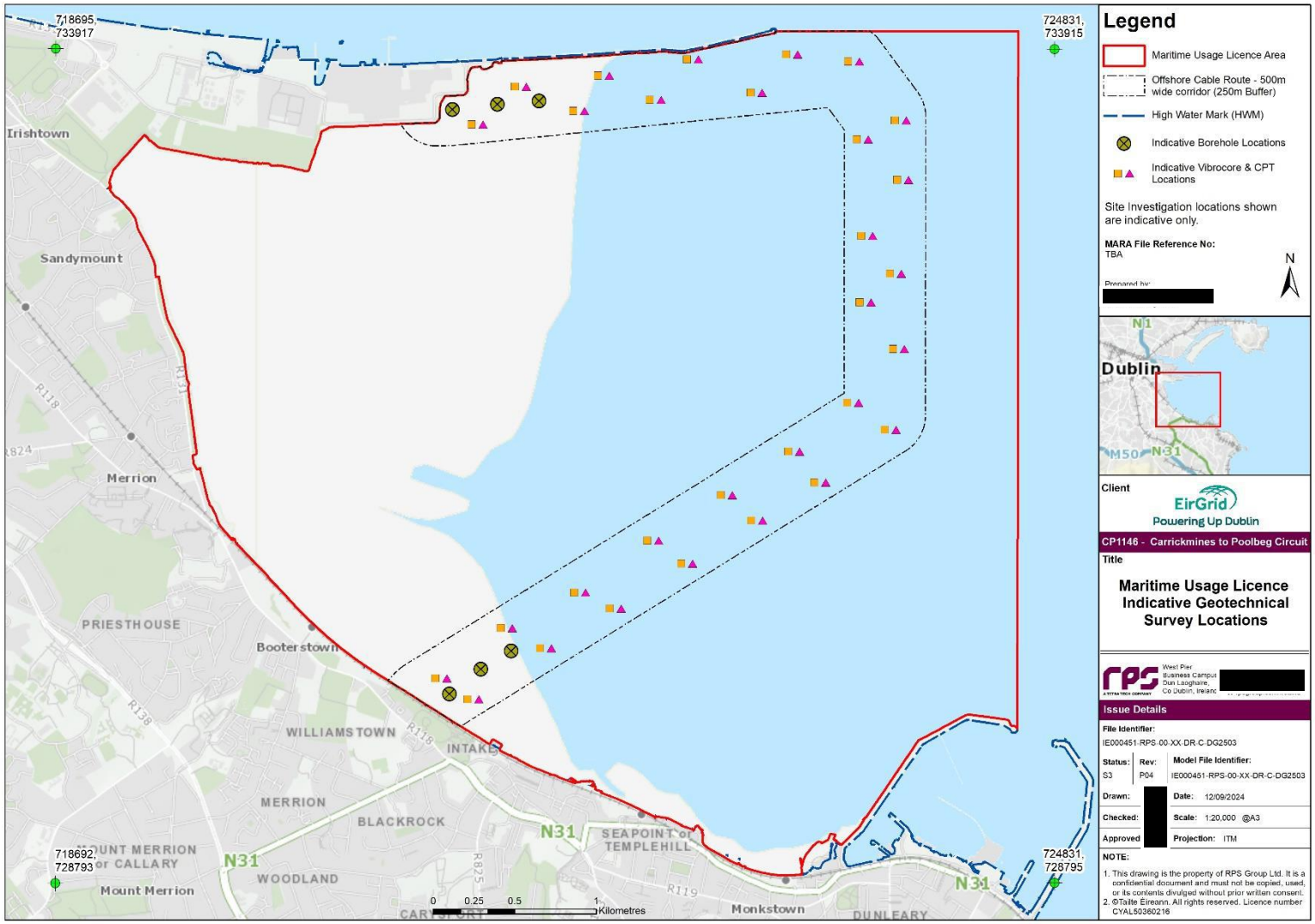

Figure 2.2 Proposed Marine Cable Section of CP1146 Carrickmines to Poolbeg project (500m wide route corridor) and MULA Area

2.2 Description of the Marine Site Investigation Works

2.2.1 Overview

In order to provide a reliable basis for design development, and to support the consenting and construction phases of the marine section of the CP1146 Carrickmines to Poolbeg project, surveys and investigations are necessary. The aim of the SI works is to acquire data to a high quality and specification within the AoI as summarised below and described in the following sections.

Marine SI Works) comprise the following elements:

Table 2.1 Marine Site Investigation Works

Survey Type	Survey Elements
Marine Geophysical Surveys	Drop-down camera/ video
	ROV
	Multi Beam Echosounder (MBES)
	Side Scan Sonar (SSS)
	Sub-bottom profiler (SBP)
	Magnetometer
	Ultrashort Baseline (USBL) acoustic positioning system
	Seismic Refraction
	Ground Penetrating Radar
	Drones/ UAVs
Marine Environmental/ Ecological Surveys	Benthic sampling/ grab samples
	Water samples
	Conductivity, Temperature, Depth (CTD) water measurements
	Static underwater noise recorders
	Shipping and navigation surveys
	Marine archaeology surveys
	Marine habitat surveys
	Other ecological surveys
Metocean Surveys	Acoustic Doppler Current Profiler (ADCP)
Geotechnical Investigations/ Surveys	Geotechnical Boreholes
	Vibro-core Sampling
	Cone Penetration Test (CPT)

It should be noted that all locations shown are provisional only and subject to change on-site due to the presence of obstructions/ refusals at individual locations, i.e. where a physical object, e.g. a subsurface boulder, prevents the borehole, CPT, etc., from going to its target depth. In such circumstances, the location is moved to another nearby location away from the obstruction and the operation repeated.

The following drawings have been prepared in support of the MULA:

- Proposed Licence Area Map (Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502)
- Maritime Usage Licence Indicative Geotechnical Survey Locations (Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2503)
- Maritime Usage Licence Indicative Benthic Sample Locations Map (Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2504)
- Maritime Usage Licence Indicative ADCP Locations Map (Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2505)

The drawings are included in Appendix A to this report.

2.2.2 Marine Geophysical Surveys

The geophysical survey scope is intended to provide significant seabed and sub-seabed information. It is therefore foreseen to gather, as a minimum, detailed information on:

- Water depths, reduced to lowest astronomical tide (LAT), throughout the AoI;
- The nature of any seabed features, obstructions, sediments, and shallow geological conditions throughout the AoI;
- The nature of the sub-seabed conditions and horizons down to circa 10-15m below chart datum (CD) depending on the geological conditions encountered and the choice of system used;
- Seabed conditions/ hazards to any SI works equipment which may need to be located on the seabed;
- Seabed habitats to inform further benthic surveys and preparation of environmental assessments; Identify sensitive marine habitats which will need to be avoided during geotechnical and environmental sampling;
- Archaeological features within the AoI;
- Unexploded ordnance (UXO).

The foreseen scope of the SI works will consist of primarily non-intrusive survey methods, in that they will not physically interact with the seabed, such as Multi Beam Echosounder (MBES), sub-bottom profiler (SBP), Side Scan Sonar (SSS) and Magnetometer surveys but may also incorporate visual surveys (e.g., drop down video, ROV, etc.) pending the development of the project's ground model.

As detailed in Section 2.2.3 below some intrusive seabed sampling will also be undertaken during the geophysical survey campaign to ground-truth geophysical data, assist in early seabed characterisation and provide data for benthic analyses and archaeological interpretation.

Figure 2.3 Typical offshore geophysical survey vessel (GeoSurveyor XI Call Sign; ORVI)

Typical nearshore vessels for geophysical surveys will be circa 10 – 20m in length. See Figure 2.3 for an example of a geophysical survey vessel. A smaller nearshore vessel may be required to complete surveys in the intertidal area, see Figure 2.4 for an example of a typical nearshore vessel.

Figure 2.4 Typical nearshore geophysical survey vessel (RV GEO)

A brief description of the geophysical survey methods has been provided in the subsequent sections. The exact technical specifications of the equipment to be used will not be known until the survey contract has been awarded, however such vessels and equipment will be within the parameters assessed within this document. Typical acoustic properties of equipment are provided in Section 2.2.6.

The intertidal area will be subject to surveys using predominantly terrestrial geophysical survey methods and techniques such as Ground Penetrating Radar (GPR), shallow seismic refraction, electrical resistivity, magnetometer, drones and photogrammetry.

2.2.2.1 Multibeam Echo sounder

Full 100% coverage of the area concerned associated with the survey and area classification will be required. Surveys shall identify the level, nature, and detailed coverage of the seabed to ensure identification of features on the seabed within the area shown, identify potential large upstanding archaeological features and guide habitat mapping with the backscatter function if available. Processing of data sets shall include processing for archaeological indicators. The area shall be surveyed in such a way as to produce a comprehensive data-set required to enable the generation of multiple sections through the survey area in any direction.

Method: A remote sensing acoustic device which will be either attached to the vessel(s) hull at the bow or mounted on a side pole.

Indicative Equipment:

- Teledyne Reson Seabat T50-R;
- R2 Sonic 2024 (see Figure 2.5); or
- similar.

Figure 2.5 MBES R2Sonic 2024

Swath width: Swath width will be optimised to provide 100% seafloor coverage with typical swath widths of 3 to 6 times water depth depending on arrangement of equipment hardware.

Location: MBES survey may be performed throughout the entire sub-tidal area illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A). The survey area is 2101 Ha.

2.2.2.2 Side Scan Sonar (SSS)

Method: A submerged acoustic device (SONAR – Sound Navigation & Ranging) for imaging areas of the seafloor will be either hull mounted or towed.

Indicative Equipment:

- Kongsberg Geoacoustic 160
- Edgetech 4200 (see Figure 2.6);
- C-Max CM2 system;
- Klein Hydro Scan; or
- similar.

Figure 2.6 Edgetech 4200 SSS

Swath width: The swath width will be based on the water depth encountered. A 100% overlap between each swath is envisaged.

Location: SSS survey may be performed throughout the entire sub-tidal area illustrated in in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A). The survey area is 2101 Ha.

2.2.2.3 Sub-bottom Profiling

A typical sub bottom profiling (SBP) survey is completed using single or multi-channel seismic reflection systems such as Chirp, Sparker, or Parametric system. Sub bottom profiling over the site and specified runs is yet to be determined.

The geophysical SBP survey shall identify the bed level and the nature, thickness, and location of the sub surface strata to rock head.

The survey shall include both items detailed below:

1. Completion of specified runs.
2. Completion of a Free Line Survey.

Method: SBP are acoustic devices for imaging sections of the seabed. The images produced are used to produce profiles beneath the seafloor, enabling delimitation of major sedimentary interfaces. They are either mounted on the vessel / pole or towed behind the vessel.

Figure 2.7 Left - Applied Acoustics AA300 being deployed & Right - Typical Hull Mounted SBP - Edgetech 3300

Indicative Equipment:

- Edgetech 3100;
- Edgetech 3300 (see Figure 2.7);
- Geopulse 5430A (pinger system);
- 400 Joule Generic sparker;
- Innomar Parametric (dual frequency); or
- similar.

Swath width: n/a

Location: SPB survey may be performed throughout the entire sub-tidal area illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A). The survey area is 2101 Ha.

2.2.2.4 Magnetometer

The magnetometer survey will be undertaken at suitable line spacing to ensure complete coverage of the seabed for archaeological purposes (and in line with UAU guidelines), i.e., identify large metal debris or metallic archaeological remains.

Method: Magnetometers provide information on embedded magnetic/ferrous objects such as cable crossings, debris and potentially UXO's. They are towed from the vessel.

Indicative Equipment:

- Geometrics G-882 caesium vapour magnetometer – see Figure 2.8;
- Marine Magnetics SeaSPY,
- G-Tec Magwing System; or
- similar.

Figure 2.8 Geometrics G-882

Survey spacing: Line spacing will be dependent on water depth encountered, with additional runs of higher density line spacing within areas where any magnetic signal is recorded.

Location: Magnetometer surveys may be performed throughout the entire sub-tidal area illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A). The survey area is 2101 Ha.

2.2.2.5 Ultrashort Baseline (USBL) – Acoustic Positioning System

An ultrashort baseline acoustic positioning system is a highly accurate and precise method of underwater acoustic positioning. It determines the orientation and position of the transponders relative to the transceiver and can be used during the set up and positioning of other geophysical and geotechnical survey equipment.

Figure 2.9 Applied Acoustics EasyTrak Nexus Model EZT-2691

Method: The system consists of a transceiver unit and a set of transponders. The transceiver unit emits acoustic signals, which are picked up by the transponders.

Indicative Equipment:

- Applied Acoustics EasyTrak Nexus Model EZT-2691 (Figure 2.9); or
- similar.

Location: USBL surveys may be performed throughout the entire sub-tidal area illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A). The survey area is 2101 Ha.

2.2.2.6 Seismic Refraction (Beach and Intertidal)

The seismic refraction method utilizes the refraction of seismic waves as they pass through various rock or soil layers to analyse underground geological conditions and structures.

Figure 2.10 Geometrics Geode Seismograph

Method: Seismic refraction profiles will be conducted using onshore survey tools during low tide in the intertidal zone. A sound source (typically a sledgehammer striking a metal plate) will generate compressional wave energy. These refracted waves will be captured by a series of geophones and logged on a digital seismograph. The locations and elevations of the geophones will be documented using GPS technology.

Indicative Equipment:

- Geophone Arrays:
  - Geosense 4.5 Hz Geophones;
  - Mark Products L-28LB Geophone;
  - Geospace GS-11D Geophone; or
  - similar
- Digital Seismographs
  - Geometrics Geode Seismograph (Figure 2.10);
  - Seistronix RAS-24;
  - ABEM Terraloc Pro; or
  - similar

Location: Refraction Seismic methods may be undertaken throughout the entire inter-tidal areas illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A).

2.2.2.7 Ground Penetrating Radar (Beach and Intertidal)

Ground Penetrating Radar (GPR) utilizes the reflection of electromagnetic waves as they are returned by rock or soil layers to analyse underground geological conditions and structures.

Method: GPR will be completed during low tide in the intertidal zone. A GPR trolley will be pushed over the area to be scanned or a GRP array will be towed using an ATV and the results analysed by a technician to determine subsurface characteristics.

Figure 2.12 Stream X Towed GPR System

Figure 2.11 Leica DS2000 GPR Trolley

Indicative Equipment:

- IDS GeoRadar Stream X Towed GPR System (see Figure 2.12)
- IDS GeoRadar Stream DP GPR System
- Leica DS2000 GPR System (see Figure 2.11); or
- similar.

Location: Refraction Seismic methods may be undertaken throughout the entire intertidal areas illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A).

2.2.2.8 Drones

Drones or Unmanned Aerial Vehicles (UAVs) are capable of mapping coastal and intertidal areas with a high degree of vertical accuracy. Drones or UAVs equipped with a high-resolution camera can be used to collect high resolution spatial data for coastal and intertidal surveys.

Method: Drones/UAVs will be used to survey intertidal zones.

Location: Drone surveys may be undertaken throughout the inter-tidal areas illustrated in Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2502 (Appendix A).

2.2.3 Marine Environmental/ Ecological Surveys

The aim of the proposed environmental surveys is to collect baseline data which will be used to inform the environmental assessments. Environmental surveys will cover both the onshore area above the high-water mark and areas below the high water mark including intertidal and subtidal areas. This will include a benthic sampling programme using grab sampling, video or still photographs and, where deemed necessary, the deployment of static acoustic monitoring to measure marine mammal activity and other background noise.

2.2.3.1 Benthic Sampling/ Grab Samples

Seabed samples will be recovered to inform benthic habitat distribution mapping as well as contamination testing (where relevant). Standard sampling techniques for subtidal and intertidal collection will be employed to include collection of macrofauna and associated sediment particle size and organic content, as described below.

Macrofaunal grab samples may be taken with a number of different grab types depending on the substrate type, e.g., Day grab, Van Veen, mini-Hamon (not suitable for undisturbed samples). The benthic sampling will be complemented by video and still photography. Seabed sampling will likely be undertaken as part of either the geophysical or geotechnical surveys or may be a standalone survey.

Indicative Quantity: It is anticipated that 11 no. stations will be required to be sampled. Three (3 no.) replicate benthic samples will be obtained at each sampling station. Two benthic samples from each

sampling station will be processed for macro-invertebrate benthos larger than 1 mm. The remaining one sample will be analysed for sediment particle size analysis and sediment chemistry. Samples will be sent to a suitably accredited (NMBAQC level participation) laboratory for analysis and reporting which will include benthic analysis, sediment particle size analysis and sediment chemistry. GPS coordinates and depths will be recorded for each location.

Method: Camera will be used to ensure seabed is suitable for sampling prior to using grab. Surface grab samples will be taken by box corer, grab sampler (e.g., Day grab, Van Veen grab or similar). These devices are typically deployed from a crane on the vessel.

Depth: Grab sample will be taken on the seabed at depths ranging between -4m CD and -10m CD. It is estimated that each sample will have a size up to 0.1m^2.

Location: Grab sampling will be performed within the area defined in CP1146-RPS-00-XX-DR-C-DG2504 (Appendix A). The final sampling locations will be determined based upon interpretation of the geophysical data and selected to sample different marine habitats.

2.2.3.2 Water Samples

Water sampling and profiling will be taken in sufficient locations to provide an even distribution of results across the site. Two water samples shall be taken at each location. Each water sample shall be analysed for the following: conductivity, temperature, pH, dissolved oxygen and turbidity. Where suitable, parameters will be tested in situ to receive accurate data. A Niskin bottle (or similar) will be used to obtain a sufficient sample of water at the surface (< 1m depth) and a second sample just above the seabed (~1m) for the subsequent chemical analysis.

2.2.3.3 Conductivity, Temperature and Depth

Conductivity, Temperature, Depth (CTD) water measurements shall be taken at a number of locations at three depths, i.e. near-surface, mid-water, and near-seabed. Measurements shall be taken only after stabilisation of the temperature at each location.

2.2.3.4 Static Underwater Acoustic Recorders

Static underwater acoustic recorder(s) may be deployed within the sea in the AoI. The recorder(s) will be Wildlife Acoustics Model: SM2M Unit with hydrophones contained in a single unit (see Figure 2.13), or similar. The location for the deployment of the recorder(s) will be determined based on factors such as tide, sediment and currents, as well as distance from shipping/ onshore noise sources that may impact on baseline noise levels. This information will be collected as part of the early SI works and therefore deployment locations are not yet known although they will be within the MUL area.

Figure 2.13 Deployment of static underwater acoustic recorders

2.2.3.5 Other Environmental Surveys

Further marine environmental surveys will be undertaken during the course of the project's development comprising the following:

- Shipping and Navigation Surveys
  - The need for shipping and navigation surveys will be determined following consultation with the relevant stakeholders. These will be shore-based visual vessel traffic surveys.
- Marine Archaeology Surveys
  - The aim of the proposed surveys, which will be undertaken by a suitably qualified archaeologist, are to collect baseline data which will be used to inform the cultural heritage impact assessment. Surveys will be undertaken in advance of any intrusive survey work and generally coordinated with the geophysical survey proposed herein. Surveys will comprise an identification programme using marine magnetometer survey (see Section 2.2.2.4), side scan sonar (see Section 2.2.2.2) data analysis and diving as required in order to identify and assess metallics and other targets. They may include dive surveys, wade surveys and archaeological walkover surveys.
- Marine Habitat Surveys
  - The aim of the proposed surveys, which will be undertaken by a suitably qualified marine ecologist, are to collect baseline habitat data which will be used to inform the environmental assessments, e.g., Appropriate Assessment (AA). Surveys will be undertaken in advance of any geotechnical survey work and generally coordinated with the geophysical survey proposed herein. Surveys will comprise drop down camera and/or Remote Operated Vehicle (ROV) inspection and diving as required in order to identify benthic habitats.
  - Intertidal walkover surveys habitat characterisation sampling, with core samples to be analysed for Fauna, Particle Size Analysis & Total Organic Carbon, and chemical analysis, e.g., heavy and trace metals, hydrocarbons, and polycyclic aromatic hydrocarbons (PAH).

    It is expected that a minimum of 9 primary transect stations are selected per landfall location, with 3 sampling points along each, (minimum 9 transects and a minimum total of 27 sampling points).
- Other Ecological Surveys
  - Terrestrial habitat walkover surveys (including protected and notable flora, and invasive alien plants and animals);
  - Bats roost assessment surveys;
  - Mammal surveys (including otters); and
  - Bird surveys including wintering bird surveys (low and high tide surveys), breeding bird surveys (vantage point surveys, boat based surveys).

It should be noted that these surveys will straddle both the marine and the terrestrial environments.

2.2.4 Metocean Surveys

The main purpose of the meteorological and oceanographic (metocean) campaign is to collect accurate wind wave, temperature, current and water levels information from the project site. The information collected will be used to inform engineering design and environmental assessments. The exact details of the surveys (equipment, locations, and deployment/retrieval methods) will be confirmed upon appointment of a preferred contractor.

2.2.4.1 Equipment Deployment & Recovery Vessel

The methodology for deployment of metocean monitoring equipment will be using a suitable vessel to either tow and/or lift and deploy from vessel deck via onboard crane. An example of a suitable vessel for this scope would be a shallow draft anchor handling tug or a utility type vessel such as that shown in Figure 2.14 or similar.

Figure 2.14 Ocean Energy DP1 Multi Cat 2309

2.2.4.2 Acoustic Doppler Current Profiler (ADCP) to measure ocean currents.

An Acoustic Doppler Current Profiler (ADCP) is used to collect data on water movements, current speeds, and directions.

Indicative Quantity: Three.

Method: Deployed to the seabed via a crane from a survey vessel for a duration of at least 5 weeks to capture a full lunar cycle including spring and neap tides.

Indicative Equipment: The ADCP unit (Figure 2.15) is mounted in a seabed frame (circa 1.8 m wide and 0.6 m high) with a weight of approximately 300 kg. This will be attached to a ground line, a clump weight and to an acoustic release system carrying a rope retrieval system. The precise equipment utilised will depend on the water depths at the locations proposed for survey.

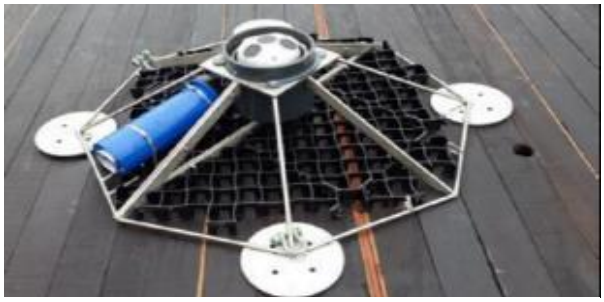

Figure 2.15 Typical seabed frame with ADCP (Ocean Scientific International Ltd)

Location: Indicative locations for the deployment of ADCP are illustrated on Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2505 (Appendix A). The actual locations will be determined based upon interpretation of the geophysical data and following a navigation safety assessment.

2.2.5 Marine Geotechnical Investigations

The aim of the geotechnical survey is to provide sufficient geotechnical data to allow the characterisation of the sub-seabed strata and composition of the seabed and the level of Rock head (including follow on coring to confirm rock head).

Normal industry standards for performance of all positioning, drilling, sampling, SPT testing, CPTu testing, laboratory testing and analysis and reporting will apply. Material sampling, in situ testing, data logging, laboratory testing and reporting (factual and interpretative) will be required.

The works will include the following:

- Sampling/ coring boreholes at 6 locations to a maximum of 20m investigation depth below seabed level.
- Vibro-cores at 30 locations.
- Cone Penetration Testing – CPT at 30 locations (at the vibro-core locations).

The indicative quantities given above relate to the requirements for the preliminary geotechnical campaign, the final quantity, location, and specification of equipment will be determined following interpretation of the geophysical survey data and considering environmental constraints (i.e., proximity to sensitive receptors). The final proposed locations will be subject to environmental conditions.

2.2.5.1 Geotechnical Boreholes

Indicative Quantity: 6 focused primarily at the landfall locations of the cable routes.

Method: A drill head is lowered to the seabed from the drilling platform (where used) via a drill string. The drill head penetrates the seabed via rotation of the drill string and the application of a downward pressure. Soils and rock samples are then retrieved for laboratory testing via the drill string.

Sample Diameter: up to 102mm.

Depth: Up to 20m below the seabed, or refusal.

Indicative Equipment: Indicative equipment to be used would be Camacchio 205 or Comacchio 602 drill rigs using traditional drill string or a triple core barrel system (e.g., Geobor 'S') and associated ancillary equipment (water bowser, air compressor).

Depending on the specifics of each borehole location the drill rig and ancillary equipment may be deployed in two different methods, the choice of method will be determined based on the geophysical surveys, tidal working windows, as well as availability of plant and equipment.

For investigations at all borehole locations where there is sufficient depth of water (draft) to deploy a jack-up barge, the drill rig and equipment can be mounted on a jack up barge and boreholes completed from this barge during any phase of the tide (see Figure 2.16).

Figure 2.16 Jack-up Barge and drill rig

Figure 2.17 Landing Craft deploying onto beach (MV Spanish Jonh II)

For investigations located within the intertidal zone where sufficient time is available between inundation by tides, a tracked borehole / CPT rig and ancillary equipment may be deployed from a small landing craft (see Figure 2.17) to complete the borehole during the intertidal window.

Location: Indicative geotechnical locations for the boreholes are illustrated on Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2503 (Appendix A). The final borehole locations will be determined based upon interpretation of the geophysical data and selected based on the preliminary engineering design. The micro siting of individual geotechnical site investigation locations will take into consideration environmental constraints such as the position of sensitive habitats or archaeological features.

2.2.5.2 Vibro-core Sampling

Indicative Quantity: 30 vibrocores.

Method: Gravity or piston core (self-weight penetration sampler), deployed from a works vessel equipped with Dynamic Positioning. An example of a suitable vessel for this scope would be a shallow draft anchor handling tug or a utility type vessel such as that shown in Figure 2.14 (above) or similar.

Sample Diameter: up to 150mm.

Depth: Vibrocore up to 6m depth.

Indicative Equipment: The exact equipment to be used will be confirmed following a tender process to procure the site investigation contractor.

Location: Vibro-core sampling will be performed at representative locations within the cable route corridor - Refer to Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2503 (Appendix A). The final sampling locations will be determined based upon interpretation of the geophysical data and selected based on the preliminary engineering design. Some locations may need to be avoided due to environmental reasons including sensitive archaeological features or unsuitable substrate types.

2.2.5.3 Cone Penetration Testing (CPT)

Indicative Quantity: 30 CPT

Method: Cone Penetration Test (CPT) using a cone penetrometer deployed from a works vessel. An example of a suitable vessel for this scope would be a shallow draft anchor handling tug or a utility type vessel such as that shown in Figure 2.14 (above) or similar.

Sample Diameter: 32 mm (standard cone diameter).

Depth: CPT up to 6m depth, or refusal.

Indicative Equipment: The exact equipment to be used will be confirmed following a tender process to procure the site investigation contractor.

Location: Cone Penetration Testing will be performed at representative locations within the cable route corridor - Refer to Dwg Ref: CP1146-RPS-00-XX-DR-C-DG2503 (Appendix A). The final sampling locations will be determined based upon interpretation of the geophysical data and selected based on the preliminary engineering design. Some locations may need to be avoided due to environmental reasons including sensitive archaeological features or unsuitable substrate types.

2.2.6 Marine Noise Level Summary

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

A summary of the noise sources, for the main activities proposed to be undertaken as part of the SI works surveys is included in Table 2.2 (see Appendix B: Subsea Noise Technical Report for further detail).

Table 2.2 Summary of Noise Sources and Activities Included in the Subsea Noise Assessment

Equipment	Source level [SPL] (as used in model)	Primary decidecade bands (-20 dB width)	Source model details	Impulsive/non-impulsive
Survey vessel, Geophysical	161 dB SPL	10-16,000 Hz	Based on <20 m generic survey vessel.	Non-impulsive
Survey vessel, Geotechnical	168 dB SPL	10 – 25,000 Hz	Based on <30 m tug with dynamic positioning system	Non-impulsive
MBES	187 dB SPL (Spherical equivalent level)	200,000-800,000 Hz	Based on Reason SeaBat T50 & R2 Sonic 2024.	Impulsive
SSS	166 dB SPL (Spherical equivalent level)	100,000-1,000,000 Hz	Generic SSS from 400-1,000 kHz.	Impulsive
USBL	190 dB SPL	18,000-31,500 Hz	Active with non-hull mounted SSS* & during vibro-core operations, 2 Hz ping rate, ping length 10 ms.	Impulsive
SBP-parametric (P-SBP)	204 dB SPL	80,000-150,000 Hz (Primary) 2,000-22,000 Hz (Secondary)	Source level adjusted for sediment effects and beam widths. Based on Innomar Standard, worst-case for shallow water.	Impulsive
SBP-chirper/pinger (C-SBP)	181 dB SPL	2,000-12,000 Hz	Generic shallow water SBP of chirper/pinger type. Source level adjusted for sediment effects and beam widths.	Impulsive
SBP-sparker/UHRS (S-SBP)	184 dB SPL	600 – 6,300 Hz	Based on GeoSource 400. Firing rate of 1 Hz assumed	Impulsive

Equipment	Source level [SPL] (as used in model)	Primary decidecade bands (-20 dB width)	Source model details	Impulsive/non-impulsive
ADCP (**Not modelled given high frequency**)	114 dB SPL	500,000-1,260,000 Hz	Based on suitable ADCP for depths <100 m (e.g. Nortek AWAC, Teledyne Reason Sentinel, Workhorse or Monitor) Source level adjusted for sediment effects and beam widths.	Impulsive
Drilling/ rotary coring (Boreholes, no USBL)	145 dB SPL	10-500,000 Hz	Based on published levels (Erbe, et al., 2017; Fisheries and Marine Service, 1975; MR, et al., 2010; L-F, et al., 2023)	Non-impulsive
Vibro-coring & CPT	187 dB SPL	50 – 16,000 Hz	Based on levels from previous work & (Reiser, et al., 2010)	Non-impulsive

*If the SSS and SBP are hull-mounted, there is no need for a positioning device (USBL) and this noise source should be removed from consideration.

2.2.7 Programme and Timescale

EirGrid propose a site investigation activities schedule that will be phased over a two-year period. The intention is to begin survey activities as soon as feasible following license award, with a phased programme of investigations, capitalising on suitable weather windows over this time period. This phased approach will progress the overall development towards detailed design stage. It is worth noting that the exact survey schedule is dependent on the availability of the supply chain and therefore exact timelines for the surveys cannot be determined until closer to the time.

The exact dates for the surveys are to be determined pending the appointment of survey contractors but based on the estimated scope of works to be conducted the duration of each SI works phase scope has been estimated in Table 2.3 below. The estimated durations are subject to change based on variables such as weather conditions onsite, unforeseen seabed conditions, unforeseen obstructions etc.

Mobilisation location will be dependent on the survey contractor, who may choose to mobilise from their home port, port of previous job or local port. The local port options for mobilisation, for example, could include Dublin, Dún Laoghaire, Howth or Malahide depending on vessel size and marine traffic restrictions. Any changes to the anticipated project schedule and port mobilisation locations are not predicted to affect the findings in this assessment.

It is proposed to complete a number of follow on geophysical surveys to determined seabed mobility, these will be completed over the course of the two year license period.

Table 2.3 Estimated SI works Schedule

Phase	Scope of Work	Total No of SI Locations	Estimated Duration
Phase One	Marine Geophysical Surveys	n/a	4-6 weeks (weather dependent)
	Benthic Sampling	11	4-6 days (weather dependant)
	Intertidal Sampling	27	2-3 days (tide/weather dependant)
Phase Two	Vibrocore & CPT Sampling	30	4-6 weeks
	Borehole Sampling	6	4-6 weeks
Phase Three	Follow up Marine Geophysical Surveys	n/a	4-6 weeks (weather dependent)
All Phases	Other Environmental/ Ecological Surveys	Varies	As appropriate to environmental/ ecological survey requirements.

2.3 General Survey Requirements

All appointed survey contractors shall obtain and comply with all necessary marine operational permits including routine and customary vessel/crew/equipment clearances from Customs Agencies, Port Authorities, Marine Survey Office, etc.

2.3.1 Quality Assurance

Each of the appointed survey contractors shall comply with the following as a minimum:

- Quality and Environmental Management Systems based on ISO9001:2015.
- Provision of Quality Management Plans for all the marine operations.
- Provision of site and activity specific Method Statements for all the marine operations within their scope.

2.3.2 Health & Safety

Health, safety, environment, and welfare considerations will be a priority in the evaluation of possible contractors for the various survey scopes and will be actively managed during the course of the survey scopes of work.

Appointed contractors will be required to comply with all legislation relevant to the activities within their scope of work.

Prior to survey works taking place, both Project Supervisor for Design Process (PSDP) and Project Supervisor for Construction Stage (PSCS) will be appointed under the relevant legislation and project / survey specific HSE plans will be put in place which will form part of the survey project execution plans.

Temporary barriers, warning notices, lighting, and other measures necessary to provide for the safety of the workers on the site and/or the public will be erected and maintained for the duration of the SI works.

2.3.3 Working Hours

The working hours for the SI works are proposed to be 24 hours a day, seven days a week.

Tides, weather conditions and/or sea-state will impact on the working hours, and it may be necessary to temporarily suspend operations when adverse weather conditions and/or sea-states are encountered or forecast. Similarly, equipment maintenance and repair may impact on operational activities resulting in downtime.

Following downtime or suspension of operations, recommencement of sound producing activities shall only occur after the successful implementation of the measures contained in the *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (DAHG, 2014).

2.3.4 Vessels

All vessels will be fit for purpose, certified and capable of safely undertaking all required survey work. Marine vessels will be governed by the provisions of the Sea Pollution Act 1991, as amended, including the requirements of MARPOL. In addition, all vessels will adhere to published guidelines and best working practices such as: the National Maritime Oil/HNS Spill Contingency Plan (NMOSCP), Marine Pollution Contingency Plan (MPCP), Chemicals Act 2008 (No. 13 of 2008), Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated regulations.

Vessels shall have a Health, Safety and Environmental Managements system which should conform to the requirements of the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or continental / EEZ waters to be operated in.

The SI works will be undertaken from vessels in accordance with the relevant guidelines required to manage the risk to marine mammals from man-made sound sources in Irish waters.

3 APPROPRIATE ASSESSMENT METHODOLOGY

3.1 Guidance

This SISAA has been prepared in compliance with the EU and national guidance documents that pertain to Member States' fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this SISAA in accordance with the following guidance:

- EC (2000). Communication from the Commission on the Precautionary Principle. Office for Official Publications of the European Communities, Luxembourg;
- EC (2002). Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission;
- EC, (2007). Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC. European Commission;
- DoEHLG (2009, rev. 2010). Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government;
- EC (2013). Interpretation Manual of European Union Habitats. Version EUR 28. European Commission, Luxembourg;
- EC (2018). European Commission Notice C (2018) 7621 'Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg;
- OPR (2021). Practice Note PN01: Appropriate Assessment Screening for Development Management. Office of the Planning Regulator, Dublin Ireland.
- EC (2021). European Commission Notice C (2021) 6913 'Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC', Office for Official Publications of the European Communities, Luxembourg.

3.2 Stages

Appropriate Assessment (AA) is a four-stage process with tests at each stage. The four stages are summarised diagrammatically in Figure 3.1 below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

Stages 1-2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 is a precursor to Stage 4 which is the main derogation step of Article 6(4).

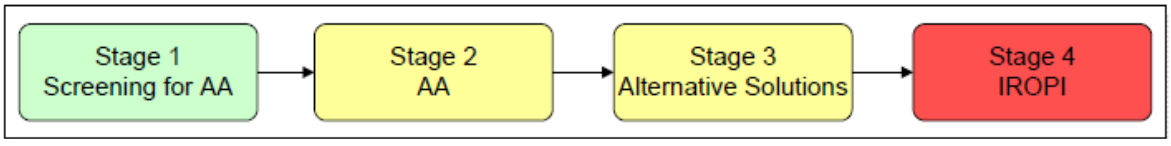

Figure 3.1 Four Stages of Appropriate Assessment

The screening for AA carried out by the competent authority (Stage 1), will determine whether an AA (Stage 2) of the proposed project is required. The purpose of the screening stage is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project, alone and in-combination with other plans or projects, could have significant effects on a European site in view of the site's conservation objectives. Where significant effects are likely, uncertain or unknown at screening stage, a second stage AA will be required. In this case, a NIS must be prepared to assist the competent authority to conduct the Stage 2 AA. If it is not possible during Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. If it can be demonstrated that there are no reasonable alternative solutions, the AA progresses to Stage 4. This final stage is undertaken when it has been determined that negative impacts on the integrity of a European site will result from a plan or project and there are no alternative solutions. At Stage 4 of the AA process, it is the

characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of Imperative Reasons for Overriding Public Interest (IROPI).

While there is no prescribed form or content for reporting (DoEHLG, 2009) the methodology and format adopted in this report has been in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2021) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2018), and guidance prepared by the NPWS (DoEHLG, 2009).

3.3 Stage 1 Screening / Test of Significance

This process identifies whether the proposed development is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant impacts upon a European site(s) either alone or in combination with other projects or plans.

The screening for AA will incorporate the following steps:

1. Determining whether a project or plan is directly connected with or necessary to the conservation management of any European sites;
2. Describing the project or plan (see Section 2);
3. Identifying the European sites potentially affected by the project or plan;
4. Identifying and describing any potential effects of the project or plan on European sites, alone, in combination and cumulatively with other plans/projects; and
5. Assessing the likelihood of significant effects on European sites.

The output from this stage is a determination for each European site(s) of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause that site to be brought forward to Stage 2.

3.4 Desk Study

Information on the receiving environment was analysed to determine the potential for significant effects to QI of the European sites with established connectivity to the SI works (see Section 4.4). The following publications and data sources were reviewed in October 2024.

- Carter, MI, Boehme, L, Cronin, MA, Duck, C, James Grecian, W, Hastie, GD, Jessopp, MJ, Matthiopoulos, J, McConnell, BJ, Morris, CD, Moss, SEW, Thompson, D, Thompson, P & Russell, DJF (2022), 'Sympatric seals, satellite tracking and protected areas: habitat-based distribution estimates for conservation and management', Frontiers in Marine Science, vol. 9, 875869. https://doi.org/10.3389/fmars.2022.875869;
- CSO (2024). Statistics of Port Traffic Q4 and Year 2023. Available at: https://www.cso.ie/en/releasesandpublications/ep/p-spt/statisticsofporttrafficq4andyear2023/data/ Accessed October 2024;
- Cummins, S., Lauder, C., Lauder, A. & Tierney, T. D. (2019) The Status of Ireland's Breeding Seabirds: Birds Directive Article 12 Reporting 2013 – 2018. Irish Wildlife Manuals, No. 114. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland;
- Department of Arts, Heritage and the Gaeltacht (DAHG) (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. Dublin, Ireland, Department of Arts, Heritage and the Gaeltacht, 58pp;
- Distribution records for QI of European sites held online by the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie). Accessed October 2024;
- EMODnet (2024) Map Viewer. Available at: https://emodnet.ec.europa.eu/geoviewer/ . Accessed October 2024;
- Environmental Protection Agency (EPA) online interactive mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/) for water quality data including surface and ground water quality status, and river catchment boundaries. Accessed October 2024;

- Geohive online data catalogue (https://www.geohive.ie/pages/data). Accessed October 2024;
- Geological Survey Ireland (GSI) (https://www.gsi.ie/en-ie/Pages/default.aspx) Accessed October 2024;
- IAMMWG. (2023). Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091. https://hub.jncc.gov.uk/assets/b48b8332-349f-4358-b080-b4506384f4f7;
- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019), and associated digital shapefiles obtained from the NPWS Research Branch;
- Irish Whale and Dolphin Group Sightings Log https://iwdg.ie/browsers/sightings.php/ Accessed October 2024;
- JNCC (2019) The UK Approach to assessing Conservation Status for the 2019 Article 17 reporting under the EU Habitats Directive. Joint Nature Conservation Committee, Peterborough. Available to download from https://jncc.gov.uk/article17;
- Macklin, R., Brazier, B. & Sleeman, P. (2019). Dublin City otter survey. Report prepared by Triturus Environmental Ltd. for Dublin City Council as an action of the Dublin City Biodiversity Action Plan 20152020;
- Mapping of European site boundaries and Conservation Objectives for relevant sites, available online from the NPWS included site synopsis, European site Data form and Conservation Objective Supporting Documents where available (https://www.npws.ie/protected-sites). Accessed October 2024;
- Mullen, E., Marnell, F. & Nelson, B. (2021) Strict Protection of Animal Species. National Parks and Wildlife Service Guidance Series, No. 2. National Parks and Wildlife Service, Department of Housing. Local Government and Heritage;
- NPWS (2009) Threat Response Plan: Otter (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin;
- Ordnance Survey of Ireland maps and aerial photography (https://osi.ie). Accessed October 2024; and
- Woodward, I., Thaxter, C.B., Owen, E. & Cook, A.S.C.P., (2019). Desk-based revision of seabird foraging ranges used for HRA screening, Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate, ISBN 978-1-912642-12-0.

The identification of relevant European sites to be included in this report was based on the criteria provided in OPR (2021), namely:

- Any European site within or immediately adjacent to the project area; and
- Identification of European sites where a Source-Pathway-Receptor (S-P-R) link exists, explained below in Section 3.5.

3.5 Identification of Relevant European Sites

3.5.1 Source-Pathway-Receptor Model

The identification of relevant European sites to be included in this report was based on the identification of the 'zone of influence (ZoI)' of the SI works using a Source-Pathway-Receptor (S-P-R) model where:

- A 'source' is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features, and its COs;
- A 'pathway' is defined as the means or route by which a source can affect the ecological receptor; and
- A 'receptor' is defined as QI of European sites being assessed for which COs have been set.

An S-P-R model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of

European sites, and their QIs, to which the SI works are potentially linked. These are termed as 'relevant' sites/QIs throughout this report.

3.5.2 Zone of Influence

Determination of the ZoI of the SI works was undertaken by assessing the activities against the ecological receptors within the project footprint, in addition to the ecological receptors that could be connected to and subsequently impacted by the SI works through abiotic and biotic vectors.

The proximity of the SI works to European sites, and more importantly, QIs of the European sites, is of importance when identifying potentially likely significant effects (LSE). In accordance with the OPR AA Screening Guidelines (2021), the S-P-R model has been used to identify the ZoI to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g., 15 km), within which all European sites should be considered. This approach follows the DoEHLG 2009 guidance on AA which states that:

> "*For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects" (DoEHLG, 2009; p.32, para 1).*

The ZoI of the SI works on mobile species (e.g., birds, mammals, and fish), and static species and habitats (e.g., saltmarshes, woodlands, and flora) is considered differently. Mobile species have a 'range' outside of the European site for which they are a QI. The range of mobile QI species varies considerably, from several metres (e.g., in the case of whorl snails *Vertigo* spp.), to hundreds of kilometres (in the case of migratory wetland birds). A project's ZoI may extend well beyond the project boundary and can impact or have an effect on static species and habitats remote from the SI works; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source. In particular, hydrological linkages between the SI works and European sites (and their QIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact.

To this end, the ZoI for this project extends outside of the immediate SI works area to include ecological receptors connected to the project through proximity and connectivity through features such as watercourses and waterbodies in addition to potential connectivity through land and air. See Section 4.4 for the identification of relevant European sites.

4 IDENTIFICATION OF RELEVANT EUROPEAN SITES

4.1 Assessment of Connectivity

Connectivity is identified via the S-P-R model which identifies the potential impact pathways such as land, air, hydrological pathways etc. which may support direct or indirect connectivity between the SI works (source) and European sites and their QIs (receptors).

Where it is evident that there is no connectivity between the SI work and receptors (i.e., European sites and/or habitats and species for which the sites are selected), the receptors are excluded from the Screening for AA process. Where connectivity exists between the SI works and receptors, these receptors are taken forward to the assessment of likely significant effects (Section 5.2).

4.2 Identification of Potential Receptors

Receptors with the potential to be affected by the SI works are:

- QI habitats of European sites within the SI works area, or within an area likely to be affected by the proposed SI works;
- QI species of the European sites within or immediately adjacent to the SI works area; and
- Mobile QI species to forage or transit into the SI works area or an area likely to be affected by the SI works (ex situ effects).

Following identification of potential sources of impact, the potential for a pathway to various receptors is considered, followed by the identification of relevant European sites.

4.3 Identification of Potential Sources of Impacts

Identification of a risk of impact does not constitute a prediction that it will occur or, in the event that it does occur, that there is an intrinsic likelihood that it will result in ecological or environmental damage or that it will cause or create a significant effect on the European sites in question. The level and significance of the effect depends upon the magnitude, duration or intensity of the impacts ensuing from the proposal and the existence of a credible or tangible S-P-R link between the SI works and the aforementioned European sites. It is also determined by the extent of the exposure to the risk and the characteristics of the receptor.

When assessing impact, the QI habitats and species are only considered receptors where a credible or tangible S-P-R link exists between the SI works and the receptor. In order for an impact to occur there must be a risk initiated by having a ‘source’ - the origin of potential impacts (e.g., near stream construction works), an impact pathway - the means by which the effect reaches the receptor (air, water, or ground) between the source and the receptor (e.g., a watercourse which connects the development site to the site designated for the protection of a receptor) and a 'receptor' (e.g. a protected species associated aquatic or riparian habitats). If the source, pathway, or receptor is absent, no linkage exists and thus, there will be no potential for an impact to be transmitted.

The potential impacts arising from the SI works have been identified as follows:

Potential impacts arising from SI works in the maritime area:

- Visual and above water noise disturbance;
- Habitat loss, alteration and/ or fragmentation;
- Increased Suspended Sediment Concentrations (SSC);
- Underwater noise, including injury and or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual);
- Accidental pollution event; and
- Risk of collision.

Table 4.1 identifies the SI works associated with each impact, and the receptors with the potential to be affected.

Table 4.1 Source-Pathway-Receptor Assessment for the SI Works

Impact	Potential source of impact	Description of Effect Pathway	Relevant Receptors
Visual and above water noise disturbance.	Vessel activity associated with the marine geophysical and geotechnical surveys, metocean surveys, and marine environmental surveys (including intertidal/beach surveys).	Potential for direct impacts by disturbing species, leading to displacement from the area.	Marine mammals, otter, birds.
Habitat loss, alteration and/ or fragmentation.	Interactions with the beach/ seabed resulting from geotechnical surveys (borehole drilling, metocean surveys and marine environmental works (grab sampling).	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds.
Increased Suspended Sediment Concentrations (SSC).	Interactions with the beach/ seabed resulting from geotechnical surveys (borehole drilling), metocean surveys and marine environmental works (grab sampling).	Potential for direct effects on sensitive habitats and indirect effects to species which rely on those habitats for feeding and/or breeding.	Marine habitats, marine mammals, otter, fish, birds.
Underwater noise, including injury and or displacement of Annex II marine mammals, otter, and fish from underwater noise and/or the presence of increased marine traffic (visual).	Noise emissions and increased marine traffic from geophysical and geotechnical (borehole drilling and vibrocores) equipment, vessels and metocean devices associated with marine geophysical surveys, metocean surveys, and marine environmental surveys. May cause injury and/or displacement of Annex II marine mammals, otter, and fish	Potential for direct effects on species in the marine environment including injury, disturbance and/or displacement.	Marine mammals, otter, fish, birds.
Accidental pollution event.	Vessel activity associated with the marine geophysical and geotechnical surveys, metocean surveys and marine environmental surveys.	Potential for direct effects on marine habitats and species, and indirect effects through contamination of supporting habitats.	Marine habitats, marine mammals, otter, fish, birds.
Risk of collision	Vessel activity associated with the marine geophysical and geotechnical surveys, and marine environmental surveys.	Potential for direct effects to large species in the marine environment.	Marine mammals, otter.
In-combination effects	In-combination effects from other consented or planned projects within the ZoI.	Potential for direct effects on marine habitats and species, and indirect effects through contamination of supporting habitats.	Marine habitats, marine mammals, otter fish, birds

4.4 Identification of Relevant European sites

Dublin Bay and the western Irish Sea supports a large number of protected areas. The cable route lies within and adjacent to two European Sites, namely South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA (see Figure 4.1). In addition, there are multiple other European sites in proximity to Dublin Bay where there are potential impact pathways. International protected sites including those in the UK and EU were considered in the initial screening exercise. Candidate SACs and proposed SPAs were also considered and the most up to date boundaries from the NPWS website for SACs and SPAs were utilised at the time of writing this report (refer to Appendix D for the long list of EU sites). Using the S-P-R model to identify the ZoI for each impact as outlined in Table 4.1, the following summarises the ZoI of the project within which relevant European sites will be selected:

- Those which occur within or immediately adjacent to the SI works boundary;
- The water body within which the SI works will be undertaken to capture any hydrological linkages (i.e., the South Dublin Bay); and
- Foraging ranges of relevant QI species (i.e., potential for ex situ effects).

Table D.1 in Appendix D lists the European sites that were considered to have the potential to be affected by the proposed project using the S-P-R method and summarises the QIs / Special Conservation Interests (SCIs) species for which these European and UK sites were designated. Figure 4.1 shows the location of the SI works project relative to these European sites. A discussion on the relevant QI habitats and species follows.

4.4.1 Annex I Habitats

There was considered to be potential connectivity with an SAC and its QIs if the AoI overlapped the SAC or was within range of direct impacts on Annex I habitats from the SI works.

As the SI works are being undertaken in the marine environment, using the S-P-R model, only the marine and coastal Annex I habitats were considered in this screening process. There is no SPR link between terrestrial habitats and the SI works, and therefore these have not been considered further.

Only one site was identified for potential impacts on Annex I habitat QIs as below (with details provided in Appendix D):

- South Dublin Bay SAC

4.4.2 Annex II Marine Mammals

The European sites with relevant Annex II marine mammal QIs to be considered in the SISAA are:

- All European sites that physically overlap with the AoI; and,
- All European sites that have marine mammal QIs with a realistic potential for connectivity with the AoI. A conservative approach has been adopted which has considered all sites within a 100km buffer of the AoI. This buffer is considered over-precautionary with respect to capturing the zone of influence of underwater noise impacts associated with the proposed surveys, however, it allows for the possibility that marine mammals from distant SACs may be foraging or passing through the survey area.

It is noted that MARA's Applicant Technical Guidance Note proposes that foraging ranges of 274 km and 448 km for harbour and grey seal, respectively, are applied in order to identify relevant European sites for Stage 1 screening, using maximum foraging distances quoted in the methodology of Carter et al. (2022). However, Carter et al. (2022) concludes that the drivers of distribution for both grey and harbour seals differ regionally, likely related to regional variation in diet and population trends and provide SAC-specific estimates of at-sea density in the UK and Ireland. These show that hotspots of seal density at sea are not necessarily attributable to nearby designated sites. While it is documented that grey seals can forage hundreds of kilometres from their breeding sides (Cronin et al., 2011; Russell & McConnell, 2014), and harbour seals may travel up to 100 km, this is dependent on seasonality, habitat preference and animal maturity.

JNCC management units (MU) refer to geographical areas in which the animals of a particular cetacean species are found, to which management of human activities is applied (IAMMWG, 2023). It is noted that

MUs are not estimates of populations, and that almost all species of cetacean are part of larger biological populations. The MU boundary is based on the best understanding of the population structure of species, taking into account jurisdictional boundaries and divisions already used for the management of human activities. According to IAMMWG (2023), MUs may be subdivided to provide advice on a smaller spatial scale for a given purpose.

It is recognised that MARA proposes that all harbour porpoise and bottlenose dolphin SACs within the JNCC MU boundaries should be used in order to identify relevant European sites for Stage 1 Screening for AA. However, considering the vast scale of the relevant MUs for these species, it is considered that this would result in an overly precautionary assessment.

For the present assessment, the maximum range for behavioural disturbance expected for marine mammals is out to 8 km from the sound source for all hearing groups for the geophysical survey (sparker SBP & USBL active). The worst-case Temporary Threshold Shift (TTS) is for the VHF hearing group (e.g. harbour porpoise) and extends out to 2.8 km. Similarly, the worst-case Permanent Threshold Shift (PTS) is for the VHF hearing group (e.g. harbour porpoise) and extends out to 0.5 km from the sound source for the geophysical survey (sparker SBP & USBL active). Refer to Appendix B Subsea Noise Technical Report for details.

It is therefore considered sufficiently precautionary to apply a maximum 100 km buffer for the identification of marine mammal SACs to allow for consideration of foraging or transiting marine mammal from distant SACs. Beyond this distance, there is no realistic S-P-R link which may have implications for the conservation objectives of more distant European sites (e.g. ability of these species to access habitats within these sites, effects on the natural range of the population etc.).

In summary, a suitably precautionary approach to the identification of relevant sites has been adopted, which has considered European sites designated for Annex II marine mammals within 100 km of the AoI. The sites selected for consideration of Annex II marine mammal QIs are listed below and summarised in Appendix D:

- Rockabill to Dalkey Island SAC.
- Lambay Island SAC.
- Codling Fault Zone SAC.
- Blackwater Bank SAC.
- Murlough SAC (Northern Ireland)
- North Anglesey Marine SAC (Wales)
- West Wales Marine SAC (Wales)
- Lleyn Peninsula and the Sarnau SAC (Wales).

4.4.3 Annex II Otter

There are 45 SACs designated for otter in Ireland. The Wicklow Mountains SAC (002122) is the nearest SAC for which otter is a QI and this is located approximately 10 km inland to the southwest of the proposed SI works. As there is no pathway from the SI works to this European site for which otter are a QI, the species is not considered further in this SISAA.

4.4.4 Annex II Migratory Fish

The proposed SI works do not overlap with European sites designated for relevant Annex II migratory fish species (river lamprey (*Lampetra fluviatilis)*, sea lamprey (*Petromyzon marinus*), Atlantic salmon (*Salmo salar)* and twaite shad (*Alosa fallax*)). Twaite shad, Atlantic salmon, sea and river lamprey are all protected under EU legislation via Annex II of the Habitats Directive, with salmon only offered protection under Annex II when in freshwater. SACs on the east coast of Ireland which are designated for these fish species include the River Boyne and River Blackwater SAC (002299) located approximately 43 km north of the proposed project and the Slaney River Valley SAC (000781) approximately 109 km to the south where it meets the Irish Sea (refer to Appendix D for the long list of EU sites).

Brook lamprey (*Lampetra planeri*), which are QIs of the above SACs, are not considered in this SISAA as brook lamprey is not a diadromous fish species (i.e. it is confined to the freshwater section of the river and does not migrate to the marine environment) and so there is no potential for connectivity with the AoI.

As migratory fish migrate to and from their natal rivers, it is considered highly unlikely that migratory fish from other river systems or SACs will migrate through the South Dublin Bay SAC. Given the distance between the SI works AoI and European sites designated for migratory fish, it is highly unlikely for there to be any likely significant effects. Therefore, Annex II Migratory Fish are not considered further in this SISAA.

4.4.5 Birds

Certain species of seabird can forage considerable distances from their colonies (Woodward et al., 2019), however, given the limited size, scale and duration of the SI works, it is considered unlikely that there is a reasonable impact pathway to SPAs beyond the immediate SI works area, as it becomes increasingly unlikely that individuals from distant SPAs will be present.

Wintering waders and wildfowl tend to be fairly sedentary once they arrive in their over-wintering areas; often only moving short distances between roosting and feeding areas. Therefore, the SPAs in the closest proximity to the SI works and those that overlap the AoI have been included due to the foraging ranges of the species they support. As the proposed SI works will take place wholly within the south Dublin Bay area other SPAs for wintering birds were excluded on the basis that the proposed SI works will not take place within these sites.

Seabirds are more likely to forage in the open sea where they can access the rich foraging habitat of continental shelf waters (Cummins et al., 2019), as opposed to foraging within tidal bays where availability of fish prey may be more limited. Although breeding seabirds nesting on shorelines or structures in proximity to human activities can be disturbed from their nests by the close presence of a vessel or activities (Furness et. al., 2012), the SI works are taking place in a busy industrial, commercial and recreational bay, therefore bird species which are likely to occur here are habituated to human activities. As a precautionary measure, SPAs for seabirds within 15 km of the AoI boundary have been considered for screening.

The sites selected for consideration of bird species QIs in this SISAA are listed below:

- South Dublin Bay and River Tolka Estuary SPA;
- North Bull Island SPA;
- North-West Irish Sea SPA;
- Dalkey Island SPA;
- Howth Head Coast SPA; and
- Irelands Eye SPA.

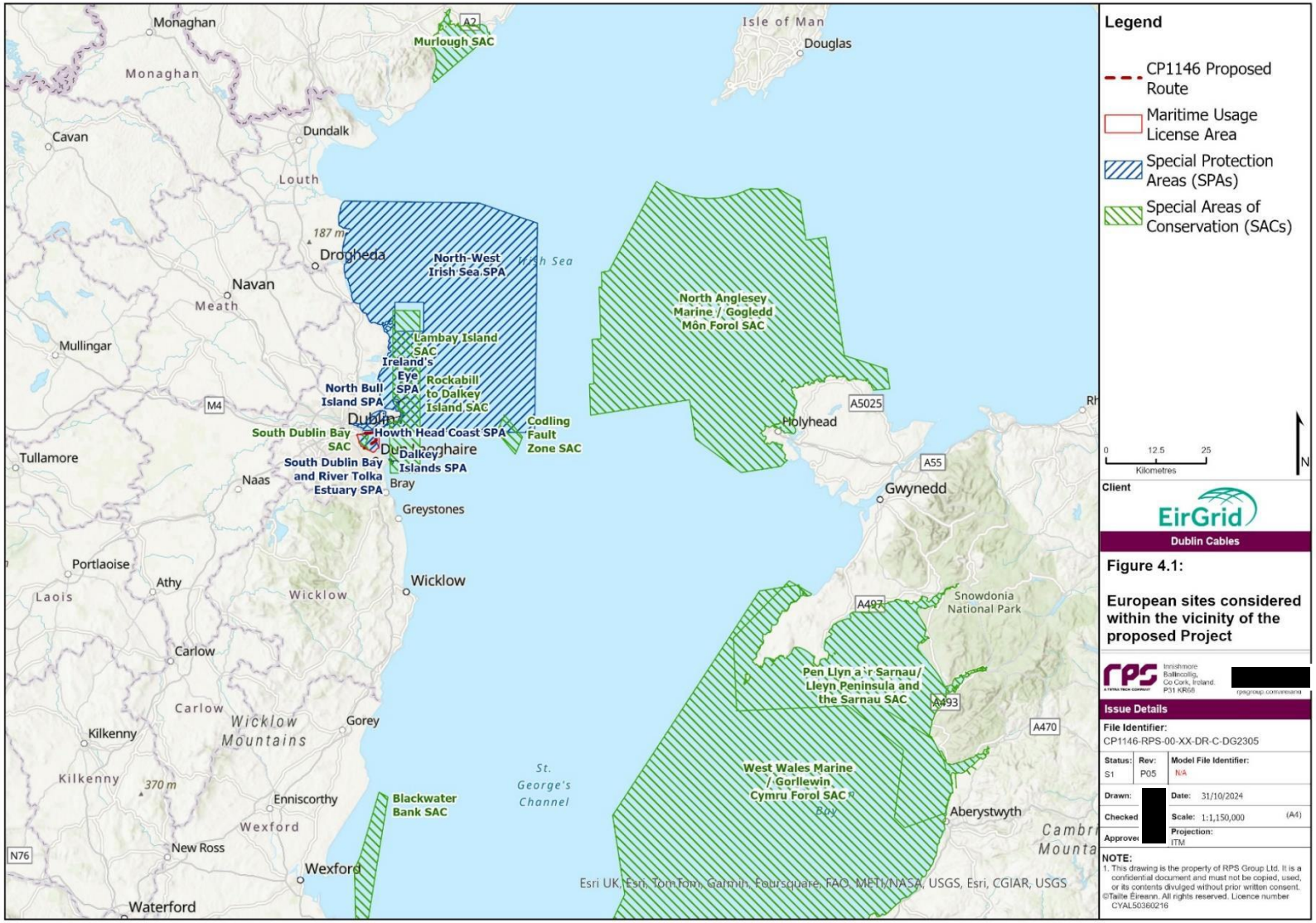

Figure 4.1 European Sites within Zone of Influence of the SI work

4.5 Conservation Objectives

The integrity of a European site is determined based on the conservation status of the QI of these sites.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as SAC and SPA. The government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

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.

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The specific conservation objectives for each European site in Ireland are available on www.npws.ie. These have been accessed for the sites listed in Table D.1 in Appendix D.

5 SUPPORTING INFORMATION FOR SCREENING FOR APPROPRIATE ASSESSMENT

5.1 Management of European Sites

The SI works are not directly connected with or necessary to the management of any European site(s).

5.2 Assessment of Likely Significant Effects

This section determines whether the impacts identified in Section 4.3 could have significant effects on the QI of the European sites identified in Section 4.4 in view of the conservation objectives of the sites. As described in Section 4.3 and Table 4.1, the potential impacts arising from the SI works are as follows:

- Visual and above water noise disturbance;
- Habitat loss, alteration and/ or fragmentation;
- Increased Suspended Sediment Concentrations (SSC);
- Underwater noise, including injury and or displacement of Annex II marine mammals, and fish from underwater noise and/or the presence of increased marine traffic;
- Accidental pollution event; and
- Risk of collision.

5.2.1 Visual and Above Water Noise Disturbance

This section assesses the potential for likely significant effects from visual and above water noise disturbance on those European sites selected for consideration in this SISAA. The assessment is based on the precautionary principle and has been undertaken in the absence of mitigation.

5.2.1.1 Annex I Habitats

Visual and above water noise disturbance will not impact on Annex I habitats.

5.2.1.2 Annex II Marine Mammals

Visual and above water noise disturbance will not impact on cetaceans.

Visual and above water noise disturbance has the potential to impact on seals if they are present within the immediate vicinity of the SI works. As there are no haul out sites for seals within the AoI or adjacent areas, no impacts will occur.

5.2.1.3 Birds

This section assesses the potential for likely significant effects (LSE) on those European sites with birds as QI where there is potential for connectivity with the AoI and the proposed SI works. The assessment is based on the precautionary principle and has been undertaken in the absence of mitigation.

Given the urban nature of the surrounding environment and the presence of public roads and railway tracks, supporting DART, commuter and freight train services, frequent dog walkers at low tide, and the use of the area for recreational purposes (e.g. sailing) there is an existing baseline level of audio and visual disturbance which fauna in the area will have become habituated to.

Overwintering bird species favour wetland and intertidal habitats for foraging and roosting, and do not forage in the offshore marine environment. SI works with the potential to interact with overwintering bird species are those in the nearshore and intertidal zones, namely:

- Geophysical surveys;

- Geotechnical and environmental sampling (vibrocores, boreholes and grab samples) from jack-up barge or tracked borehole / CPT rig;
- Ecological surveys (habitat walkover surveys, intertidal core sampling, bat activity and roost assessment surveys, mammal and ornithological surveys)

As stated in Section 4.4.5, SPAs for overwintering birds that do not spatially overlap the AoI were excluded from this assessment on the basis that the proposed SI works will not take place within these sites. However, given the proximity of North Bull Island SPA to South Dublin Bay and River Tolka Estuary SPA it is reasonable to assume that bird species found in North Dublin Bay SPA may utilise the South Dublin Bay and River Tolka Estuary SPA, therefore North Bull Island SPA QI bird species were also considered here.

There is potential for interaction between the survey types mentioned above and the following SPA for overwintering birds:

- South Dublin Bay and River Tolka Estuary SPA; and
- North Bull Island SPA.

Given the presence of these overwintering bird species, the proposed SI works potentially presents direct visual and above water noise disturbances. In an open coastal environment consisting of intertidal mudflats/sandflats, there is a low baseline for visual and above water noise disturbance. Dublin Bay's mudflats/sandflats are an open environment such that any temporary structures (e.g. jack-up barge), vessels, people and equipment will be clearly visible and audible. Therefore, the survey activities mentioned above have the potential to disturb wintering bird species (individuals or small groups) that may be within the immediate vicinity of the survey area.

For most survey types no noise or vibration will be above baseline levels (the potential landfalls are accessible recreational areas where human activities e.g., walkers, dog walkers etc regularly occur). Marine habitat surveys at the landfall locations may however disturb bird species found within the immediate vicinity of the landfall locations. Intrusive surveys that have the potential to emit noise and vibration beyond baseline levels are the geotechnical sampling (boreholes etc.) from a jack-up barge or a tracked borehole / CPT rig. It should be noted there is an existing level of baseline noise in the area due to industrial and commercial operations at Dublin Port and the Poolbeg peninsula, traffic on nearby roads, the operational railway/ DART line, and normal human activities including walkers (including dogs) in the intertidal area. The intertidal area is free of vehicles/machinery but is popular at low tide resulting in a regular, existing level of human disturbance for intertidal birds.

Wetlands are a non-annexed habitat type for the following SPAs: North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA, which is defined in NPWS (2015a, and 2015b) as follows:

> *[T]he wetland habitat in the North Bull Island and South Dublin Bay and River Tolka Estuary, [which is] a resource for the regularly occurring migratory waterbirds that utilise it.*

Wetlands provide food, shelter and breeding habitat for many species. Visual and above water noise disturbance to these wetlands have the potential to have a significant effect on QIs for which these SPAs are designated. The proposed SI works do not overlap spatially with the North Bull Island SPA therefore no direct visual and above water noise disturbance will occur to its wetland habitat. There is potential for visual and above water noise disturbance to roost sites that have been identified on the NPWS mapping of count sites, subsites and of roost sites[1] within the South Dublin Bay and River Tolka Estuary SPA , which indicate that there are four roost sites (NK14, NK09, SMAC2, SMAC1) which are within the proposed cable route corridor. To the south between Blackrock and Booterstown for common gull (*Larus canus*), black headed gull (*Chroicocephalus ridibundus*) and oystercatcher (*Haematopus Ostralegus*), and to the north along south-wall at Poolbeg for Purple Sandpiper (*Calidris maritima*), Dunlin (*Calidris alpina*) and Turnstone (*Arenaria)*.

The SI works will take place in the intertidal and subtidal areas of the South Dublin Bay and River Tolka Estuary SPA and potentially overlap with roosting sites NK14, NK09, SMAC2, and SMAC1.

There are a number of breeding seabirds known to forage in south Dublin Bay during the summer months. Seabirds from the North-West Irish Sea SPA, Dalkey Island SPA, Howth Head Coast SPA and Irelands Eye SPA may also utilise Dublin Bay. The presence of construction related visual and auditory disturbances gives rise to potential displacement of these seabirds from their foraging grounds in the bay, albeit over a

[1] https://webservices.npws.ie/arcgis/rest/services/NPWS/SscoSPA/MapServer Accessed 16 October 2024

relatively short duration (i.e., days). Dublin Bay is classified for populations of breeding tern species. Both common tern (*Sterna hirundo*) and Arctic tern (*Sterna paradisaea)* breed in Dublin Docks, on a man-made structures known as the ESB and CPL Dolphin which are located to the north of Great South Wall within the South Dublin Bay and River Tolka Estuary SPA. Arctic, common and roseate tern (*Sterna dougallii*) are also known to breed on Dalkey Islands SPA (c. 5 km southeast from the AoI). Similar to the construction related disturbances, the openness of the bay environment may cause these disturbances to impact birds from a greater distance. As such, the direct impacts from undertaking the SI works are anticipated to have some disturbance effect on breeding and foraging seabirds, potentially displacing them from Dublin Bay over a brief (less than a day) to temporary (a number of days or weeks) period. Therefore, there is potential for interaction between the survey types mentioned above and the following SPAs for breeding birds with North-West Irish Sea SPA and Dalkey Island SPA.

The physical presence of survey vessels in the marine environment, and the noise associated with the operation of survey equipment, could result in a limited degree of disturbance to birds in the vicinity of the survey vessel. Birds present on the surface waters near the survey vessels could be temporarily displaced from their chosen feeding/ resting locations. For all surveys, vessel activity in any one location will be of short duration with the vessels moving steadily forward along the transect lines (e.g. during geophysical surveys) or remaining stationary at sample locations for short durations (e.g. during geotechnical sampling and benthic sampling) before moving to the next location. This activity will not differ considerably to existing vessel activity in the region, which includes commercial shipping, ferries, fishing and recreational vessels. Birds using the area are likely to be habituated to the baseline levels of activity and are unlikely to be significantly disturbed by the presence of a maximum of two survey vessels operating within the AoI.

The operation of vessels and equipment in the nearshore areas of the AoI have the potential to disturb nesting/breeding birds i.e. Tern species.

The following SPA have therefore been screened in for Appropriate Assessment:

- **South Dublin Bay and River Tolka Estuary SPA,**
- **North Bull Island SPA,**
- **North-West Irish Sea SPA,**
- **Dalkey Island SPA.**

5.2.2 Habitat loss, alteration, and/or fragmentation

This section assesses the potential for likely significant effects from habitat loss, alteration, and/or fragmentation on those on those European sites selected for consideration in this SISAA. The assessment is based on the precautionary principle and has been undertaken in the absence of mitigation.

5.2.2.1 Annex I Habitats

The AoI overlaps one SAC for Annex I habitats which is the South Dublin Bay SAC. All other SACs which contain Annex I QI habitats have been screened out of this assessment as the SI works will have no overlap/ interaction with the habitats in those European sites.

As identified in Table 4.1, there is the potential for habitat loss, alteration, and/or fragmentation to these Annex I habitats as a result of the environmental surveys and geotechnical investigations. The distribution of the annexed habitats within the South Dublin Bay SAC are presented in the conservation objectives document (NPWS, 2013). The annexed habitats for which the South Dublin Bay SAC is designated occur in the intertidal area, i.e. "*Mudflats and sandflats not covered by seawater at low tide*".

The proposed locations for SI works are shown in the drawings in Appendix A.

There is potential for temporary habitat disturbance to the Annex I habitat type *"Mudflats and sandflats not covered by seawater at low tide" as* a result of the following intrusive survey types: geotechnical surveys (boreholes, CPT and vibrocores including disturbance from placement and anchoring of the jack-up barge) and environmental surveys i.e. marine habitat surveys. With respect to sedimentary communities and habitats (i.e., sand, gravelly sand), sediment removal and disturbance from intrusive techniques will affect small areas in the context of the wider SAC.

The metocean and grab sample surveys will be conducted wholly within the subtidal area of the AoI therefore there is no potential for habitat loss, alternation and/or fragmentation to Annex I habitats due to the proposed SI works..

The geotechnical surveys which will be conducted within the intertidal area include: six boreholes, seven vibrocores and CPTs and 13 locations for the jack up barge legs. The total area impacted by the six boreholes equates to 0.05m^2, which is approximately 0.0000007% of the total mudflat and sandflat area in the SAC (which is 720 ha (NPWS, 2013)). The total area impacted by the seven vibrocores equates to 0.12m^2 whereas the total area impacted by the CPT equates to 0.01m^2. The vibrocore samples are approximately 0.000002% and the CPT samples are approximately 0.00000008% of the total mudflat and sandflat area in the SAC (which is 720 ha (NPWS, 2013)). The total area impacted by the jack up barge equates to 163m^2 (total across 13 investigation locations), which is approximately 0.002% of the total mudflat and sandflat area in the SAC (which is 720 ha (NPWS, 2013)).

Marine habitat surveys will require core sampling to characterise fauna, particle size analysis and total organic carbon. Nine transect stations will be selected per landfall with three sampling points along each therefore 27 sampling points will be conducted. The total area impacted by the marine habitat surveys equates to 0.27m^2 which is approximately 0.000004% of the total mudflat and sandflat area in the SAC (which is 720 ha (NPWS, 2013)). Intertidal survey methods (cores) as listed in Section 2.2.3 will also have minimal impacts on the nearshore environment.

The total area impacted by the boreholes, CPT and vibrocores including disturbance from placement and anchoring of the jack-up barge and environmental surveys equates to 164m^2 which is approximately 0.002% of the total mudflat and sandflat area in the SAC (which is 720 ha (NPWS, 2013)). Therefore, given the nature and scale of the habitat characterisation surveys and as the habitats will recover quickly, within one or two tidal cycles.

The SI works will not interact with *annual vegetation of drift lines* as this habitat occurs above the high-water mark (NPWS, 2015c).

Embryonic shifting dunes are recorded above *annual vegetation of drift lines* and above the high-water mark and therefore the SI works will not interact with these Annex I habitats.

The SI works will also not interact with *salicornia and other annuals colonising mud and sand*. A small area occurs in the lee of an *embryonic sand dune* just north of Booterstown Station (NPWS, 2015c) but this is remote from the SI works area and therefore no impact will occur.

Taking the above into consideration, **there is no likely significant effects due to habitat loss, alteration and/ or fragmentation of Annex I habitat mudflats and sandflats not covered by seawater at low tide, annual vegetation of drift lines, salicornia and other annuals colonising mud and sand, and embryonic shifting dunes of the South Dublin Bay SAC**.

5.2.2.2 Annex II Marine Mammals

The proposed SI works do not overlap spatially with European sites designated for Annex II marine mammals i.e. harbour porpoise, bottlenose dolphin, grey seal and harbour seal, therefore there is no risk of direct habitat loss, alteration and/or fragmentation to haul-out sites or supporting habitats for these species.

Likely significant effects due to habitat loss, alteration or fragmentation can be ruled out for European sites with marine mammals as QI.

5.2.2.3 Birds

As stated in Section 5.2.1, wetlands are a non-annexed habitat type for North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA. As the proposed SI works do not overlap spatially with the North Bull Island SPA no direct habitat loss, alteration and/or fragmentation will occur.

As stated in Section 5.2.1, four roost sites (NK14, NK09, SMAC2, SMAC1) were identified within the proposed cable route corridor which is within the South Dublin Bay and River Tolka Estuary SPA, to the south between Blackrock and Booterstown for common gull (*Larus canus*), black headed gull (*Chroicocephalus ridibundus*)

and oystercatcher (*Haematopus Ostralegus*), and to the north along south-wall at Poolbeg for Purple Sandpiper (*Calidris maritima*), Dunlin (*Calidris alpina*) and Turnstone (*Arenaria).*

Given that the works will take place in the intertidal and subtidal areas of the South Dublin Bay and River Tolka Estuary SPA and potentially overlap with roosting sites NK14, NK09, SMAC2, and SMAC1. **Likely significant effects to the wetland habitat of the South Dublin Bay and River Tolka Estuary SPA due to habitat loss, alteration and/ or fragmentation cannot be excluded.**

5.2.3 Increased suspended sediment concentrations (SSC) in the marine environment.

This section assesses the potential for likely significant effects from increased suspended sediment concentrations (SSC) on those European sites selected for consideration in this SISAA. The assessment is based on the precautionary principle and has been undertaken in the absence of mitigation.

5.2.3.1 Annex I Habitats

The deployment of metocean equipment to the seafloor will have an extremely small footprint (2-3m^2 out of a survey area of 21,010,000 m^2) and as a result there will be negligible amounts of sediments released into the water column. Given the water depth, tidal influence, and the currents in South Dublin Bay, any sediment entering the water column from deployment and recovery of metocean equipment will rapidly disperse.

There is potential for increased SSC arising from the marine environmental and the geotechnical surveys which has the potential to result in indirect effects of Annex I habitats of the South Dublin Bay SAC. As stated above in Section 5.2.2, the total area sampled for boreholes equates to 0.0000007%, for vibrocores the total area sampled equates to 0.000002%, for CPT the total area sampled equates to 0.00000008% of the total mudflat and sandflat area in the SAC. Increased SSC and smothering may also occur from other activities such as use of anchors, positioning of equipment on the seabed (e.g., jack-up barge legs). As stated above in Section 5.2.2, the total area impacted by the jack up barge equates to 163 m^2, which is approximately 0.002% of the total mudflat and sandflat area in the SAC. There is potential for limited SSC within the immediate footprint of the vibrocores, CPT, boreholes, environmental grab sampling, and when anchoring/ spudding the jack up barge. However, due to the small area sampled within the Annex I mudflat and sandflat habitat i.e. 164m^2 in total, and the small number of sites for each survey (six boreholes, 27 marine habitat survey points, seven vibrocores and CPTs, and 13 locations for the jack up barge), SSC for the proposed SI works will be negligible. Given the water depth, tidal influence, and the currents within South Dublin Bay, any sediment from marine environmental and geotechnical surveys entering the water column will rapidly disperse. **Therefore, there will be no likely significant effects to Annex I habitats of South Dublin Bay SAC due to increased SSC.**

5.2.3.2 Annex II Marine Mammals

The proposed SI works do not overlap spatially with European sites designated for Annex II marine mammals i.e. harbour porpoise, bottlenose dolphin, grey and harbour seal, therefore there is no risk increased SSC to haul-out sites or supporting habitats for these species. **Likely significant effects due to increased SSC can be ruled out for all marine mammal SACs.**

5.2.3.3 Birds

There is potential for indirect effects to SPA QI birds due to SSC impacts on fish prey species. The SI works will take place over a relatively limited extent of the AoI (total sampled area of 164m^2 of the Annex I mudflats and sandflats of South Dublin Bay SAC), particularly when considered alongside the wider availability of suitable habitat within the SPA and surrounding areas. In addition, there will be no significant increase in SSC as a result of the SI works and therefore no likely significant effects on fish prey species.

Therefore, there will be no likely significant effects on the bird species of the South Dublin Bay and River Tolka Estuary SPA, the North Bull Island SPA, the North-West Irish Sea SPA, Dalkey Island SPA, Howth Head Coast SPA and Irelands Eye SPA due to increased SSC.

5.2.4 Underwater noise (incl. injury and/or displacement from increased marine traffic)

This section assesses the potential for likely significant effects from underwater noise on those European sites selected for consideration in this SISAA. The assessment is based on the precautionary principle and has been undertaken in the absence of mitigation.

There is potential for effects as a result of the underwater noise emitted by the following marine-based SI works: marine geophysical and geotechnical survey, and marine environmental works, deployment, and recovery of metocean equipment along with the presence of the survey vessels.

An underwater (subsea) noise assessment was carried out using indicative noise sources for the marine SI works. The assessment and results are presented in the Subsea Noise Technical Report in Appendix B. A summary of the equipment proposed to be used in the SI Works and modelled for the Subsea Noise technical Report is provided in Section 2.2.6.

When assessing the potential impact of underwater noise sources on the marine environment a range of variables such as source level, frequency, duration, and directivity were considered. Increasing the distance from the sound source usually results in attenuation with distance. The factors that affect the way noise propagates underwater include: water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed type and thickness. When sound encounters the seabed the amount of noise/sound reflected back depends on the composition of the seabed, i.e., mud or other soft sediment will reflect less than rock. The water depth in the South Dublin Bay ranges from 0 to 10m with a mixed substrate type of sand, gravelly sand and mud. Given the acoustically soft sediment nature of the ZoI sound will reflect less than acoustically harder seabeds such as rock.

The active acoustic instruments, such as those proposed on this survey, operate by emitting extremely short pulses and are and are highly directional with narrow beams (Ruppell et al, 2022). While the swathe of the sonars and echosounders will have a maximum range of 6 to 60m in diameter, many of the sources used for this survey, such as multibeam, side-scan sonar, sub-bottom profilers (SBP), Ultra Short Base-Line positioning system (USBL), chirper/pinger, and sparker operate at high frequency and attenuate quickly as they spread from the source. Coupled with the narrow beam angle and short duty cycles (‘on’ for microseconds or milliseconds per second) means that surveying sonars have relatively low acoustic impact.

5.2.4.1 Annex I Habitats

Underwater noise will not impact on habitats.

5.2.4.2 Annex II Marine Mammals

Auditory injury in marine mammals can be defined as a permanent threshold shift (PTS) leading to non-reversible auditory injury, or as a temporary threshold shift (TTS) in hearing sensitivity, which can have negative effects on the ability to use natural sounds (e.g., to communicate, navigate, locate prey) for a period of minutes, hours, or days. With increasing distance from the sound source, where it is audible to the animal, the effect is expected to diminish through identifiable stages (i.e., PTS or TTS in hearing, avoidance, masking, reduced vocalisation) to a point where no significant response occurs. Factors such as local propagation and individual hearing ability can influence the actual effect (DAHG, 2014).

The DAHG “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters” 2014 contains the following statement:

“It is therefore considered that anthropogenic sound sources with the potential to induce TTS in a receiving marine mammal contain the potential for both (a) disturbance, and (b) injury to the animal.”

This states that TTS constitutes an injury and should thus be the main assessment criteria[2]. However, the guidance goes on to specify the use of thresholds from a 2007 publication (Southall et al., 2007) which has

[2] Injury being the qualifying limit in the Irish Wildlife Act 1976, section 23, 5c : https://www.irishstatutebook.ie/eli/1976/act/39/enacted/en/print#sec23

since been superseded (by (Southall, et al., 2019)) and no longer represents best available science, nor reflects best practice internationally. Thus, the following excerpt from the guidance is relevant:

"The document will be subject to periodic review to allow its efficacy to be reassessed, to consider new scientific findings and incorporate further developments in best practice."

As there has been no such update to date, but the guidance clearly states intent, we have applied the latest guidance, reflecting the current best available method for assessing impact from noise on marine mammals.

Should the noise levels from sources exceed the thresholds, there is the potential for underwater noise generated during the geophysical survey to result in injury and/or disturbance to marine mammals in the vicinity of the SI works.

Marine mammal species can be split into functional hearing groupings, according to their frequency-specific hearing sensitivity (Southall *et al*., 2019). The Subsea Noise Technical Report (refer to Appendix B) assessed all hearing groups, however the following section will focus on those marine mammal species which are the QI of the European sites brought forward for consideration in this SISAA. These QI are harbour porpoise, bottlenose dolphin, grey seal and harbour seal. Harbour porpoise belong to the Very High Frequency (VHF) group, bottlenose dolphin belong to the High Frequency (HF) group and seals are considered phocid carnivores in water (PCW).

From Section 6.2 and 6.3 of the Subsea Noise Technical Report (Appendix B), in the absence of mitigation, the following worst-case distances from the sound source were modelled for impact to the various hearing groups:

HF Group (bottlenose dolphin):

- PTS out to 50 m from the sound source.
- TTS out to 310 m from the sound source.
- Behavioural disturbance out to 8000 m from the sound source.

VHF hearing group (harbour porpoise):

- PTS out to 500 m from the sound source.
- TTS out to 2,800 m from the sound source.
- Behavioural disturbance out to 8000 m from the sound source.

PCW hearing group (seals):

- PTS out to 10 m from the sound source.
- TTS could occur within 180 m of the sound source.
- Behavioural disturbance out to 8000 m from the sound source.

All of the above distances relate to the geophysical survey which presents the worst-case scenarios.

Based on the above distances, it is reasonable to screen out all European sites that are remote from the SI works AoI, i.e. greater than the behavioural disturbance distance out to 8000 m from the AoI. This will rule out all of the considered European sites except Rockabill to Dalkey Island SAC and Lambay Island SAC.

In the absence of mitigation, likely significant effects due to underwater noise disturbance cannot be excluded for the marine mammals which are QIs of:

- **Rockabill to Dalkey Island SAC**
- **Lambay Island SAC**

5.2.4.3 Birds

There is potential for diving seabirds to interact with the SI works while underwater noise is being produced. The following SPAs are designated for the protection of diving species, including cormorant, shag, red-throated diver and common scoter:

- North-West Irish Sea SPA;
- Dalkey Island SPA;

- Howth Head Coast SPA; and
- Irelands Eye SPA.

Hartley Anderson Limited (2020) provide a summary of the available evidence on the auditory abilities and effects of underwater noise of diving birds, however, this evidence is very limited. While seabird responses to approaching vessels are highly variable (e.g. Fliessbach et al. 2019), flushing disturbance would displace most diving seabirds from close proximity to the survey vessel and any towed equipment, thereby limiting their exposure to the highest sound pressures generated. Similarly, behavioural disturbance of seabirds due to acoustic survey activities is most likely to be temporary displacement associated with the physical presence of the vessel, comparable to that experienced by routine shipping traffic (Hartley Anderson Limited, 2020). Given the limited extent of sound-producing activity, the limited time diving birds spend underwater, and given that birds are likely to be temporarily displaced to the surrounding area due to the presence of the vessel, it is considered that there is a very low likelihood of interaction between underwater noise sources and diving birds during the proposed SI works.

Therefore, there will be no likely significant effects and the above SPAs, to the extent that they are designated for diving QI species are screened out from further assessment.

5.2.5 Accidental pollution event

The proposed marine SI works will result in a slight increase in the number of vessels using the area for a temporary period. Although the increase is slight, this could in theory increase the risk of an accidental release of pollutants (e.g., fuels, oils, and lubricants) to the marine environment, which has the potential to result in toxic effects to Annex I benthic habitats and in turn on Annex II species that rely on these habitats for food. Notwithstanding that water quality is not, in and of itself a qualifying interest, it is self-evident that high water quality is the vital and crucial component underpinning and supporting certain ecological structures and functions of the SPA.

Dublin Bay is a busy commercial port and in 2023 Dublin Port accounted for 59% of all vessel arrivals in Irish ports (CSO, 2024[3]). Dun Laoghaire was the second busiest port regarding cruise ships in 2023 with 75 arrivals. Along the northern boundary of the MULA and the proposed cable route corridor on the approaches to Dublin Port to the north and Dun Laoghaire Harbour to the east vessel routes per sq km per year[4] range from 19,848 at Dublin Port to 1,805 at Dun Laoghaire Harbour EMODnet (2024[4]). Routes per sq km per year are less frequent within the MULA ranging from five to 66 routes. Tanker ship routes along the northern boundary of the MULA at Poolbeg range from 626 to 1,057, while to the south at Dun Laoghaire Harbour to the east of the proposed cable route corridor routes are below four. Passenger vessel routes at Dublin Port were 8,164 and 547 at Dun Laoghaire Harbour. Classified as “other vessels” by EMODnet (2024[4]), vessel routes at Dublin Port ranged from 2,018 to 5,375 and at Dun Laoghaire Harbour routes were below 2,000 per year. Fishing activity was concentrated Dun Laoghaire Harbour with routes ranging from 114 to 490 per year. Further north of the bay routes adjacent to the MULA for fishing vessels were less frequent ranging from five to 12. Cargo vessel activity was concentrated at Dublin Port where 6,047 routes were as at Dun Laoghaire Harbour routes per year were as low as two. Based on the above the areas surrounding the MULA are used frequently by a range of vessels. Given that the surveys would amount to, at most, two additional small vessels operating in this area (including a jack up barge), the likelihood of a collision resulting in a pollution event is considered insignificant. As vessels are required by law to adhere to regulations governing accidental leakages and spillages similarly the likelihood of such an occurrence is considered very unlikely. All vessels operating in the marine environment must also adhere to the International Convention for the Prevention of Pollution from Ships (MARPOL) which is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. In addition, all substances handled and/or used whilst undertaking the works are required to be handled, used, stored, and documented in accordance with assessments and the Chemicals Act 2008 (No. 13 of 2008) and Chemicals (Amendment) Act 2010 (No. 32 of 2010) and associated Regulations.

[3] https://www.cso.ie/en/releasesandpublications/ep/p-spt/statisticsofporttrafficq4andyear2023 Accessed 15 October 2024

[4] EMODnet Route Density data for the years 2019-2023 for all vessels https://emodnet.ec.europa.eu/geoviewer/ Accessed 15 October 2024

Given the nature of the proposed SI works, their limited scale and duration, and the insignificant increase in vessel activity, it is considered highly unlikely that there will be a pollution incident, e.g., accidental spills of small quantities of fuel. **Therefore, this effect is screened out from further assessment.**

5.2.6 Risk of Collision

Vessel strikes are a known cause of mortality in marine mammals (Laist *et al*., 2001). Non-lethal collisions have also been documented (Laist *et al*., 2001; Van Waerebeek *et al*., 2007). Injuries from such collisions can be divided into two broad categories: blunt trauma from impact and lacerations from propellers. Injuries may result in individuals becoming vulnerable to secondary infections or predation.

A maximum of two vessels will be operating at any one time within the AoI. Due to the nature of the surveys, the vessels will be travelling at low speeds or stationary.

Dublin Port is a major shipping area which services upwards of ~5000 vessels from Q1 to Q3 of 2024. Harbour porpoises and other mammals are likely to be habituated to marine traffic, and the increase in vessel traffic as a result of the proposed surveys is very low and temporary. On this basis it is predicted that collisions between survey vessels and harbour porpoise, grey and harbour seals will be extremely unlikely. No likely significant effects are predicted as a result of collision with survey vessels.

It is considered highly unlikely that there would be any significant effects to marine species as a result of collision with survey vessels. **Therefore, this effect is screened out from further assessment.**

5.3 In-combination effects

Even if projects are unlikely to have significant effects on their own, the effects in-combination with those of other plans or projects could be significant. An in-combination assessment has been carried out to identify other projects/plans that could act in-combination with the SI works to affect site conservation objectives (in accordance with OPR, 2021).

Potential impacts related to the proposed SI works are described in Section 4.3 of this SISAA Report, and in the absence of mitigation, the proposed SI works individually have the potential to give rise to likely significant effects, namely visual and above water noise disturbance, habitat loss, alteration, and/or fragmentation and underwater noise.

Other plans/ projects that have the potential to act in-combination with the proposed SI works are considered to be those that are likely to contribute to the effects identified. On this basis, a range of other plans and projects were considered in terms of their potential to have in-combination effects with the proposed SI works.

MARA's approach for identifying plans or projects with the potential to act in-combination was used coupled with professional and scientific judgement to identify those relevant plans and projects which have the potential for in-combination effects with the proposed SI works. The key steps for assessing cumulative effects based on MARAs *"stepwise approach"* are as follows:

1. Defining the Cumulative Effects Spatial Scope (CESS);
2. Defining the Cumulative Effects Temporal Scope (CETS);
3. Impact identification;
4. Pathway identification;
5. Prediction;
6. Identification of Plans or Projects that could act in combination;
7. Screening Stage Cumulative Effects Assessment conclusion; and
8. Managing cumulative impacts - to be carried out as part of Stage 2 AA process.

The CESS was identified as 5 km and the CETS was identified as two years. The CESS is based on the acoustic survey equipment deterrence ranges as per JNCC (2020), and the CETS is defined as the Maritime Usage Licence period. However, a further search of projects within the last five years was undertaken to ensure any potential cumulative effect of overlapping licence periods for past projects was considered. The potential impacts were identified in the absence of mitigation in Section 4.3 of this SISAA Report. The pathway and prediction of these impacts are also discussed in Section 4.3 of this SISAA Report.

A desk study using online sources was undertaken to determine a list of projects within the zone of impact of the proposed SI works which may have the potential to give rise to in-combination effects. These searches are summarised below:

- Foreshore Applications https://www.gov.ie/en/foreshore-notices/; Accessed 21/10/2024;
- EPA Dumping at Sea (DaS) boundaries; https://gis.epa.ie/GetData/Download Accessed 21/10/2024;
- MARA website for Maritime Usage Licences and Maritime Area Consents https://www.maritimeregulator.ie/ Accessed 21/10/2024;
- An Bord Pleanála (ABP) case search for marine Strategic Infrastructure Development and other marine developments https://www.pleanala.ie/en-ie/case-search#pnlAllFilters Accessed 21/10/2024.

A full list of each planning and foreshore application for the last five years was reviewed and is available in Appendix C.

5.3.1 Projects

There are two dredge projects ongoing by Dublin Port (FS007132 and FS007164). FS007132 has a licence term until the 30/09/2029 while FS007164 has a licence term until 13/12/2031. Dredging activities give rise to increased SSC and therefore nearby SACs and SPAs including those species for which they are designated may be impacted. These dredging activities do not overlap spatially with the AoI, however there is potential for temporal overlap as the licence periods for these dredging activities extends to 2029 and 2031 respectively. As stated above in Section 5.2.3 the proposed SI works will not cause likely significant effects due to increased SSC. Therefore no in-combination effects with the two dredge projects is considered likely and they are screened out.

There are 20 Dumping at Sea (DaS) boundaries within 5 km of the AoI. None are located within the AoI. These DaS permits ended most recently in 1996. Four of these are located at Dublin Port at the ferry terminal at North Wall between 500 m and 1.4 km northwest of the AoI. The remaining DaS boundaries are located further offshore to the east of the AoI at the mouth of Dublin Bay. There is no potential for in-combination effects with these DaS boundaries as the proposed SI works do not overlap these boundaries and that the most recent date of permit was in 1996. Therefore, there will be no in-combination effects with DaS and the proposed SI works and they are screened out.

There are nine port developments ongoing at Dublin Port and the surrounding environs these include: 320250, 307080, 301798, 304888, 309812, 313918, FS006893, FS006806.

Application 320250 relates to the 3FM project which is Dublin Port's third and final Masterplan 2040 Project. Its primary focus is on the Poolbeg Peninsula and includes the construction of a new bridge across the River Liffey. A new Maritime Village, public park and enhanced public and community amenity will also be provided. The 3FM project planning boundary overlaps the Dublin Cables MULA to the north-east (east of Poolbeg Lighthouse). The application was lodged with An Bord Pleanála on 23rd July 2024 and , according to the case file, it is due to be decided by the 06/02/2025. The application notes that there will be a 12-18 month design and procurement period post-consent and anticipates that construction will only commence on-site in H2 2027. Therefore, it is highly unlikely that any construction works for 3FM will commence within the lifetime of this MUL and in-combination effects with the 3FM project have been screened out.

ABP applications 307080, 309812, 313918 relate to onshore works which do not spatially overlap the AoI. Works on 307080 have commenced and will be completed by the end of 2024, therefore there will be no temporal overlap with the proposed SI works.

309812 was granted permission to increase capacity at the powerplant at Dublin port which is currently operational.

309812 will not spatially or temporally overlap with the proposed SI works therefore there will be no in-combination effects.

313918 relates to North Wall Power Generating Station. It is currently at permitting stage and will be developed in a single phase, the project is set to start construction in 2025 and begin commercial operation in 2026. The proposed project is not within the AoI and will not have in-combination effects with the SI works.

ABP application 301798 may give rise to water quality issues within Dublin Bay as this application intends to use the outfall pipe in Dublin Bay to release treated effluent. However, the proposed SI works will not contribute to a decrease in water quality within the Bay and therefore there will be no in-combination effects.

Applications 304888/ FS006893 relate to the MP2 Project of the Dublin Port Masterplan for a 15-year planning permission for development at Oil Berth 3 and Oil Berth 4, Eastern Oil Jetty and at Berths 50A, 50N, 50S, 51, 51A, 49, 52, 53 and associated terminal yards to provide for various elements including new Ro-Ro jetty and consolidation of passenger terminal buildings. Permission was granted in July 2020. There is no spatial overlap between that project and the SI works. There may be temporal overlap in activities. However, the activities associated with 304888 will occur on the northern side of the River Liffey. There is unlikely to be any impact resulting from any temporal overlap. As a result, there will be no likely significant in-combination effects on any European sites**.**

A further port development application by Dublin Port was for FS006806, this project has been constructed and is operational. Therefore, there is no potential for in-combination effects between the proposed SI works and FS006806.

Application 320768 to An Bord Pleanála is for the Codling Wind Park. The application was lodged on 6th September 2024 and is due to be decided by An Bord Pleanála in April 2025. The cable route for the Codling Wind Park traverses the AoI for the SI works. The application includes a four year construction programme with landfall works commencing in year 2. It is therefore considered unlikely that construction works for the Codling Wind Park will take place within the timeframe for the SI works. Therefore, it is highly unlikely that any construction works for Codling Wind Park will have an in-combination effect with the SI works and therefore the project has been screened out.

There are six foreshore licence applications for SI works which have the potential for in-combination effects with the proposed SI works, these are: FS007546, FS007188, FS007029, FS007472, FS007367, and FS007134. There are also three MULs: LIC230016, MUL230034, and LIC230007.

The following applications have been determined or granted with conditions:

- FS007546 Codling Wind Park site investigations.
- FS007188 RWE Renewables Ireland Ltd. site investigations for the proposed Dublin Array Offshore Wind Farm.
- FS007029: Innogy Renewables Ireland Ltd. site Investigation for Dublin Array at Kish and Bray Banks, and
- LIC230016: Microsoft Ireland Operations Ltd. geophysical survey and site investigations for a proposed subsea fibre optic cable between Anglesey and Dublin with landfall in Dublin Bay.

The site investigations to be undertaken as part of the above permissions, may result in in-combination effects with the SI works in terms of underwater noise and visual and above water noise. **Therefore, these site investigation projects are screened in.**

MUL230034 spatially overlaps the AoI and **therefore has the potential for in-combination effects and is screened in**.

The following projects are at application stage:

- FS007472,
- FS007367, and
- FS007134.

Geotechnical and geophysical survey activities have the potential to act in-combination with the proposed SI works. These foreshore applications were at early stages of application when Government policy changed to a plan-led approach for the development of offshore wind projects post Phase One. As a result, it is considered unlikely that any of the undetermined foreshore licences for developer-led SI works will be progressed within the CETS of the proposed SI works and these three projects are screened out.

LIC230007 does not spatially overlap the AoI of the proposed SI works. A final decision on this MUL has not yet been concluded. However, as there is no spatial overlap between the AoI and this MUL area, no in-combination effects will arise.

Other foreshore applications are FS006786, FS007180, FS005691 and FS007290. These projects are determined and have licence period of between five (FS007180) to 35 years (FS005691).

FS006786 application was to use, occupy and maintain St. Michaels Pier. The works will not reduce habitat area/cause habitat or species fragmentation. There will be no reduction in species density and there will be

no discharge to the water column or direct discharge of pollutants therefore water quality will not be affected. Therefore, there is no potential for in-combination effects between FS006786 and the proposed SI works.

There is no spatial overlap between FS007180 and the proposed SI works, the deployment of the data buoy has the potential to contribute to increased SSC due to the mooring system used. However given its small footprint (1m^2), and that the data buoy will not produce underwater noise there is no potential for in-combination effects between FS007180 and the proposed SI works.

FS005691 relates to the construction of a storm water discharge outfall pipe at Clontarf. There is no spatial overlap between FS005691 and the proposed SI works. Phase two works were programmed to be completed in September 2024. The storm outfall will flow into north Dublin Bay. As there is no spatial overlap and given the tidal nature of Dublin Bay, no in-combination effects will arise from FS005691 and the proposed SI works.

There is no spatial overlap between the proposed SI works and FS007290, these works were completed in June 2024 therefore there is no potential for in-combination effects.

There are four other projects that have the potential to cause in-combination effects due to disturbance these are: 313727, 316225, 313509 and 313738. The first three of these projects (313727, 316225, 313509) are onshore applications where works will be conducted above the high-water mark.

313727 and 316225 works will be carried out at St. Vincent's Hospital. These works are 2 km from the AoI, separated by a busy roadway and DART line. Therefore, there is no potential in-combination effects with the proposed SI works.

313509 works will take place along the bus route in Blackrock. This area is already a busy, residential and commercial area, therefore relative to background levels the works proposed combined with the proposed SI works will not contribute to disturbance above the baseline and therefore there will be no in-combination effects.

313738 was granted permission for a new outfall structure to the River Liffey and all ancillary site works. 313738 does not spatially overlap the AoI for the proposed SI works. Therefore, there is no potential for in-combination effects.

5.3.2 Plans

A search was conducted of national, regional and local plans which were deemed relevant using planning portals and datasets. This list is not exhaustive of all plans and programmes, but instead focuses on plans which may result in an in-combination effect.

The plans that are considered in-combination with the SI works:

- The Climate Action Plan 2024;
- River Basin Management Plans (RBMP);
- Designated Maritime Area Plans (DMAPs);
- Transmission Development Plan 2023-2032;
- Dún Laoghaire-Rathdown County Development Plan 2022-2028;
- Dún Laoghaire-Rathdown County Council's Climate Action Plan 2024-2029;
- Dublin City Development Plan 2022-2028; and
- Dublin Port Masterplan 2012-2040
- Poolbeg West Strategic Development Zone (SDZ)

5.3.2.1.1 The Climate Action Plan 2024

The *Climate Action Plan 2024*[5] (CAP24) is the third annual update to Ireland's *Climate Action Plan 2019*. It implements the carbon budgets and sectoral emissions ceilings and sets out a roadmap for taking decisive

[5] https://www.gov.ie/en/publication/79659-climate-action-plan-2024/ Accessed October 2024

action to halve our emissions by 2030 and reach net zero no later than 2050, as committed to in the Programme for Government. CAP24 sets out how Ireland can accelerate the actions that are required to respond to the climate crisis, putting climate solutions at the centre of Ireland's social and economic development.

Section 12.4.1 of CAP24 notes that achieving further emissions reductions between now and 2030 requires a major step up across three key measures:

- Accelerate and increase the deployment of renewable energy to replace fossil fuels;
- Deliver a flexible system to support renewables and demand;
- Manage demand.

The proposed SI works will support the Carrickmines to Poolbeg Cable Replacement project, which is part of the overall installation of the Dublin Bay Cables. The Dublin Bay Cables project will contribute to accelerating and increasing the deployment of renewable energy to replace fossil fuels and delivering a flexible system to support renewables and demand. The proposed SI works, which form an essential step in delivering the Dublin Bay Cables project, are therefore considered to align with CAP24.

The CAP24 does not establish specific works or projects to achieve the plan objectives, **as such there is no potential for in-combination effects with the SI works.**

5.3.2.1.2 River Basin Management Plans (RBMPs)

The Water Framework Directive (WFD) sets out the environmental objectives which are required to be met through the process of river basin planning and implementation of those plans. Specific objectives are set out for surface water, groundwater, and protected areas. The challenges that must be overcome in order to achieve those objectives are very significant. Therefore, a key purpose of the River Basin Management Plan (RBMP) is to set out priorities and ensure that implementation is guided by these priorities. Overall, RBMPs assesses the quality of water in Ireland and presents detailed scientific characterisation of our water bodies. The characterisation process also takes into account wider water quality considerations, such as the special water-quality requirements of protected areas. The characterisation process identifies those water bodies that are At Risk of not meeting the objectives of the WFD, and the process also identifies the significant pressures causing this risk. Based on an assessment of risk and pressures, a programme of measures has been developed to address the identified pressures and work towards achieving the required objectives for water quality and protected areas.

The 2nd cycle River Basin Management Plan (RBMP) for Ireland 2016-2021 set out the actions that Ireland will take to improve water quality and achieve 'good' ecological status in water bodies (rivers, lakes, estuaries and coastal waters) by 2021. Changes from previous River Basin Management Plans is that all River Basin Districts are merged as one national River Basin District. The Plan provides a more coordinated framework for improving the quality of our waters — to protect public health, the environment, water amenities and to sustain water-intensive industries, including agri-food and tourism, particularly in rural Ireland. The first cycle of River Basin Management Plans summarised the waterbodies that may not meet the environmental objectives of the WFD by 2015 and identified which pressures are contributing to the environmental objectives not being achieved. The plans described the classification results and 33 identified measures that can be introduced in order to safeguard waters and meet the environmental objectives of the WFD: The River Basin Management Plan for Ireland (2018-2021) outlined the new approach that Ireland will take to protect our waters over the period to 2021. It builds on lessons learned from the first planning cycle in a number of areas:

- Stronger and more effective delivery structures have been put in place to build the foundations and momentum for long-term improvements to water quality.
- A new governance structure, which brings the policy, technical and implementation actors together with public and representative organisations. This will ensure the effective and coordinated delivery of measures.

The 3rd River Basin Management Plan for Ireland 2022 – 2027 was published on 3rd September 2024 by the Department of Housing, Local Government and Heritage (DHLGH) in line with the EU Water Framework Directive (WFD) (2000/60/EC). It aims to build on the initiatives of the second cycle, to ensure that our natural waters are sustainably managed and that freshwater resources are protected so as to maintain and improve Ireland's water environment. There is a strong focus on the governance and implementation structures, and aims to improve the establishment of Uisce Éireann (Irish Water), An Fóram Uisce (the Water

Forum), the Local Authority Waters Programme and the Agricultural Sustainability Support and Advisory Programme.

Future developments are required to comply with the objectives and all development proposals will be required to demonstrate compliance with the requirements of the Water Framework Directive and the River Basin Management Plan for Ireland 2022-2027 to ensure impacts on water quality are avoided. **There is no potential for in-combination effects between the RBMP and the proposed SI works as these management plans provide for cleaner and less polluted ground and surface water.**

5.3.2.1.3 Designated Maritime Area Plans (DMAPs)

To ensure coordinated and strategic marine and coastal planning at regional and local levels, Designated Maritime Area Plans (DMAPs) are necessary. All Designated Maritime Area Plans prepared in the coming years will need to actively take into account the expansion of Ireland's marine protected area network, a process which will be happening in parallel. Indeed, the designation and establishment of marine protected areas may provide socio-economic benefits for coastal communities. The Maritime Area Planning (MAP) 2021 Act, as amended makes provision for the preparation of maritime spatial plans at both national and subnational scales. Such plans may be geographical (focussed on all relevant issues within a specific area) or sectoral (focussed on one sectoral use only) and are the responsibility of the Minister for Housing, Local Government and Heritage. In order to prepare a DMAP, a public body must first be designated as a competent authority in accordance with Section 20 of the MAP Act 2021. The MAPA 2021 Act stipulates that the current National Marine Planning Framework (NMPF) is reviewed within six years of its publication, and that following this, a new national-level MSP may or may not be prepared. The EU Maritime Spatial Planning Directive (MSPD) stipulates that marine spatial plans are reviewed within ten years of their adoption. The MAP Act also makes provision for the preparation of DMAPs. These plans are generally prepared by a competent authority (designated by the Minister) and must be aligned with the objectives of the NMPF. DMAPs do not generally identify specifics of arising development. DMAPs will encompass the offshore environment, however, these plans identify several protective measures for the management of the marine area and contain either policies or frameworks that are considered development proposals.

Irelands first draft DMAP, the South-Coast (SC) DMAP is currently at consultation stage. The draft SC-DMAP makes provision for a plan-led approach for the development of ORE within its geographical area, and specifically fixed offshore wind technology. The decision to establish Ireland's first ORE DMAP in the Irish Celtic Sea reflects the suitability of this maritime area for the accelerated deployment of fixed offshore wind technology and the achievement of Ireland's renewable energy and climate objectives. There is no overlap between the draft SC-DMAP and the SI works, **therefore there is no potential for in-combination effects between the SC-DMAP and the proposed SI works.**

5.3.2.1.4 Transmission Development Plan 2023

The *Transmission Development Plan 2023 - 2032*[6] *(*the Transmission Development Plan) supersedes the Transmission Development Plan 2021 - 2030 and sets out EirGrid's updated list of projects which are committed to and those that are in the development stages for the progression of the Irish transmission network and interconnection over the next ten years.

The proposed SI works will support the installation of the Carrickmines to Poolbeg Cable Replacement project which is included in the listed projects in the Transmission Development Plan.

Other projects listed in the plan that are within the general area of the SI works are summarised in Table 5.1.

Table 5.1 EirGrid Transmission Development Plan 2023 Relevant Projects

Project	Likely In-Combination effects
Finglas – North Wall 220 kV circuit (CP1100)	No. Works are to the north of the river Liffey and do not overlap with the SI works area.
Poolbeg South – Inchicore 220 kV circuit 2 (CP1150)	No. Works are onshore and not connected to the marine area for the SI Works.

[6] Transmission Development Plan 2023-2032 | Eirgrid Accessed October 2024

Poolbeg South – Inchicore 220 kV circuit 1 (CP1157)	No. Works are onshore and not connected to the marine area for the SI Works.
North Wall – Poolbeg 220 kV circuit (CP1216)	No. Works involve a cable connection under the seabed between the north and south sides of the River Liffey between Dublin Port and Poolbeg substation. The works are not connected to the marine area for the SI Works.
Belcamp – Shellybanks New 220 kV Cable (CP0984)	No. Works are onshore and not connected to the marine area for the SI Works.
Irishtown, Shellybanks & connected stations 220 kV Protection Upgrade (CP1162)	No. Project is confined to the onshore substations.
Poolbeg 220 kV Station project (CP1190)	No. Project is confined to the onshore substation at Poolbeg.
Dublin Array (CP1398)	No. The export cable route for the wind farm to shore is just north of Bray near Shanganagh Cliffs. Construction of the array is expected to commence in 2027, subject to planning permission.

Therefore, there is no potential for in-combination effects with the Transmission Development Plan 2023 and the proposed SI works.

5.3.2.1.5 Dún Laoghaire-Rathdown County Development Plan 2022-2028

The *Dún Laoghaire-Rathdown County Development Plan 2022-2028*[7] (CDP) sets out the policy objectives and the overall strategy for the proper planning and sustainable development of the County. The CDP sets out an approach centred on the core principle of sustainability with a focus on creating vibrant, liveable, climate resilient communities.

The CDP supports the use of renewable energy sources to facilitate the transition to a low carbon society, stating that, "*DLR supports the increase in use of renewable energy and low carbon resources, namely solar photovoltaic, geothermal, heat pumps, district heating, solar thermal, hydro, tidal power, offshore wind, small-scale onshore wind and biomass"*. The following policy objectives (Pos) are of particular relevance to the proposed SI works:

> **PO CA10 – Renewable Energy: "***It is a Policy Objective to support County, Regional, National and International initiatives and pilot schemes to encourage the development and use of renewable energy sources, including the SEAI Sustainable Energy Community initiatives, as a means of transitioning to a low carbon climate resilient County in line with national renewable energy targets."*
>
> **PO CA11 – Onshore and Offshore Wind Energy and Wave Energy:** "*It is a Policy Objective to support in conjunction with other relevant agencies, wind energy initiatives, both on-shore and offshore, wave energy, onshore grid connections and reinforcements to facilitate offshore renewable energy development when these are undertaken in an environmentally acceptable manner. (Consistent with NSO 8 and NPO 42 of the NPF and RPO 7.36 and 10.24 of the RSES)*."
>
> **PO EI18 – Energy Facilities**: *"It is a Policy Objective to encourage the provision of energy facilities in association with the appropriate service providers and in accordance with 'Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure' (2012). In addition, the Council will facilitate, subject to the proper planning and sustainable development of the area, the expansion of the services and infrastructure of existing service providers, notably Bord Gáis, Eirgrid, the Electricity Supply Board (ESB), other strategic electricity infrastructure developers and statutory undertakers, in order to ensure satisfactory levels of supply and to minimise constraints for development."*

[7] https://www.dlrcoco.ie/CDP2022-2028 Accessed October 2024

PO EI19 – Overhead Cables: *"It is a Policy Objective to seek the undergrounding of all electricity, telephone and television cables wherever possible, in the interests of visual amenity and public health."*

In this regard, it is noted that the proposed SI works are essential to providing scientific, environmental, and engineering information to support the installation of the Carrickmines to Poolbeg cable. The Carrickmines to Poolbeg Cable Replacement project will enable the city's grid to use the electricity generated from offshore wind energy in Dublin city and will contribute to Ireland's transition to a low carbon electricity future. **As such, it is considered that the proposed SI works are fully supported by the policies of the CDP and therefore there is no potential for in-combination effects.**

5.3.2.1.6 Dún Laoghaire-Rathdown County Climate Action Plan

Dún Laoghaire-Rathdown County Council's *Climate Action Plan 2024-2029*[8] sets out to achieve, by no later than the end of 2050, the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral County. One of the aims of the Plan is to: "*facilitate and advocate for improved energy efficiency and carbon reduction in our County*".

In this regard, it is noted that the proposed SI works will support the installation of the Carrickmines to Poolbeg Cable Replacement project. The Carrickmines to Poolbeg cable project will contribute to accelerating the deployment of renewable energy to replace fossil fuels and delivering a flexible system to support renewables and demand. **The proposed SI works are therefore considered to be in compliance with the Climate Action Plan and therefore there is no potential for in-combination effects.**

5.3.2.1.7 Dublin City Council Development Plan 2022-2028

The *Dublin City Development Plan 2022-2028*[9] (the City Plan) serves as the key planning policy document for the City and includes policy objectives and development standards for all development types. The aim of the City Plan is to improve the quality of life for its citizens and ensure that Dublin City is an attractive place to live, work and visit. The City Plan states that "*facilitating the provision of critical energy utilities and the transition to alternative, renewable, decarbonised and decentralised energy sources*" is a strategic issue and sets out the following related policies and objectives:

CA13 – Offshore Wind-Energy Production: "*To support, encourage and facilitate the implementation of the 2014 'Offshore Renewable Energy Development Plan' (OREDP) and any forthcoming review and to facilitate infrastructure such as grid facilities on the land side of any renewable energy proposals of the offshore wind resource, where appropriate and having regard to the principles set out in the National Marine Planning Framework."*

CA11 - Energy from Renewable Sources: "*To support, encourage and facilitate the production of energy from renewable sources, such as from solar energy, hydro energy, wave/tidal energy, geothermal, wind energy, combined heat and power (CHP), heat energy distribution such as district heating/cooling systems, and any other renewable energy sources, subject to normal planning and environmental considerations."*

SI49 - Support for Energy Utilities: "*To support the development of enhanced electricity gas supplies, and associated transmission and distribution networks, to serve the existing and future needs of the City, and to facilitate new transmission infrastructure projects and technologies including those to facilitate linkages of renewable energy proposals to the electricity and gas transmission grid that might be brought forward in the lifetime of this Plan. In this respect, the City Council will have regard to the 'Guiding Principles' for facilitating the provision of energy networks set out by the Eastern and Midland Regional Assembly Regional Spatial and Economic Strategy (2019-2031)."*

SI50 - Undergrounding of Energy Utility Infrastructure: *"To require that the location of local energy services such as electricity, telephone and television cables be underground wherever possible, and to promote the undergrounding of existing overhead cable and associated equipment, where appropriate, in the interests of visual amenity and facilitating compact urban development."*

[8] https://www.dlrcoco.ie/climate-action-plan-2024 Accessed October 2024

[9] https://www.dublincity.ie/residential/planning/strategic-planning/dublin-city-development-plan/development-plan-2022-2028 Accessed October 2024

SI51 - Renewable Energy Use and Generation: "*To promote renewable energy generation, use and storage at appropriate locations within the built and natural environment to meet national objectives towards achieving a low carbon economy by 2050."*

SI52 - Poolbeg Peninsula Strategic Sustainable Infrastructure Hub: *"To support the development of the Poolbeg Peninsula as a Sustainable Energy and Infrastructure Hub for Dublin with a strategic role in accommodating the City's critical hard infrastructure and to recognise the significant role that it plays in facilitating Dublin's transition to a low carbon and climate-resilient city."*

SIO30 - Facilitating Offshore Renewable Energy: "*To support the sustainable development of Ireland's offshore renewable energy resources in accordance with the National Marine Planning Framework (2021) and Offshore Renewable Energy Development Plan (2019) and its successor, including any associated domestic and international grid connection enhancements."*

Having regard for the above, it is noted that the proposed SI works are essential to providing scientific, environmental, and engineering information to support the Carrickmines to Poolbeg Cable Replacement project, which is part of the Dublin Bay Cables project. The Dublin Bay Cables project will enable the city's grid to use the electricity generated from offshore wind energy in Dublin city and will contribute to Ireland's transition to a low carbon electricity future. **In this regard, it is considered that the proposed SI works are fully supported by the policies and objectives set out in the City Plan and therefore there will be no potential in-combination effects.**

5.3.2.1.8 Dublin Port Masterplan 2012-2040

The Dublin Port Masterplan 2012 was prepared by Dublin Port Company (DPC) to guide the development of Dublin Port for the period from 2012 to 2040. It presents a vision for the future operations at the Port and critically examines how the existing land use at Dublin Port can be optimized for the merchandise trade purpose. Dublin Port Masterplan 2040 is intended to update and refine the infrastructure development options for Dublin Port and, in doing this, to ensure that the Masterplan continues to provide a fit for purpose framework for the future sustainable growth and development of Dublin Port through to 2040. The Masterplan lists strategic objectives to facilitate effective operation of the Port including port functions, investment and growth, integrating with the City, movement and access, environment and heritage, recreation and amenity and security. Relevant to the proposed SI works include port functions where adequate water depth to accommodate larger /deeper draught vessels, develop adequate quaysides adjacent to deep water will be provided through various dredging campaigns and future developments.

Advancing facilities and access to Dublin Port will require several construction and dredging campaigns that may overlap with the proposed SI works. Development associated with Dublin Port will be in accordance with the planning permission which includes mitigation measures. The implications of projects from the Dublin Port Masterplan are considered in the preceding section above.

5.3.2.1.9 Poolbeg West Strategic Development Zone (SDZ)

An Bord Pleanála case number ZD2013 relates to a strategic development zone (SDZ), the Poolbeg West planning scheme. This area of land situated in the peninsula which extends into Dublin Bay is for transforming the land at the peninsula. To date no individual planning applications have been submitted for projects as part of the Poolbeg West SDZ. **As visual and above water noise has been screened in for potential impacts on birds, this SDZ scheme has also been screened in for further assessment.**

5.3.3 Summary of Projects and Plans Screened In for AA

There is the potential for there to be in-combination effects between the SI works and the following Projects:

- FS007546 and MUL230034,
- FS007188,
- FS007029,
- LIC230016.

There is the potential for there to be in-combination effects between the SI works and the following Plan:

- ZD2013.

6 SUMMARY AND CONCLUSIONS

6.1 Summary

In accordance with the relevant legislation and the methodology followed, supporting information to inform a Stage 1 Screening for Appropriate Assessment was compiled. This SISAA report has been undertaken in order to ascertain if the proposed SI works are likely to have a significant effect on any European site.

Table 6.1 summarises the findings of this SISAA and lists the European sites for which likely significant effects cannot be excluded alone, or in-combination with other plans or projects, without further evaluation or analysis, or the application of mitigation measures.

Table 6.1 Summary of European sites and relevant qualifying interests screened in for likely significant effects

European Site	Distance to Area of Interest	Relevant Qualifying Interests	Likely Significant Effect
Rockabill to Dalkey Island SAC	3/ Within Management Unit for Harbour Porpoise (JNCC, 2023)[10]	*Phocoena phocoena* (Harbour Porpoise) [1351]	Underwater noise disturbance
Lambay Island SAC	18	*Phocoena phocoena* (Harbour Porpoise) [1351] *Halichoerus grypus* (Grey Seal) [1364] *Phoca vitulina* (Harbour Seal) [1365]	Underwater noise disturbance
South Dublin Bay and River Tolka Estuary SPA	Within SPA boundary	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (T*ringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Wetland and Waterbirds [A999]	Visual and above water noise disturbance. Habitat loss, alteration and/ or fragmentation to non-annexed wetland habitat/roost sites

[10] JNCC 2023 - IAMMWG. 2023. Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091.

Supporting Information for Screening for Appropriate Assessment

European Site	Distance to Area of Interest	Relevant Qualifying Interests	Likely Significant Effect
North Bull Island SPA	1	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] 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] Black-headed Gull (*Chroicocephalus ridibundus*) [A179]	Visual and above water noise disturbance
North-West Irish Sea SPA	1	Red-throated Diver (*Gavia stellata*) [A001] Great Northern Diver (*Gavia immer*) [A003] Fulmar (*Fulmarus glacialis)* [A009] Manx Shearwater (*Puffinus puffinus*) [A013] Common Scoter (*Melanitta nigra*) [A065] Little Gull (*Larus minutus*) [A177] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Common Gull (*Larus canus*) [A182] Lesser Black-backed Gull (*Larus fuscus*) [A183] Herring Gull (*Larus argentatus*) [A184] Great Black-backed Gull (*Larus marinus*) [A187] Kittiwake (*Rissa tridactyla*) [A188]	Visual and above water noise disturbance

European Site	Distance to Area of Interest	Relevant Qualifying Interests	Likely Significant Effect
		Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Little Tern (*Sterna albifrons*) [A195] Puffin (*Fratercula arctica*) [A204] Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200]	
Dalkey Island SPA	5	Arctic Tern (*Sterna paradisaea*) [A194] Common Tern (*Sterna hirundo*) [A193] Roseate Tern (*Sterna dougallii*) [A192]	Visual and above water noise disturbance

6.2 Conclusions

RPS has prepared this report to provide a sufficient level of information to MARA for them to complete a Screening for Appropriate Assessment of the potential for likely significant effects on European sites, in view of their conservation objectives, arising from the SI works either individually or in combination with other plans or projects. The potential impacts of the SI works have been considered in the context of the European sites potentially affected, their QIs and their conservation objectives, through the application of the S-P-R model, which considered the potential extent of effects from the SI works and the potential in-combination effects with other plans or projects. The overall findings are as follows:

The SI works are not connected with or necessary to the management of the nature conservation interest of any European site.

In the absence of mitigation, as a result of visual and above water noise disturbance associated with the SI works, disturbance of QI species is possible at the following European sites:

- South Dublin Bay and River Tolka Estuary SPA (wintering waterbirds)
- North Bull Island SPA (wintering waterbirds)
- North-West Irish Sea SPA (seabird species see Table 6.1)
- Dalkey Island SPA (seabird species see Table 6.1)

In the absence of mitigation the SI works, have the potential to contribute to habitat loss, alteration, and/or fragmentation non-annexed wetland habitat and roost sites at the following European site:

- South Dublin Bay and River Tolka Estuary SPA.

In the absence of mitigation, the geophysical, geotechnical and metocean surveys will introduce subsea noise that has the potential to impact on harbour porpoise, grey and harbour seals at the following European Sites:

- Rockabill to Dalkey Island SAC (harbour porpoise)
- Lambay Island SAC (harbour porpoise, grey seal and harbour seal)

In the absence of mitigation measures, there is the potential for there to be in-combination effects from other projects and therefore in-combination effects are screened in for further assessment.

It cannot be excluded on the basis of objective scientific information that the SI works, individually or in combination with other plans or projects, will have a significant effect on the above mentioned European sites.

It is respectfully submitted that MARA should conduct an AA and therefore an NIS has been submitted with this application.

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Appendix A
Drawings

718695
733917

718692
728793

7248
7339

7248
7287

Irishtown
Sandymount
Merrion
PRIESTHOUSE
Booterstown
WILLIAMSTOWN
INTAKE
MERRION
BLACKROCK
MOUNT MERRION
GALLARY
WOODLAND
Mount Merrion
SEAPOINT or TEMPLEHILL
N31
R118
R131
R138
R119

Area A - 2101 Ha

0 0.25 0.5 1
Kilometres

Legend

- Maritime Usage Licence Area
- Private Foreshore – Folio DN44335F
- High Water Mark (HWM)

Where the licence area adjoins or abuts the land the High Water Mark as defined by the Chief Boundary Surveyor is the boundary of the area.

MARA File Reference No:
MUL240010

N

Prepared by:
[redacted]
Chartered Engineer

Client
EirGrid
Powering Up Dublin

Carrickmines to Poolbeg Cable Replacement

Title

Proposed Licence Area Map

RPS
A TETRA TECH COMPANY
West Pier Business Campus
Dun Laoghaire
Co Dublin, Ireland
[redacted]
www.rpsgroup.com/ireland

Issue Details

File Identifier:
IE000451-RPS-00-XX-DR-C-DG2502

Status:	Rev:	Model File Identifier:
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Checked:	Scale: 1:20,000 @A3
Approved:	Projection: ITM

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2.

718695, 733917

724831, 733915

718692, 728793

724831, 728795

Irishtown
Sandymount
Merrion
PRIESTHOUSE
Booterstown
WILLIAMSTOWN
INTAKE
MERRION
BLACKROCK
SEAPOINT or TEMPLEHILL
Mount Merrion
WOODLAND
Monkstown
DUNLEARY
R118
R131
R138
R825
R119
N31

0 0.25 0.5 1 Kilometres

Legend

- Maritime Usage Licence Area
- Offshore Cable Route - 500m wide corridor (250m Buffer)
- High Water Mark (HWM)
- Indicative Borehole Locations
- Indicative Vibrocore & CPT Locations

Site Investigation locations shown are indicative only.

MARA File Reference No:
MUL240010

Prepared by:
[redacted]
Chartered Engineer

N

Client
EirGrid
Powering Up Dublin

CP1146 - Carrickmines to Poolbeg Circuit

Title

Maritime Usage Licence Indicative Geotechnical Survey Locations

RPS A TETRA TECH COMPANY
West Pier Business Campus, Dun Laoghaire, Co Dublin, Ireland.
[redacted]
www.rpsgroup.com/ireland

Issue Details

File Identifier:
IE000451-RPS-00-XX-DR-C-DG2503

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718692, 728793

724831, 728795

Irishtown
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WILLIAMSTOWN
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MERRION
BLACKROCK
SEAPOINT or TEMPLEHILL
WOODLAND
Mount Merrion
Monkstown
DUNLEARY
N31
R118
R131
R138
R825
R119
0 0.25 0.5 1 Kilometres

Legend

- Maritime Usage Licence Area
- Offhsore Cable Route - 250m Buffer
- High Water Mark (HWM)
- Indicative Benthic Sampling Locations

Benthic Sample locations shown are indicative only.

MARA File Reference No:
MUL240010

N

Prepared by:
[redacted]
Chartered Engineer

Client
EirGrid
Powering Up Dublin

CP1146 - Carrickmines to Poolbeg Circuit

Title

Maritime Usage Licence Indicative Benthic Sample Locations

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Issue Details

File Identifier:
IE000451-RPS-00-XX-DR-C-DG2504

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S5	P01	IE000451-RPS-00-XX-DR-C-DG2503

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Checked:	Scale: 1:20,000 @A3
Approved:	Projection: ITM

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718695, 733917

724831, 733915

718692, 728793

724831, 728795

Irishtown

Sandymount

Merrion

PRIESTHOUSE

Booterstown

WILLIAMSTOWN

INTAKE

MERRION

BLACKROCK

SEAPOINT or TEMPLEHILL

MOUNT MERRION or CALLARY

Mount Merrion

WOODLAND

Monkstown

DUNLEARY

R138 R118 R131 R824 R825 R119

N31

0 0.25 0.5 1 Kilometres

Legend

- Acoustic Doppler Current Profiler Indicative Locations
- Offhsore Cable Route - 250m Buffer
- Maritime Usage Licence Area
- High Water Mark (HWM)

ADCP deployment locations shown are indicative only.

MARA File Reference No:
MUL240010

N

Prepared by:
[redacted]
Chartered Engineer

Client
EirGrid
Powering Up Dublin

CP1146 - Carrickmines to Poolbeg Circuit

Title

Maritime Usage Licence Indicative ADCP Locations

RPS A TETRA TECH COMPANY
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Dun Laoghaire,
Co Dublin, Ireland.
[redacted]
www.rpsgroup.com/ireland

Issue Details

File Identifier:
IE000451-RPS-00-XX-DR-C-DG2505

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S5	P01	IE000451-RPS-00-XX-DR-C-DG2505

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Approved:		**Projection:**	ITM

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Appendix B
Subsea Noise Technical Report

CP1146 CARRICKMINES TO POOLBEG PROJECT

Subsea Noise Technical Report

CP1146-RPS-00-XX-RP-N-RP1021
A1 C01
23 October 2024

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
S3 P01	Draft for Client Review	[redacted]			18/07/2024
S5 P01	Draft				15/08/2024
S5 P02	Additional Client comments				12/09/2024
A1 C01	Final				23/10/2024

Approval for issue

[redacted] 23 October 2024

Prepared by:	Prepared for:
RPS	EirGrid

Dublin | Cork | Galway | Sligo | Kilkenny
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Tables

Figures

Glossary

Term	Meaning
Decibel (dB)	A relative scale most commonly used for reporting levels of sound. The actual sound measurement is compared to a fixed reference level and the "decibel" value is defined to be $10 \cdot \log_{10}$(“actual”/”reference”), where (“actual”/”reference”) is a power ratio. The standard reference for underwater sound pressure is 1 micro-Pascal (µPa), while 20 micro-Pascals is the standard for airborne sound. The dB symbol is often followed by a second symbol identifying the specific reference value (i.e. re 1 µPa).
Grazing angle	A glancing angle of incidence (the angle between a ray incident on a surface and the line perpendicular to the surface).
Permanent Threshold Shift (PTS)	A total or partial permanent loss of hearing caused by some kind of acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the ear and thus, a permanent reduction of hearing acuity.
Temporary Threshold Shift (TTS)	Temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.
Sound Exposure Level (SEL)	The cumulative sound energy in an event, formally: “ten times the base-ten logarithm of the integral of the squared pressures divided by the reference pressure squared”. Equal to the often seen “L_E” or “dB SEL” quantity. Defined in: ISO 18405:2017, 3.2.1.5
Sound Pressure level (SPL)	The average sound energy over a specified period of time, formally: “ten times the base-ten logarithm of the arithmetic mean of the squared pressures divided by the squared reference pressure”. Equal to the deprecated “RMS level”, “dB_{rms}” and to L_{eq} if the period is equal to the whole duration of an event. Defined in ISO 18405:2017, 3.2.1.1
Peak Level, Peak Pressure Level (L_P)	The maximal sound pressure level of an event, formally: “ten times the base-ten logarithm of the maximal squared pressure divided by the reference pressure squared” or “twenty times the base-ten logarithm of the peak sound pressure divided by the reference pressure, where the peak sound pressure is the maximal deviation from ambient pressure”. Defined in ISO 18405:2017, 3.2.2.1
Source Level (SL)	Taken here to mean the level (SEL/SPL/L_P) at 1 meter range. If not otherwise stated, it is assumed the source is omnidirectional (equal level in all directions). For sources larger than 1 m in radius, the Source Level is back-calculated to 1 m.
Decidecade	Used to refer to a step in frequency, similar to “one-third-octave”, defined as a ratio of $10^{0.1} \approx 1.259$ (one third octave is $21/3 \approx 1.260$). Used interchangeably with “3rd octave”.
Noise	Sound that is irrelevant, unwanted or harmful to the organism(s) in question. Noise is often detrimental, but not necessarily so.
Kurtosis	A statistical measure of “peakedness” of a distribution (of e.g. pressure values in a sound pulse). Defined in ISO 5479:1997

Acronyms

Term	Meaning
ADD	Acoustic Deterrent Device
ADCP	Acoustic Doppler Current Profiler
LF	Low Frequency (Cetaceans)
HF	High Frequency (Cetaceans)
VHF	Very High Frequency (Cetaceans)
MF	Mid Frequency (Cetaceans) – **DEPRECATED** only for reference to NOAA/NMFS 2018 groups
OW/OCW	Otariid pinnipeds/Other Carnivores in water (refers to the same weighting and animal groups)
PW/PCW	Phocid pinnipeds
NMFS	National Marine Fisheries Service
RMS	Root Mean Square
SEL	Sound Exposure Level, [dB]
SPL	Sound Pressure Level, [dB]
L_P	Peak Pressure Level, [dB]
SL	Source Level [dB]
TTS	Temporary Threshold Shift
PTS	Permanent Threshold Shift
SSS	Side Scan Sonar – Towed sonar device typically positioned 10-15 m above the sediment. Its main purpose is to characterise the sediment surface texture.
MBES	Multibeam Echosounder – Uses multiple narrow beams to measure the depth across a swath below the vessel.
SBP	Sub-Bottom Profiler – Any device/system that uses acoustics to record echoes from within the sediment. Examples include seismic arrays, sparkers, boomers, chirpers, pingers and associated recorder array.
USBL	Ultra Short Baseline Array – Small array of at least 4 hydrophones and a pinger to measure positions of equipment under water.
UHRS	Ultra High-Resolution Seismic survey – Usually a sparker driven sub-bottom characterisation system.
c.	Circa, i.e., approximately
CPT	Cone Penetration Testing – insertion/pushing of rod with standardised, cone-shaped front into sediment to measure various characteristics of the sediment.

Units

Unit	Description
dB	Decibel (Sound)
Hz	Hertz (Frequency)
kHz	Kilohertz (Frequency)
kJ	Kilojoule (Energy)
km	Kilometre (Distance)
km^2	Kilometre squared (Area)
m	Metre
ms	Millisecond (10^{-3} seconds) (Time)
ms^{-1} or m/s	Metres per second (Velocity or speed)
kn	Knots (speed), 1 kn = 0.514 m/s, 1 m/s = 1.944 kn
µPa	Micro Pascal
Pa	Pascal (Pressure: newton/m^2)
psu	Practical Salinity Units (parts per thousand of equivalent salt in seawater, weight-based)
kg/m^3	Specific density (of water, sediment or air)
Z	Acoustic impedance [$kg/(m^2 \cdot s)$ or $(Pa \cdot s)/m^3$]

Units will generally be enclosed in square brackets e.g.: “[m/s]”

1 INTRODUCTION

The CP1146 Carrickmines to Poolbeg project is a proposed new underground electricity cable from the Carrickmines 220 kV substation to the Poolbeg 220 kV substation and includes a section of marine cable. The marine section is located between Blackrock Park and Shelley Banks car-park on the Poolbeg peninsula, Co. Dublin

This Subsea Noise Technical Report presents the results of a desktop study considering the potential effects of underwater noise on the marine environment from the proposed geophysical and geotechnical surveys in Dublin Bay (hereafter referred to as "SI Works") for the CP1146 Carrickmines to Poolbeg project. The other surveys to be undertaken as part of the SI Works, have not been modelled as they will either not result in underwater noise or will not have any appreciable effect on receptors, e.g. the metocean device (ADCP) operates at frequencies well above the hearing ranges of sensitive receptors.

The aim of the SI Works is to acquire data to a high quality and specification for the site. The SI Works covers an area of 2101 Ha within Dublin Bay between the south side of the Poolbeg peninsula and Dun Laoghaire West Pier. The sediment within the survey area is mostly silty to sandy and water properties in the area are relatively stable given the lack of major river outflows and a modest tidal range. Geophysical and geotechnical surveys such as those proposed for the SI Works use equipment that generate loud and potentially injurious noise to marine life.

Sound is readily transmitted in the underwater environment and there is potential for the sound emissions from anthropogenic sources to adversely affect marine life such as marine mammals or fish. At close ranges from a noise source with high noise levels, permanent or temporary hearing damage may occur to marine species, while at a very close range gross physical trauma is possible. At long ranges (several kilometres) the introduction of any additional noise could, for the duration of the activity, potentially cause behavioural changes, for example to the ability of species to communicate and to determine the presence of predators, food, underwater features, and obstructions.

This report provides an overview of the potential effects due to underwater noise from the SI Works on the surrounding marine environment based on the Southall et al. 2019 and Popper et al. 2014 frameworks for assessing impact from noise on marine mammals and fish.

Consequently, the primary purpose of the underwater noise assessment is to predict the likely range of onset for potential physiological and behavioural effects due to increased anthropogenic noise as a result of the SI Works.

1.1 Statement of Authority

[redacted] is a Senior Project Scientist with RPS. He holds a master's degree in biology, biosonar and marine mammal hearing from University of Southern Denmark. [redacted] has over 11 years' experience as a marine biologist and over 9 years' experience with underwater noise modelling and marine noise impact assessments. [redacted] has co-developed commercially available underwater noise modelling software, as well developed multiple source models for e.g. impact piling, seismic airgun arrays and sonars.

[redacted] s an Associate in Acoustics with RPS. He holds a BA BAI in Mechanical Engineering from Trinity College Dublin (2004) and a PhD in Acoustics and Vibration from Trinity College Dublin (2008). He is a Chartered Engineer with Engineers Ireland. [redacted] has 20 years' experience in environmental projects including planning applications and environmental impact assessments for a wide range of strategic infrastructure projects.

[redacted] is Technical Director in the Environmental Services Business Unit in RPS. He has over 24 years' experience. He holds an honours degree in Civil Engineering (B.E.) from NUI, Galway, a postgraduate diploma in Environmental Sustainability from NUI, Galway, and a Master's in Business Studies from the Irish Management Institute/ UCC. [redacted] is also a Chartered Engineer and Project Management Professional with the Project Management Institute (PMI-PMP). He has managed the delivery of numerous environmental projects including marine and terrestrial projects that have required environmental impact assessment, appropriate assessment, and Annex IV species reports.

2 ASSESSMENT CRITERIA

2.1 General

To determine the potential spatial range of injury and disturbance, assessment criteria have been developed based on a review of available evidence including national and international guidance and scientific literature. The following sections summarise the relevant assessment criteria and describe the evidence base used to derive them.

Underwater noise has the potential to affect marine life in different ways depending on its noise level and characteristics. Assessment criteria generally separate sound into two distinct types, as follows:

- **Impulsive sounds** which are typically transient, momentary (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (ANSI, 2005; ANSI, 1986; NIOSH, 1998). This category includes sound sources such as seismic surveys, impact piling and underwater explosions. Additionally included here are sounds under 1 second in duration with a weighted kurtosis over 40 (see note below*).
- **Non-impulsive** (and continuous) sounds which can be broadband, narrowband or tonal, momentary, brief or prolonged, continuous or intermittent and typically do not have a high peak sound pressure with rapid rise/decay time that impulsive sounds do (ANSI, 1995; NIOSH, 1998).This category includes sound sources such as continuous vibro-piling, running machinery, some sonar equipment and vessels. Additionally included here are sounds over 1 second in duration with a weighted kurtosis under 40 (see note below*).

  * Note that the European Guidance: “Monitoring Guidance for Underwater Noise in European Seas, Part II: Monitoring Guidance Specifications” (MSFD Technical Subgroup on Underwater Noise, 2014) includes sonar as impulsive sources (see Section 2.2). However, the guidance suggests that *“all loud sounds of duration less than 10 seconds should be included”* as impulsive.

  This contradicts research on impact from impulsive sounds suggesting that a limit for “impulsiveness” can be set at a kurtosis[1] of 40 (Martin, et al., 2020). See examples in Appendix A, Impulsiveness.

  This latter criterion has been used for classification of impulsive versus non-impulsive for sonars and similar sources. The justification for departing from the MSFD criterion is that the Southall et al. 2019 and the Popper et al. 2014 framework limits are based on the narrower definition of impulsive as given in “Impulsive sounds” above.

There is scope for some sounds to be classified as both impulsive and non-impulsive, depending on the criteria applied. Examples are pulses from sonar-like sources that can contain very rapid rise times (<0.5 ms), sweep a large frequency range and have high kurtosis. However, given that the scientific work carried out to identify impulsive thresholds were done with “pure” impulses (from a near instantaneous event), sonar-like sounds are sometimes not included in this, impulsive, category. This argument ignores that sounds used for establishing the non-impulsive thresholds (often narrowband slowly[2] rising pulses), are markedly less impulsive (lower kurtosis, narrower bandwidth) than what is sometimes seen in pulses from sonar-like sources and are thus also not representative for all sonar-like pulses.

Given impulsive sound’s tendency to become less impulsive with increased range, a minimal range can be established where the noise is no longer impulsive (here kurtosis <40 is used) (Appendix A, Impulsiveness). This range is established using raytracing, but as the effect varies with exact depth and range of source and receiver, the transition range to non-impulsive used for exposure modelling is doubled from the modelled range where kurtosis goes below 40.

The acoustic assessment criteria for marine mammals and fish in this report has followed the latest international guidance (based on the best available scientific information), that are widely accepted for assessments in the UK, Europe and worldwide (Southall, et al., 2019; Popper, et al., 2014).

[1] Statistical measure of the asymmetry of a probability distribution.

[2] Slowly in this context is >10 ms – slow relative to the integration time of the auditory system of marine mammals.

2.2 Effects on Marine Animals

Underwater noise has the potential to affect marine life in different ways depending on its noise level and characteristics. Richardson *et al.* (1995) defined four zones of noise influence which vary with distance from the source and level, to which an additional zone has been added "zone of temporary hearing loss". These are:

- **The zone of audibility**: This is defined as the area within which the animal can detect the sound. Audibility itself does not implicitly mean that the sound will affect the animal.
- **The zone of masking**: This is defined as the area within which sound can interfere with the detection of other sounds such as communication or echolocation clicks. This zone is very hard to estimate due to a paucity of data relating to how animals detect sound in relation to masking levels (for example, humans can hear tones well below the numeric value of the overall sound level). Continuous sounds will generally have a greater masking potential than intermittent sound due to the latter providing some relative quiet between sounds. Masking only occurs if there is near-overlap in sound and signal, such that a loud sound at e.g., 1000 Hz will not be able to mask a signal at 10,000 Hz[3].
- **The zone of responsiveness**: This is defined as the area within which the animal responds either behaviourally or physiologically. The zone of responsiveness is usually smaller than the zone of audibility because, as stated previously, audibility does not necessarily evoke a reaction. For most species there is very little data on response, but for species like harbour porpoise there exists several studies showing a relationship between received level and probability of response (Graham IM, 2019; Sarnoci´nska J, 2020; BOOTH, 2017; Benhemma-Le Gall A, 2021).
- **The zone of temporary hearing loss**: The area where the sound level is sufficient to cause the auditory system to lose sensitivity temporarily, causing loss of "acoustic habitat": the volume of water that can be sensed acoustically by the animal. This hearing loss is typically classified as Temporary Threshold Shift (TTS).
- **The zone of injury / permanent hearing loss**: This is the area where the sound level is sufficient to cause permanent hearing loss in an animal. This hearing loss is typically classified as Permanent Threshold Shift (PTS). At even closer ranges, and for very high intensity sound sources (e.g., underwater explosions), physical trauma or acute mortal injuries are possible.

For this study, it is the zones of injury (PTS) that are of primary interest, along with estimates of behavioural impact ranges. To determine the potential spatial range of injury and behavioural change, a review has been undertaken of available evidence, including international guidance and scientific literature. The following sections summarise the relevant thresholds for onset of effects and describe the evidence base used to derive them.

2.2.1 Irish Guidance Interpretation

We note that the DAHG "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" 2014 (Department of Arts, Heritage and the Gealtacht, 2014) contains the following statement:

"It is therefore considered that anthropogenic sound sources with the potential to induce TTS in a receiving marine mammal contain the potential for both (a) disturbance, and (b) injury to the animal."

This states that TTS constitutes an injury and should thus be the main assessment criteria[4]. However, the guidance goes on to specify the use of thresholds from a 2007 publication (Brandon L. Southall, 2007) which has since been superseded (by (Southall, et al., 2019)) and no longer represents best available science, nor reflects best practice internationally. Thus, the following excerpt from the guidance is relevant:

[3] The exact limit of how near a noise can get to the signal in frequency before causing masking will depend on the receivers' auditory frequency resolution ability, but for most practical applications noise and signal frequencies will need to be within 1/3rd octave to start to have a masking effect.

[4] Injury being the qualifying limit in the Irish Wildlife Act 1976, section 23, 5c : https://www.irishstatutebook.ie/eli/1976/act/39/enacted/en/print#sec23

"The document will be subject to periodic review to allow its efficacy to be reassessed, to consider new scientific findings and incorporate further developments in best practice."

As there has been no such update to date, but the guidance clearly states intent, we have applied the latest guidance, reflecting the current best available method for assessing impact from noise on marine mammals.

2.3 Thresholds for Marine mammals

The zone of injury in this study is classified as the distance over which a fleeing marine mammal can suffer PTS leading to non-reversible auditory injury. Injury thresholds are based on a dual criteria approach using both un-weighted L_P (maximal instantaneous SPL) and marine mammal hearing weighted SEL. The hearing weighting function is designed to represent the sensitivity for each group within which acoustic exposures can have auditory effects. The categories include:

- **Low Frequency (LF) cetaceans**: Marine mammal species such as baleen whales (e.g. minke whale *Balaenoptera acutorostrata*).
- **High Frequency (HF) cetaceans**: Marine mammal species such as dolphins, toothed whales, beaked whales and bottlenose whales (e.g., bottlenose dolphin *Tursiops truncatus* and white-beaked dolphin *Lagenorhynchus albirostris*).
- **Very High Frequency (VHF) cetaceans**: Marine mammal species such as true porpoises, river dolphins and pygmy/dwarf sperm whales and some oceanic dolphins, generally with auditory centre frequencies above 100 kHz) (e.g., harbour porpoise *Phocoena phocoena*).
- **Phocid Carnivores in Water (PCW)**: True seals, earless seals (e.g., harbour seal *Phoca vitulina* and grey seal *Halichoreus grypus*); hearing in air is considered separately in the group PCA.
- **Other Marine Carnivores in Water (OCW)**: Including otariid pinnipeds (e.g., sea lions and fur seals), sea otters and polar bears; in-air hearing is considered separately in the group Other Marine Carnivores in Air (OCA).
- **Sirenians (SI)**: Manatees and dugongs. This group is only represented in the NOAA guidelines.

These weightings are used in this study and are shown in Figure 2-1. It should be noted that not all of the above hearing groups of marine mammals will be present in the SI Works survey area, but all hearing groups are presented in this report for completeness.

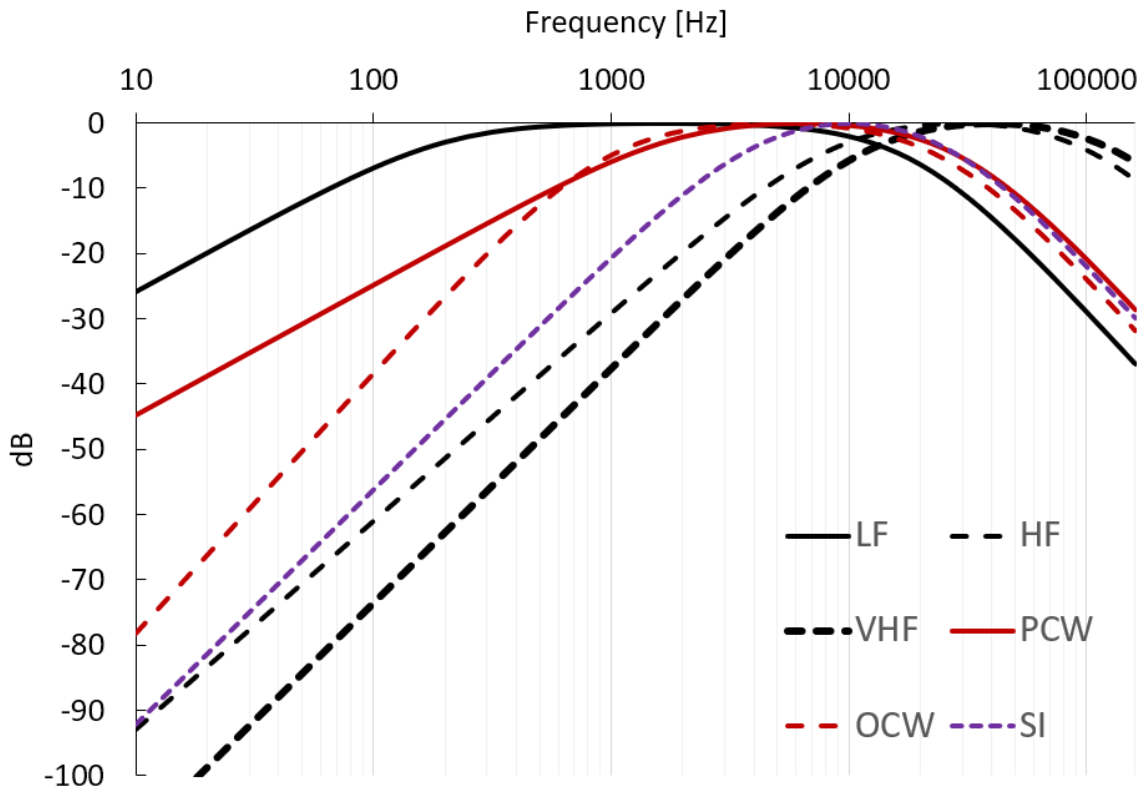

Figure 2-1: Auditory weighting functions for seals, whales and sirenians (NMFS, 2018; Southall et al. 2019)

Both the criteria for impulsive and non-impulsive sound are relevant for this study given the nature of the sound sources used during the SI Works. The relevant PTS and TTS criteria proposed by Southall *et al*. (2019) are summarised in Table 2-1.

Table 2-1: PTS and TTS onset acoustic thresholds (Southall *et al., 2019*; Tables 6 and 7)

Hearing Group	Parameter	Impulsive [dB]		Non-impulsive [dB]	
		PTS	TTS	PTS	TTS
Low frequency (LF) cetaceans	L_P, (unweighted)	219	213	-	-
	SEL, (LF weighted)	183	168	199	179
High frequency (HF) cetaceans	L_P, (unweighted)	230	224	-	-
	SEL, (MF weighted)	185	170	198	178
Very high frequency (VHF) cetaceans	L_P, (unweighted)	202	196	-	-
	SEL, (HF weighted)	155	140	173	153
Phocid carnivores in water (PCW)	L_P, (unweighted)	218	212	-	-
	SEL, (PW weighted)	185	170	201	181
Other marine carnivores in water (OCW)	L_P, (unweighted)	232	226	-	-
	SEL, (OW weighted)	203	188	219	199
Sirenians (SI) (NOAA only)	L_P, (unweighted)	226	220	-	-
	SEL, (OW weighted)	190	175	206	186

These updated marine mammal injury criteria were published in March 2019 (Southall, et al., 2019). The paper utilised the same hearing weighting curves and thresholds as presented in the preceding regulations

document NMFS (2018) with the main difference being the naming of the hearing groups and introduction of additional thresholds for animals not covered by NMFS (2018). A comparison between the two naming conventions is shown in Table 2-2.

The naming convention used in this report is based upon those set out in Southall *et al*. (2019). Consequently, this assessment utilises criteria which are applicable to both NMFS (2018) and Southall *et al*. (2019).

Table 2-2: Comparison of Hearing Group Names between NMFS (2018) and Southall *et al.* (2019)

NMFS (2018) hearing group name	Southall *et al*. (2019) hearing group name
Low-frequency cetaceans (LF)	LF
Mid-frequency cetaceans (MF)	HF
High-frequency cetaceans (HF)	VHF
Phocid pinnipeds in water (PW)	PCW
Otariid pinnipeds in water (OW)	OCW
Sirenians (SI)	Not included

2.4 Disturbance to Marine Mammals

Disturbance thresholds for marine mammals are summarised in Table 2-3. Note that the non-impulsive threshold can often be lower than ambient noise for coastal waters with some human activity, meaning that ranges determined using this limit will tend to be higher than actual ranges. However, the levels are unweighted and ranges to threshold will be dominated by low-frequency sound, which for most hearing groups is outside their hearing range. For hearing groups with low thresholds this can mean that their range to TTS/PTS is *larger* than the range to the behavioural threshold, e.g., the PTS threshold for impulsive sound for the VHS group is 155 dB SEL, while the behavioural threshold is 160 dB SPL. For a typical scenario, for 1 second's exposure (SEL equals SPL for 1-second durations) that means the range to the behavioural threshold will be approximately twice the range to the PTS threshold (a difference of 5 dB). This is just one of the reasons why this behavioural threshold should be interpreted with caution.

Table 2-3: Disturbance Criteria for Marine Mammals Used in this Study based on Level B harassment of NMFS (National Marine Fisheries Service, 2005)

Effect	Non-Impulsive Threshold	Impulsive Threshold
Disturbance (all marine mammals)	120 dB SPL	160 dB $SEL_{single\ impulse}$ or 1-second SEL

2.5 Injury and Disturbance to Fishes

The injury criteria used in this noise assessment are given in Table 2-4 and Table 2-5 for impulsive noises and continuous noise respectively. L_P and SEL criteria presented in the tables are unweighted. Physiological effects relating to injury criteria are described below (Popper, et al., 2014):

- **Mortality and potential mortal injury**: either immediate mortality or tissue and/or physiological damage that is sufficiently severe (e.g., a barotrauma) that death occurs sometime later due to decreased fitness. Mortality has a direct effect upon animal populations, especially if it affects individuals close to maturity.

- **Recoverable injury ("PTS" in tables and figures)**: Tissue damage and other physical damage or physiological effects, that are recoverable, but which may place animals at lower levels of fitness, may render them more open to predation, impaired feeding and growth, or lack of breeding success, until recovery takes place.

  The PTS term is used here to describe this, more serious impact, even though it is not strictly permanent for fish. This is to better reflect the fact that this level of impact is perceived as serious and detrimental to the fish.

- **Temporary Threshold Shift (TTS)**: Short term changes (minutes to few hours) in hearing sensitivity may, or may not, reduce fitness and survival. Impairment of hearing may affect the ability of animals to capture prey and avoid predators, and also cause deterioration in communication between individuals, affecting growth, survival, and reproductive success. After termination of a sound that causes TTS, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of sound exposure.

Popper et al. 2014 does not set out specific TTS limits for L_P and for disturbance limits for impulsive noise for fishes. Therefore publications: "Washington State Department of Transport Biological Assessment Preparation for Transport Projects Advanced Training Manual" (WSDOT, 2020) and "Canadian Department of Fisheries and Ocean Effects of Seismic energy on Fish: A Literature review" (Worcester, 2006) on effects of seismic noise on fish are used to determine limits for these:

- The criteria presented in the Washington State Department of Transport Biological Assessment Preparation for Transport Projects Advanced Training Manual (WSDOT, 2020). The manual suggests an un-weighted sound pressure level of 150 dB SPL (assumed to be duration of 95 % of energy) as the criterion for onset of behavioural effects, based on work by (Hastings, 2002). Sound pressure levels in excess of 150 dB SPL are expected to cause temporary behavioural changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area. The document notes that levels exceeding this threshold are not expected to cause direct permanent injury but may indirectly affect the individual fish (such as by impairing predator detection). It is important to note that this threshold is for onset of potential effects, and not necessarily an 'adverse effect' threshold. The threshold is implemented here as either single impulse SEL or 1 second SEL, whichever is greater.
- The report from the Canadian Department of Fisheries and Ocean "Effects of Seismic energy on Fish: A Literature review on fish" (Worcester, 2006) found large differences in response between experiments. Onset of behavioural response varied from 107-246 dB L_P, the 10^{th} percentile level for behavioural response was 158 dB L_P.

Given the large variations in the data from the two sources above, we have rounded the value to 160 dB L_P as the behavioural threshold for fishes for impulsive sound, and 150 dB SPL for non-impulsive sound.

Note that while there are multiple groups of fish presented, we have used the thresholds of the more sensitive group for all fish thus covering all fishes (203/186 PTS/TTS for impulsive sound & 222/204 PTS/TTS for non-impulsive sound). These lower thresholds also cover "Eggs and Larvae.

Table 2-4: Criteria for onset of injury to fish and sea turtles due to impulsive noise. For this assessment the lowest threshold for any group is used for all groups (shown in bold).

Type of animal	Unit	Mortality and potential mortal injury [dB]	Recoverable injury (PTS) [dB]	TTS [dB]	Behavioural [dB]
Fish: no swim bladder (particle motion detection) Example: Sharks.	SEL	219[1]	216[1]	186[1]	150[3]
	L_P	213[1]	213[1]	193[2]	160[2]
Fish: where swim bladder is not involved in hearing (particle motion detection). Example: Salmonoids.	SEL	210[1]	203[1]	186[1]	150[3]
	L_P	207[1]	207[1]	193[2]	160[2]
Fish: where swim bladder is involved in hearing (primarily pressure detection). Example: Gadoids (cod-like).	SEL	207[1]	**203[1]**	**186**	**150[3] [SPL]**
	L_P	207[1]	**207[1]**	**193[2]**	**160[2]**
Sea turtles	SEL	210[1]	(*Near*) High* (*Mid*) Low (*Far*) Low	-	-
	L_P	207[1]		-	-
Eggs and larvae	SEL	210[1]	(*Near*) Moderate (*Mid*) Low (*Far*) Low	-	-
	L_P	207[1]		-	-

[1] (Popper et al. 2014) table 7.4, [2] (Worcester, 2006), [3] (WSDOT, 2020)

* Indicate (range) and risk of effect, e.g., "(Near) High", meaning high risk of that effect when near the source.

Where Popper et al. 2014 present limits as ">" 207 or ">>" 186, we have ignored the "greater than" and used the threshold level as given.

Relevant thresholds for non-impulsive noise for fishes relating to PTS, TTS, and behaviour are given in Table 2-5. Note that for the behaviour threshold we have used the impulsive threshold as basis for the continuous noise threshold, in absence of better evidence.

Table 2-5: Criteria for fish (incl. sharks) due to non-impulsive noise from Popper et al. 2014, table 7.7.

Type of animal	Unit	Mortality and potential mortal injury	Recoverable injury (PTS) [dB]	TTS [dB]	Behavioural [dB]
All fishes	SEL	(*Near*) Low (*Mid*) Low (*Far*) Low	222†	204†	150 [SPL]*

*Based on the impulsive criteria.

†Based 48 hours of 170 dB SPL and 12 hours of 158 dB SPL

3 THE SITE ENVIRONMENT

3.1 SI Works Area of Interest

The SI Works Area of Interest (AoI) and nearby surroundings are characterised by shallow water (c. 14 m at the deepest extents), generally silty to sandy sediment and stable water properties (Figure 3-1).

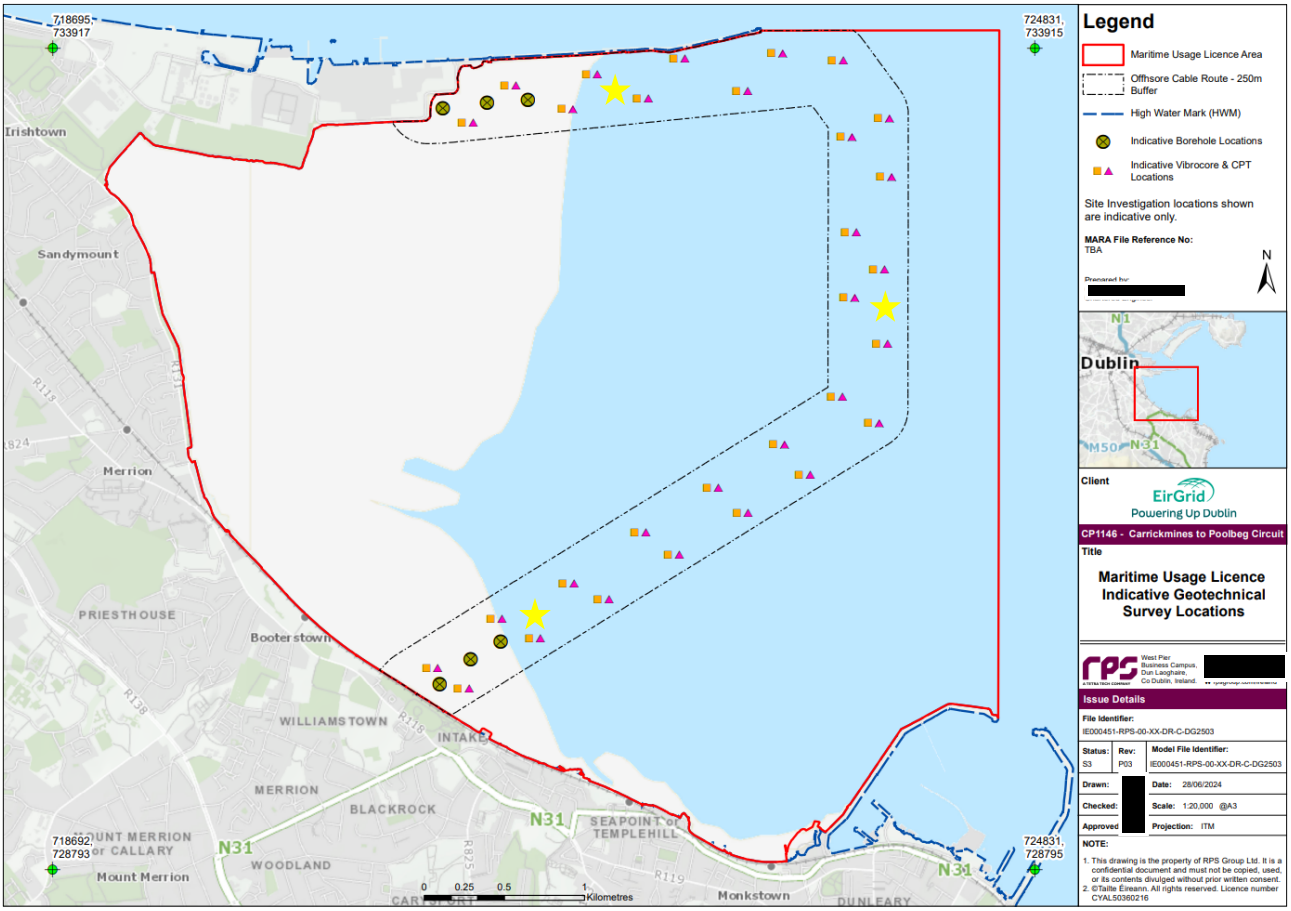

Figure 3-1: Maximal extent of surveys (red line). Indicative cable route (dot-dash line) with indicative locations for boreholes and geotechnical sampling locations. Additionally (yellow stars) are 3 indicative locations for ADCP deployments.

The maximal area to be surveyed is 2101 Ha of depths up to 14 meters (at mean high water springs “MHWS”).

The survey speed is expected to be 4 knots (2.1 m/s), limited by the survey equipment. The survey transects plan is yet to be determined so reasonable worst-case locations throughout the survey area have been used as basis for the modelling rather than a specific survey plan.

3.2 Water Properties

Water properties were determined from historical data for the area. Where a range of values are expected or observed, the value resulting in the lowest transmission loss was chosen for a more conservative assessment (more noise at range). Thus, this also covers seasonal variation.

- Temperature: 18°C – maximal summer temperature given by seatemperature.net for the past seven years for bay Dublin.

- Salinity: 34.5 psu – Measurements in relation to Ringsend Wastewater Treatment Plant Upgrade Project[5]
- Soundspeed profile: Assumed uniform given high mixing as a result of tidal flows and generally shallow water and absence of river outflows.

3.3 Sediment Properties

Sediment properties are based on sediments given in Table 3-1.

Sediment types are informed by the "Folk 7-class Classification" from EMODnet Geology[6] (European Commision, 2024). A sediment model (Ainslie, 2010) was used to derive the acoustic properties of the sediment from the grain size. (Table 3-1).

Table 3-1: Sediment Properties for the two survey areas.

Site	Sediment type (ISO 14688-1:2017)	Density [kg/m³]	Soundspeed [m/s]	Grain size [mm] (nominal)
Outer/deeper part of the Survey area	Medium Silt	1551	1544	0.011
Inner/shallower part of the Survey area	Sand	2123	1801	0.35

[5] "Ringsend WwTP - EIAR modelling services" Figure 5.39 available online (2024/07/11)

[6] https://drive.emodnet-geology.eu/geoserver/gtk/wms

4 SOURCE NOISE LEVELS

Underwater noise sources are usually quantified in dB scale with values generally referenced to 1 µPa pressure amplitude as if measured at a hypothetical distance of 1 m from the source (called the Source Level). In practice, it is not usually possible to measure at 1 m from a source, but the metric allows for comparison and reporting of different source levels on a like-for-like basis. In reality, for a large sound source, this imagined point at 1 m from the acoustic centre does not exist. Furthermore, the energy is distributed across the source and does not all emanate from an imagined acoustic centre point. Therefore, the stated sound pressure level at 1 m does not occur for large sources. In the acoustic near-field (i.e. close to the source), the sound pressure level will be significantly lower than the value predicted by the back-calculated source level (SL).

4.1 Source Models

The noise sources and activities investigated during this assessment are summarised in Table 4-1.

Note that:

1. The ping rate, and therefore the SPL and SEL of the sound source varies with the local depth.

2. Due to differences in sediment, the angle at which the sediment will tend to reflect sound back into the water column changes. As we use this information to derive practical source levels for highly directional sources, this will change with sediment type (further information below and in Appendix A & Figure 8-7).

3. To account for the shallow depth, and therefore assumed short duration of pulses from Multibeam Echo-Sounder (MBES), Side Scan Sonar (SSS) and pinger/chirper, we have assessed the weighted kurtosis in order to determine impulsiveness (Section 2.1).

Sonars and echosounders generally use tone pulses of either constant frequency or as a frequency sweep. These pulses are typically windowed to limit "spectral leakage[7]". We assume use of a Von Hann window (sometimes "Hanning") which gives effective attenuation of frequencies outside the intended frequencies. This means that while a sonar with a centre frequency of 200 kHz is well above the hearing range of any marine mammal, there will be energy at 100 kHz c. 50 dB lower than the source level at 200 kHz. This is accounted for in the assessment. Note that this might contrast with some guidelines, such as the "JNCC guidelines mitigation during geophysical surveys" (JNCC, 2017), which state that "*Multi-beam surveys in shallower waters (<200m) are not subject to these requirements* [mitigation for protection of European Protected Species]". However, given the fact there is substantial energy outside the nominal frequency range of any echo sounder (see example in Figure 4-1), we have included this energy spread here.

[7] Acoustic phenomenon where a sharp change in pressure produces sound in a wide frequency range (similar to an ideal impulse) outside the intended frequencies.

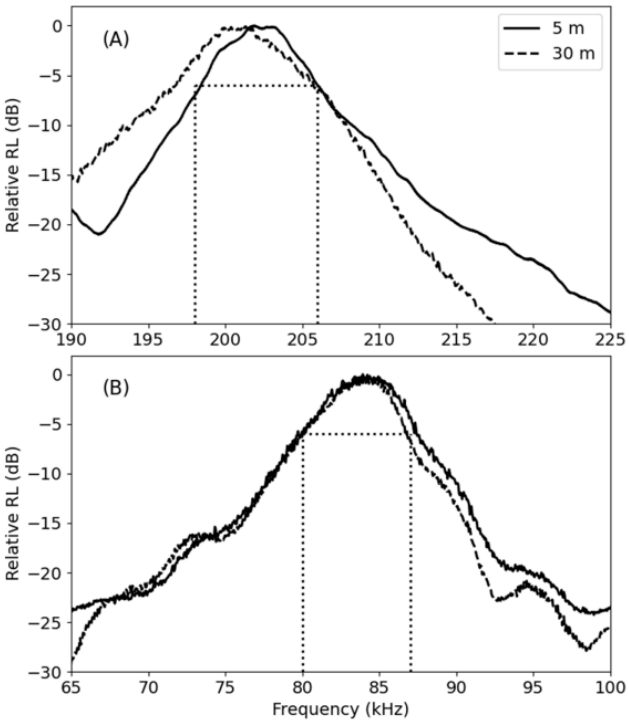

Figure 4. The relative received levels (RLs, in decibels (dB)) of the signals of the acoustic frequency bandwidth of the dual-frequency echosounder used in this study, as observed at two different depths. The dotted lines indicate the −6 dB acoustic bandwidths of 198–206 (**A**) and 80–87 kHz (**B**). The peak frequencies of the two channels were found to be 201.5 (**A**) and 84 kHz (**B**).

Figure 4-1. Example of recorded levels from an echosounder showing significant energy outside the nominal frequencies, necessitating assessment at those frequencies too (Burnham, et al., 2022).

Highly directional sources with narrow beams (sonars and echosounders) will tend to ensonify only a narrow cone of water at any given time. For multibeam echosounders or side scan sonars, the beam(s) sweeps though the water, side to side, to get wider sediment coverage. For this type of sonar, we have converted the source to an omnidirectional source with the same acoustic energy as the original but represented as omnidirectional. This simplifies the calculation process, but yields identical results, and means that we account for the probabilistic nature of an animal being “ensonified” by the source.

For beams only directed vertically down or up, such as sub-bottom profilers or ADCPs, we incorporate the directivity of the beam as well as the ability of the sediment to reflect the sound emitted. This means that we can account for the fact that primarily, a narrow cone directly below/above the source is ensonified with high sound levels and also that a significant attenuation occurs in the sediment where sound enters at steep angles. In practice, we use the angle with the highest level after accounting for directivity combined with sediment loss to a range of 100 m.

Table 4-1: Summary of Sound Sources and Activities Included in the Subsea Noise Assessment

Equipment	Source level [SPL] (as used in model)	Primary decidecade bands (-20 dB width)	Source model details	Impulsive/non-impulsive
Survey vessel, Geophysical	161 dB SPL	10-16,000 Hz	Based on <20 m generic survey vessel.	Non-impulsive
Survey vessel, Geotechnical	168 dB SPL	10 – 25,000 Hz	Based on <30 m tug with dynamic positioning system	Non-impulsive
MBES	187 dB SPL (Spherical equivalent level)	200,000-800,000 Hz	Based on Reason SeaBat T50 & R2 Sonic 2024.	Impulsive

Equipment	Source level [SPL] (as used in model)	Primary decidecade bands (-20 dB width)	Source model details	Impulsive/non-impulsive
SSS	166 dB SPL (Spherical equivalent level)	100,000-1,000,000 Hz	Generic SSS from 400-1,000 kHz.	Impulsive
USBL	190 dB SPL	18,000-31,500 Hz	Active with non-hull mounted SSS* & during vibro-core operations, 2 Hz ping rate, ping length 10 ms.	Impulsive
SBP-parametric (P-SBP)	204 dB SPL	80,000-150,000 Hz (Primary) 2,000-22,000 Hz (Secondary)	Source level adjusted for sediment effects and beam widths. Based on Innomar Standard, worst-case for shallow water.	Impulsive
SBP-chirper/pinger (C-SBP)	181 dB SPL	2,000-12,000 Hz	Generic shallow water SBP of chirper/pinger type. Source level adjusted for sediment effects and beam widths.	Impulsive
SBP-sparker/UHRS (S-SBP)	184 dB SPL	600 – 6,300 Hz	Based on GeoSource 400. Firing rate of 1 Hz assumed	Impulsive
ADCP (**Not modelled given high frequency**)	114 dB SPL	500,000-1,260,000 Hz	Based on suitable ADCP for depths <100 m (e.g. Nortek AWAC, Teledyne Reason Sentinel, Workhorse or Monitor) Source level adjusted for sediment effects and beam widths.	Impulsive
Drilling/ rotary coring (Boreholes, no USBL)	145 dB SPL	10-500,000 Hz	Based on published levels (Erbe, et al., 2017; Fisheries and Marine Service, 1975; MR, et al., 2010; L-F, et al., 2023)	Non-impulsive
Vibro-coring & CPT	187 dB SPL	50 – 16,000 Hz	Based on levels from previous work & (Reiser, et al., 2010)	Non-impulsive

*If the SSS and SBP are hull-mounted, there is no need for a positioning device (USBL) and this noise source should be removed from consideration.

The ADCP has not been modelled due to its lowest frequency being significantly above the upper frequency limit of hearing of any marine animal. Furthermore, the extremely high frequencies will attenuate rapidly with range, meaning that on top of the spreading loss there will be an additional c. 140 dB/km loss from absorption[8].

In addition to the activities outlined above, there may also be grab sampling. However, this activity has not been modelled given the low noise levels associated with the activity.

[8] See e.g., APPENDIX A, Figure 8-12 or http://resource.npl.co.uk/acoustics/techguides/seaabsorption/ for further information.

All other surveys undertaken in the intertidal area, e.g. environmental walkover surveys, intertidal sampling, etc. have not been included in this assessment as they will not result in underwater noise.

4.1.1 Equipment

This section presents details on each sound source individually. Combined sources, with expected combination of active equipment, are presented in Section 4.1.2.

4.1.1.1 Survey Vessel, Geophysical

A small survey vessel of up to 20 m in length, travelling at 4 knots (equipment limited), has been assessed in this report as this represents the anticipated vessel parameters for the geophysical and geotechnical surveys. Broadband level of the vessel is 161 dB SPL with decidecade band levels given in Figure 4-2 (maximal band level is 150 dB SPL at the 25 Hz band). Smaller vessels will have lower emitted levels and are therefore covered by this assessment.

This vessel is also used as a proxy for a suitable platform for support vessels, representing generic machinery noise.

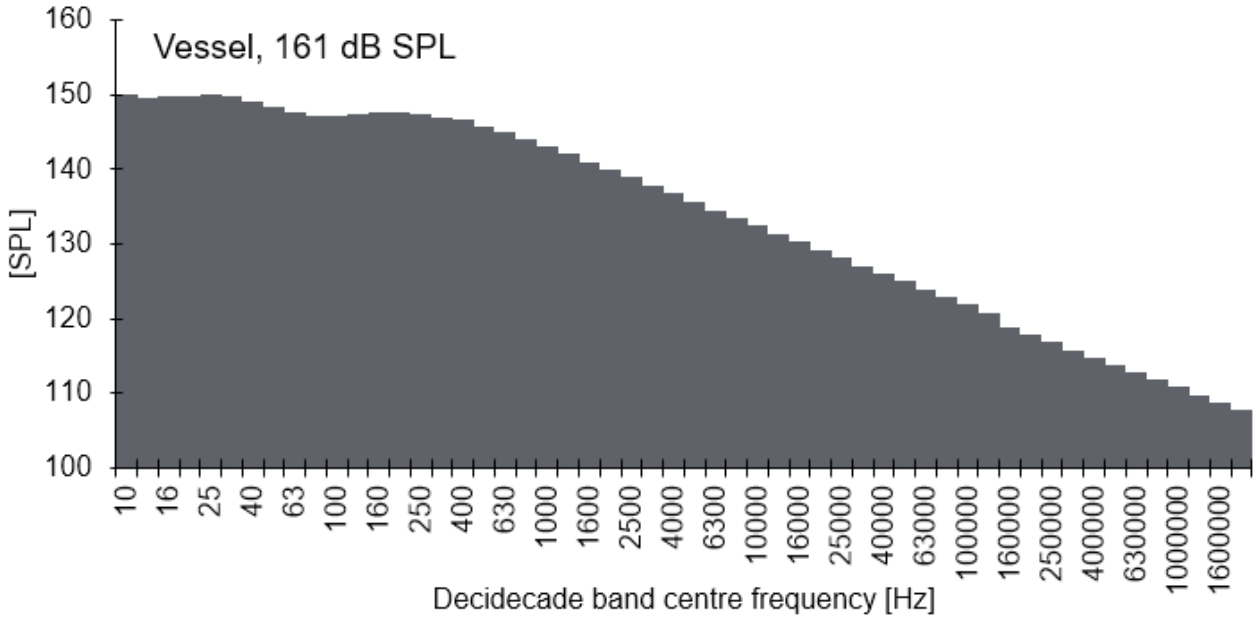

Figure 4-2. Vessel source band levels. Broadband level: 161 dB SPL. Based on generic survey craft at 4 kn.

4.1.1.2 Survey Vessel, Geotechnical

A small survey vessel of up to 30 m in length, travelling at 4 knots transiting to SI locations (equipment limited), has been assessed in this report as this represents the anticipated vessel parameters for carrying out the geotechnical survey. Broadband level of the vessel is 168 dB SPL with decidecade band levels given in Figure 4-2 (maximal band level is 157 dB SPL at the 400 Hz band). Smaller vessels will have lower emitted levels and are therefore covered by this assessment.

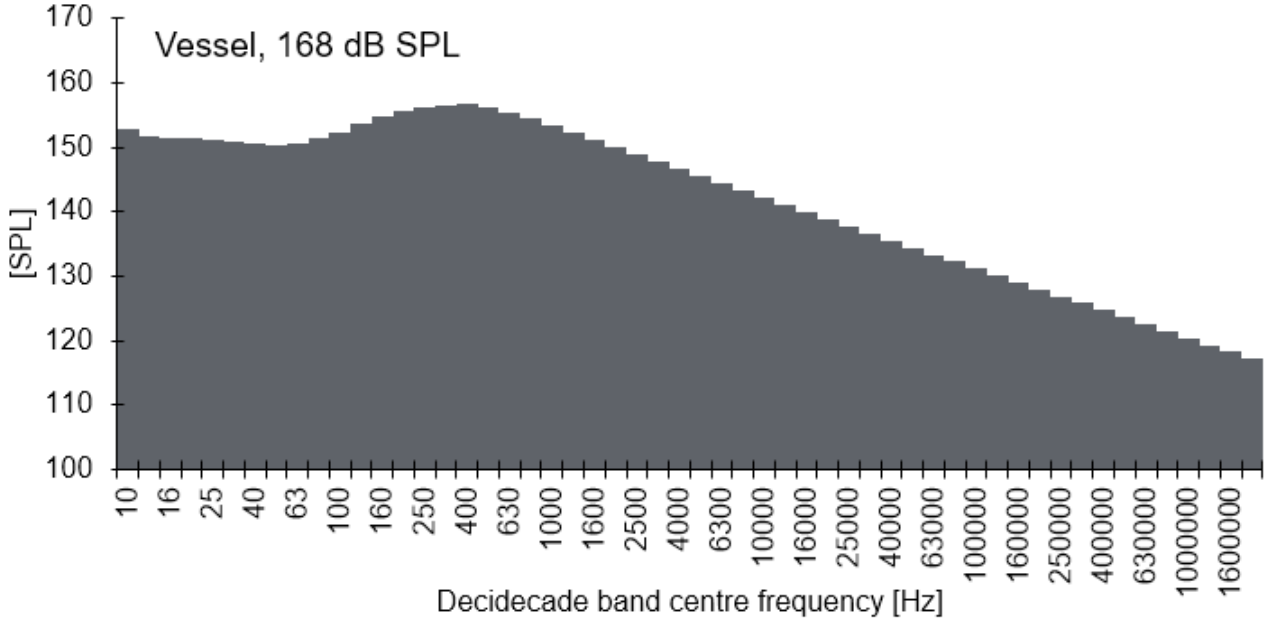

Figure 4-3. Vessel source band levels. Broadband level: 168 dB SPL. Based on generic tug with DP system at 4 kn.

4.1.1.3 Multibeam Echosounder (MBES)

The “Reason SeaBat T50-P”, “R2 Sonic 2024”, or similar shallow water model, is a likely MBES for this survey. Nominal frequencies from 200 kHz to 800 kHz have been modelled. The equivalent spherical level is 187 dB SPL (maximally 179 dB SPL in each band). Band levels are presented in Figure 4-4.

Given the shallow water (<14 m depth), it is likely that shorter pulses will be used as they offer sufficient energy for a clear returning echo. This will increase kurtosis (“impulsiveness”) for realistic ping rates for the depth. Therefore, the MBES is modelled as an impulsive noise source.

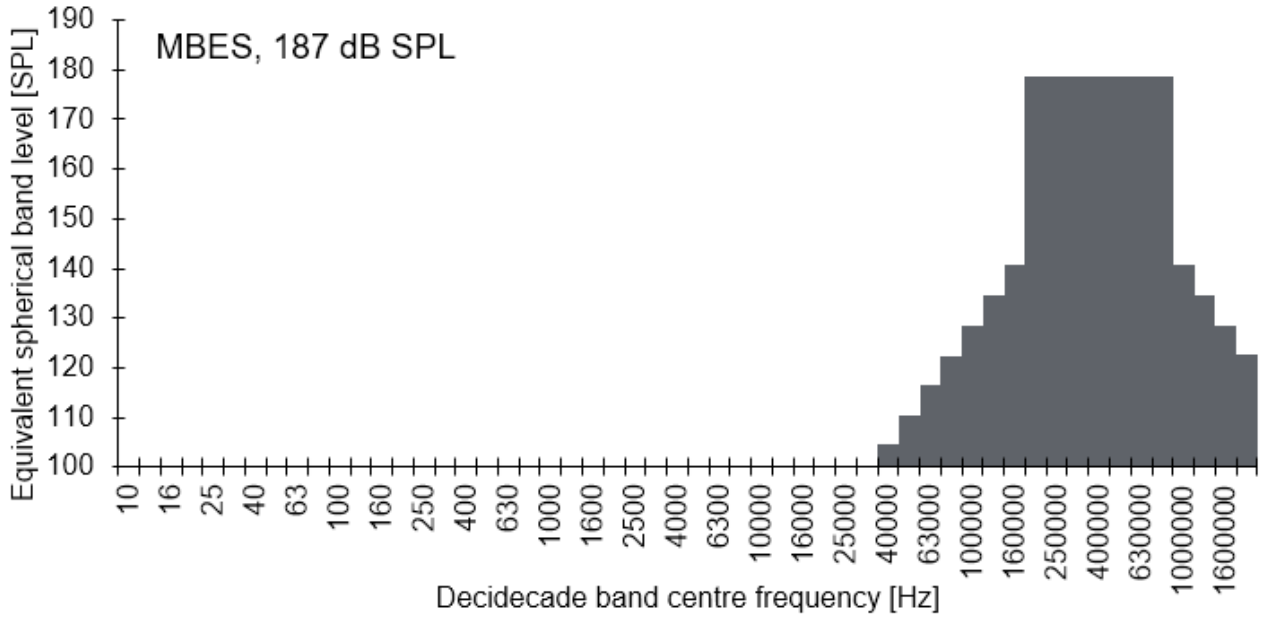

Figure 4-4. MBES source band levels as equivalent spherical/omnidirectional levels.

4.1.1.4 Side Scan Sonar (SSS)

No specific model of side scan sonar (SSS) has been determined for the survey, except for specification of nominal frequencies of 100 – 1,000 kHz. To address this uncertainty, a generic SSS model has been generated from seven commonly used SSS systems (from EdgeTech, C_MAX and Klein Systems). We have used the 90th percentile level as the representative level. The equivalent spherical broadband level is 166 dB SPL (Figure 4-5).

Given the shallow water (<14 m depth), it is likely that shorter pulses will be used as they offer sufficient energy for a clear returning echo. This will increase kurtosis ("impulsiveness") for realistic ping rates for the depth. Therefore, the SSS is modelled as an impulsive noise source.

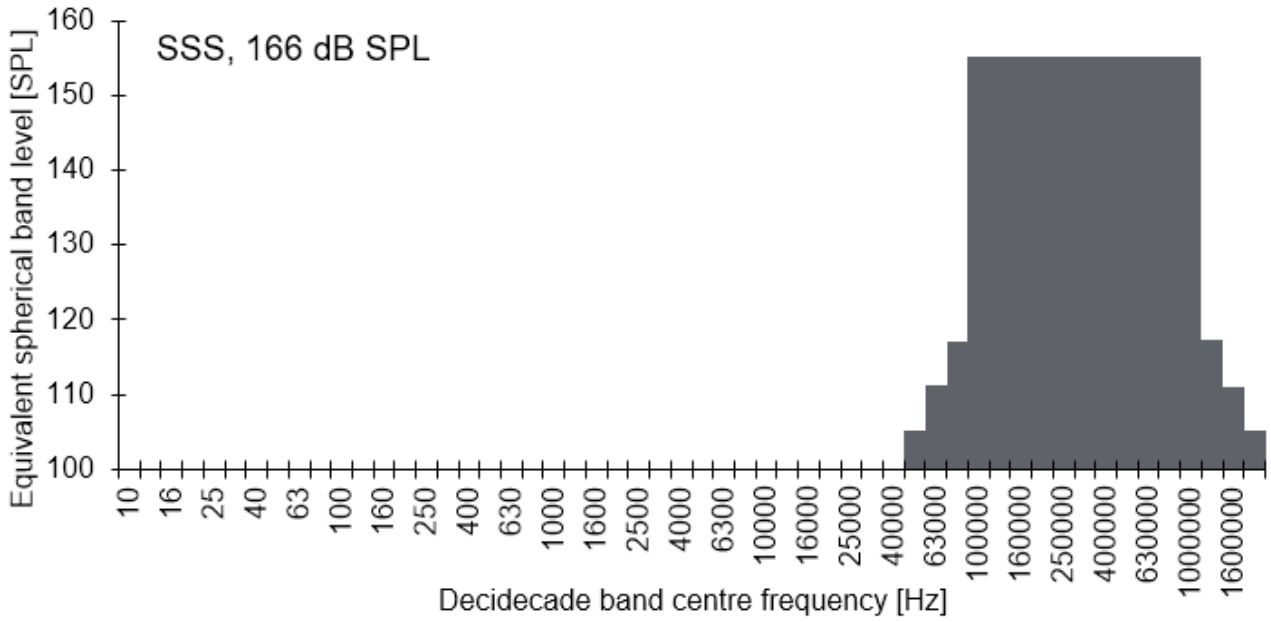

Figure 4-5. SSS source band levels as equivalent spherical/omnidirectional levels.

4.1.1.5 Ultra Short Base-Line positioning system (USBL)

If the SSS or SBP is deployed as a towfish (towed behind the vessel), its accurate positions will need to be known. A USBL positioning system is a common solution. This is also the case for the deployed Vibro-corer units. Here, a generic USBL is used, with a 10 ms pulse length and 2 Hz ping rate, consistent with popular models (Edgetech BATS, IxBlue GAPS, Sonardyne Ranger). A max SPL [L_P] of 210 dB have been modelled, giving an SPL of 190 dB (Figure 4-6).

The relatively short pulses and slow repetition of pulse gives a weighted kurtosis over the limit value (40), therefore, the USBL is modelled as an impulsive noise source.

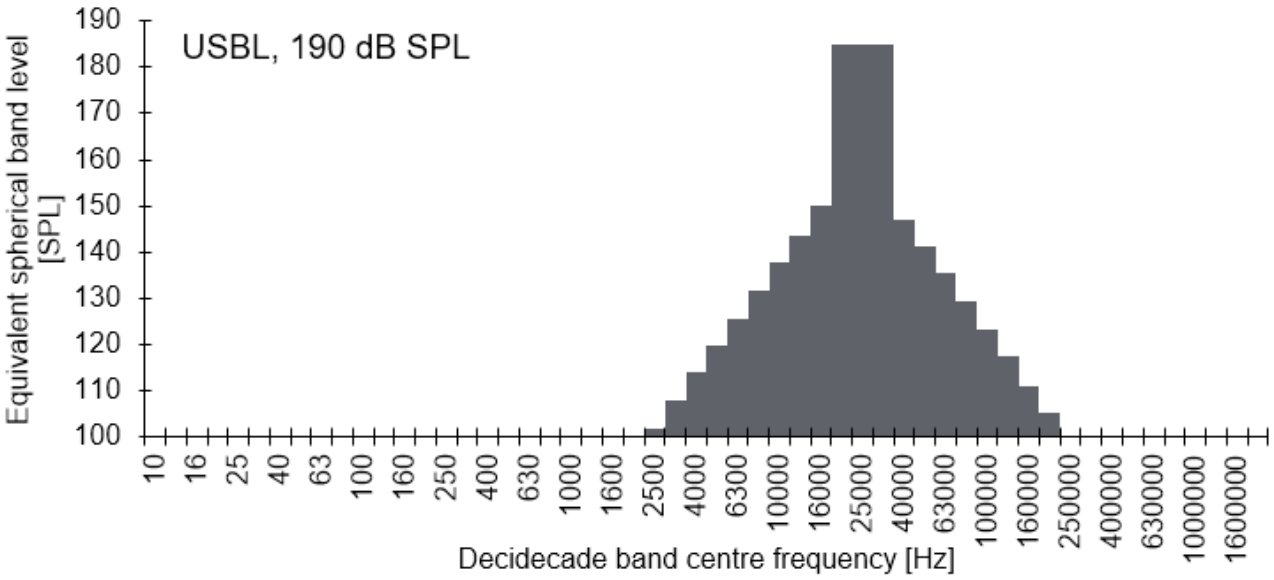

Figure 4-6. USBL source band levels.

4.1.1.6 Sub-bottom Profilers (SBP)

4.1.1.6.1 Parametric SBP (P-SBP)

The survey might use a parametric sub-bottom profiler (SBP) such as the “Innomar standard”. These SBPs use two higher frequencies (“primary frequencies”) to generate an interference pattern at lower frequencies (“secondary frequencies”). This means that the secondary beam can be made extraordinarily narrow, leading to a much smaller sound impact (Appendix A, Figure 8-8). We account for these differences in beam pattern by including the sediment reflection loss at high incidence angles (see Appendix A, Figure 8-7) to reduce the effective source level accordingly.

The source level for the P-SBP is split into two regions according to the nominal frequencies, accounting for some spectral leakage (Figure 4-7) and assuming the full range of frequencies is used during the survey (a conservative assumption). The total, broad band level for the parametric SBP is 204 dB SPL, with the secondary frequencies being 144 dB SPL.

Given the shallow water (<14 m depth), it is likely that shorter pulses will be used as they offer sufficient energy for a clear returning echo. This will increase kurtosis (“impulsiveness”) for realistic ping rates for the depth. Therefore, the P-SBP is modelled as an impulsive noise source.

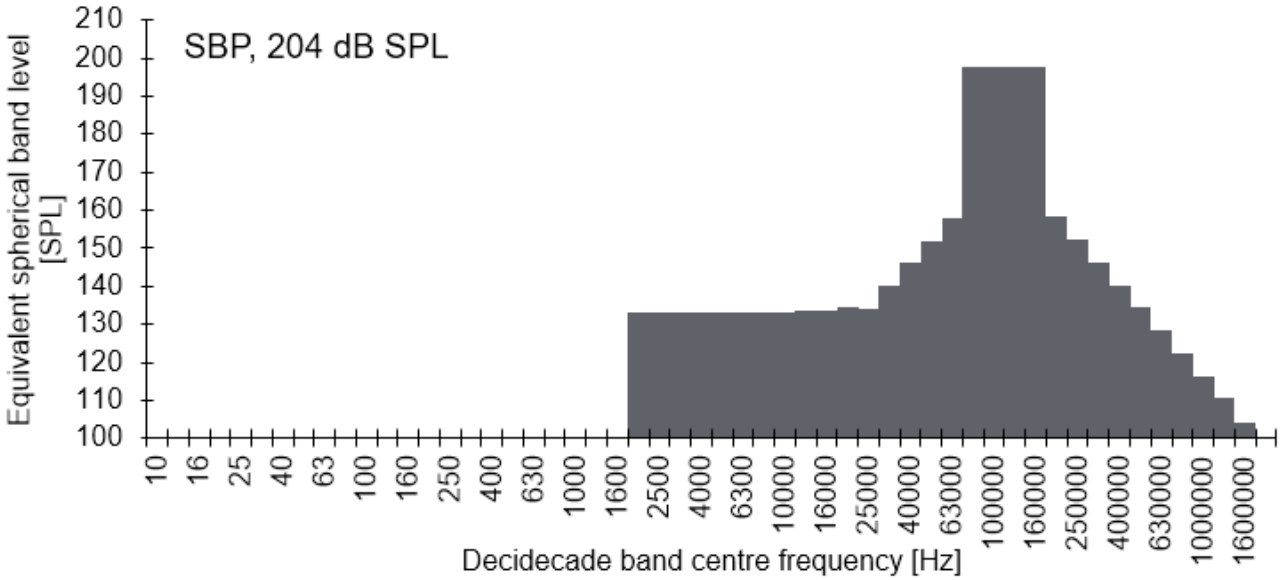

Figure 4-7. Parametric SBP source band levels as equivalent spherical/omnidirectional levels. Primary frequencies 85 kHz – 150 kHz, secondary frequencies 2 kHz – 22 kHz.

4.1.1.6.2 Chirper/Pinger SBP (C-SBP)

A chirper or pinger type SBP might be used for the survey. As no specific model has been specified, we have used a generic model based on common SBPs of this type. These have wide beams and therefore a comparatively higher noise impact, relative to their in-beam source levels. A single SBP source has been generated to represent both these sources as they are acoustically similar. Total broadband level for this SBP is 181 dB SPL with band levels given in Figure 4-8.

Given the shallow water (<14 m depth), it is likely that shorter pulses will be used as they offer sufficient energy for a clear returning echo. This will increase kurtosis (“impulsiveness”) for realistic ping rates for the depth. Therefore, the C-SBP is modelled as an impulsive noise source.

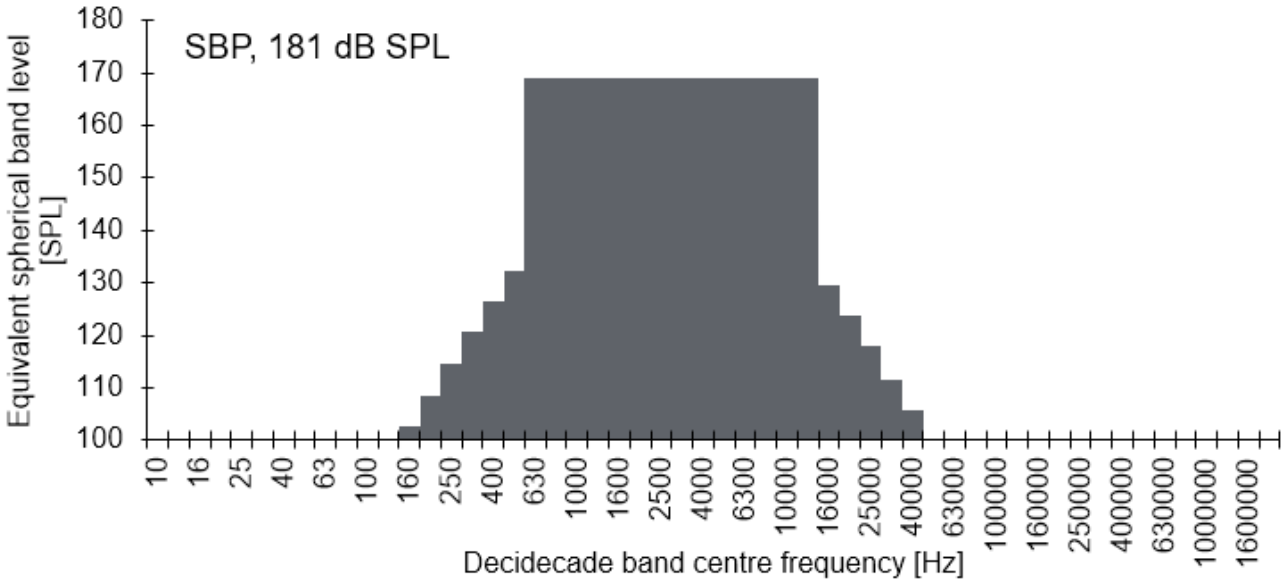

Figure 4-8. Chirper/Pinger type SBP band levels.

4.1.1.6.3 Sparker SBP (S-SBP)

A sparker type SBP (sometimes “UHRS”) might be used during the survey. As no specific model has been specified, we have used a generic model based on common SBPs of this type and an energy per firing of 400 J and 1 firing per second. The total broadband level for this SBP is 184 dB SPL, with band levels given in Figure 4-8. Levels at frequencies below 100 Hz are taken from a spectral analysis of the timeseries in Figure 4-10.

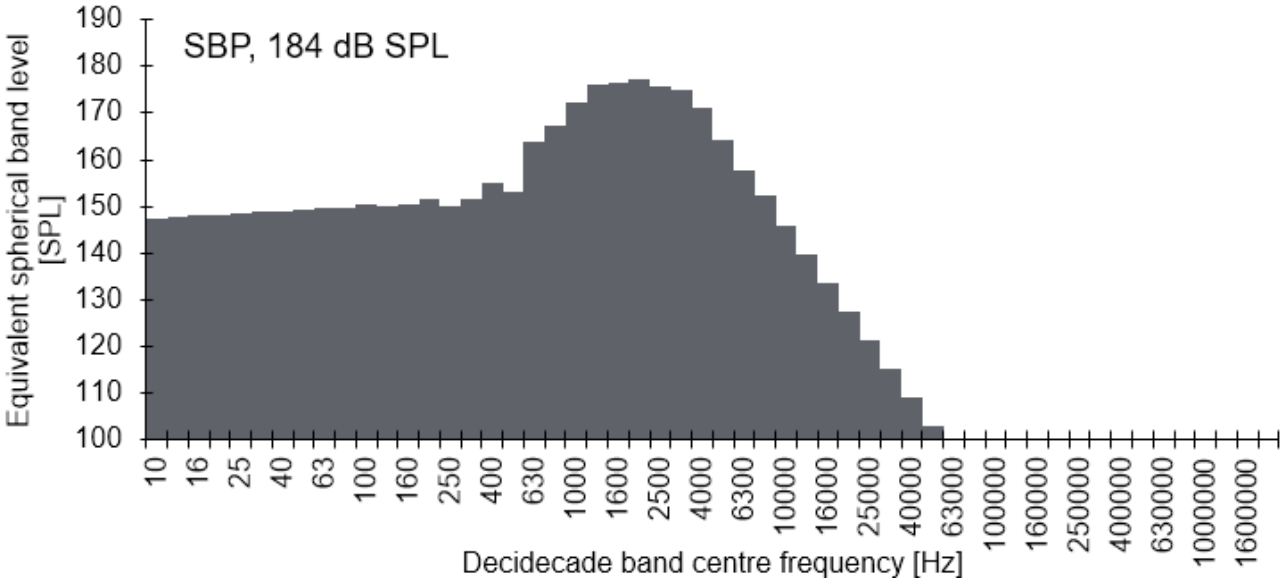

Figure 4-9. Chirper/Pinger type SBP band levels.

The very short impulses and slow repetition mean that this source is modelled as an impulsive noise source.

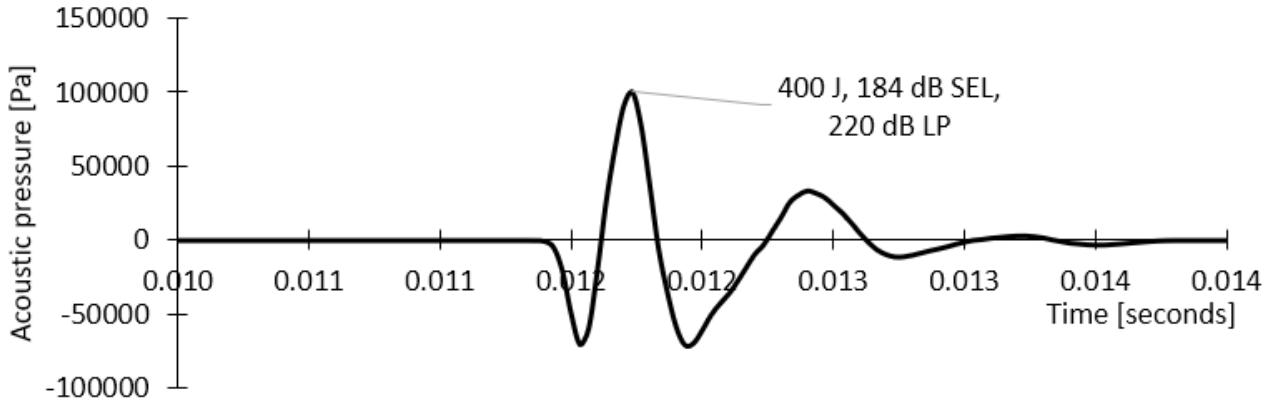

Figure 4-10. Example of an impulse from a sparker type SBP.

4.1.1.7 Boreholes Drilling

Boreholes are planned in the shallow parts of the SI Works area, with a drill of c. 0.1 m diameter. Recordings from similar equipment has informed the source levels used here (Erbe, et al., 2017; Fisheries and Marine Service, 1975; MR, et al., 2010; L-F, et al., 2023) Figure 4-11. This activity is a non-impulsive sound source with a broadband level of 145 dB SPL.

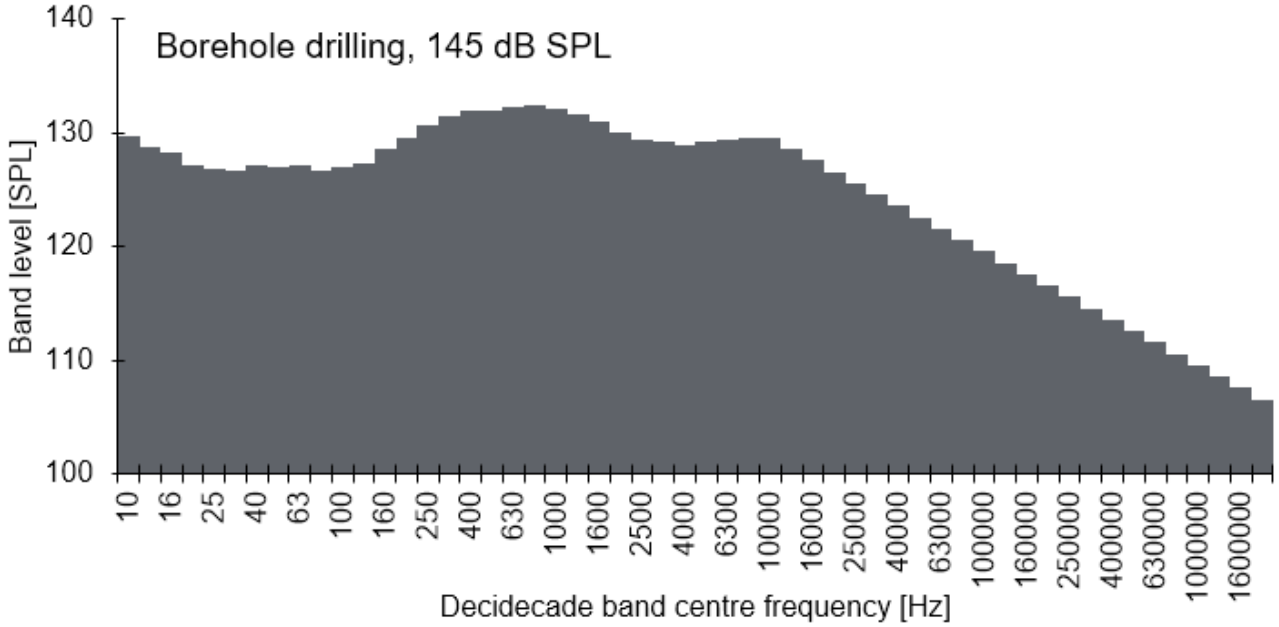

Figure 4-11. Band levels for drilling, Levels above 25 kHz are extrapolated based on trend in bands at lower frequencies.

4.1.1.8 Vibro-coring & CPT

For extraction of physical samples and sediment testing, vibro-coring and Cone Penetration Testing (CPT) will be carried out. Band levels are shown in Figure 4-11. The “Vibro-coring & CPT” activity is a non-impulsive sound source with a broadband level of 187 dB SPL.

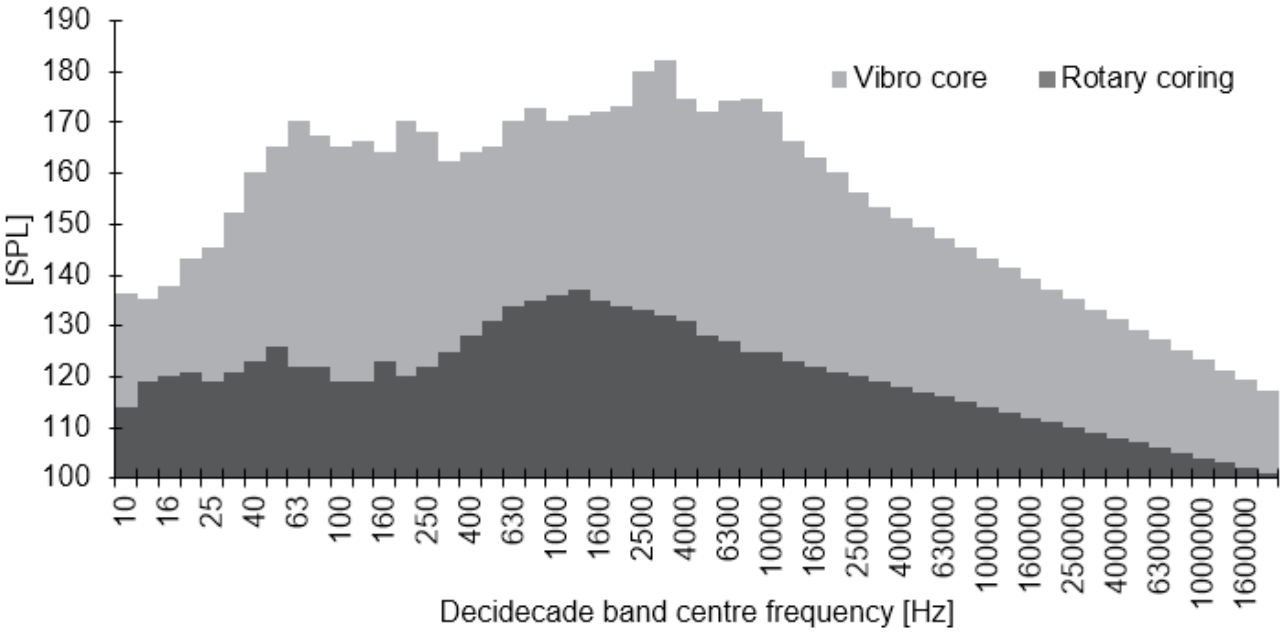

Figure 4-12. Band levels vibro-coring and CPT. Levels above 25 kHz are extrapolated based on trend in bands at lower frequencies.

4.1.2 Combined Sources

The relevant equipment for each survey type has been grouped into six scenarios that represent the most combinations for the survey equipment proposed to be used in the SI works.

MBES and SSS are active for all combined sources of the geophysical survey.

The “Vessel” noise source is active for all sources of both geophysical and geotechnical surveys.

4.1.2.1 Geophysical Survey (Parametric SBP & USBL Active)

This scenario assumes the geophysical survey is using a parametric SBP and that a towfish is deployed requiring an active USBL. Total broadband level of 204 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- USBL
- Parametric SBP

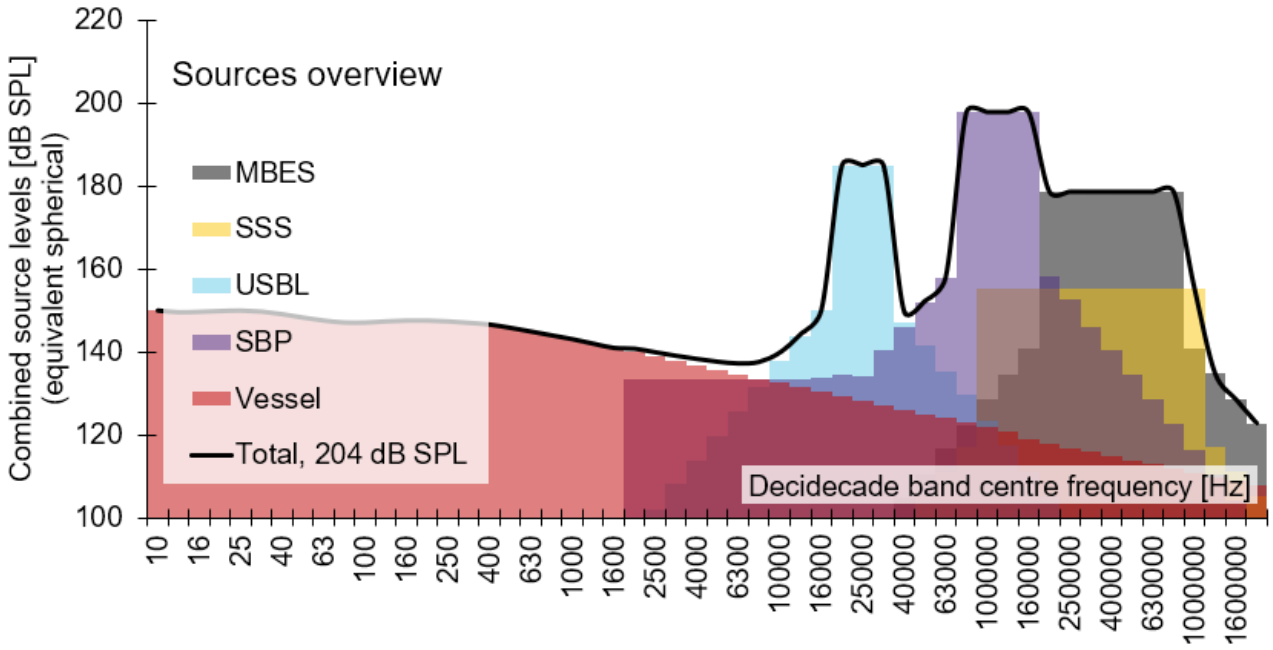

Figure 4-13. Source band level during geophysical survey (parametric SBP & USBL active).

4.1.2.2 Geophysical Survey (Parametric SBP & USBL Not Active)

This scenario assumes the geophysical survey is using a parametric SBP and that there is no need for a USBL (hull mounted SBP and SSS with known positions). Total broadband level of 204 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- Parametric SBP

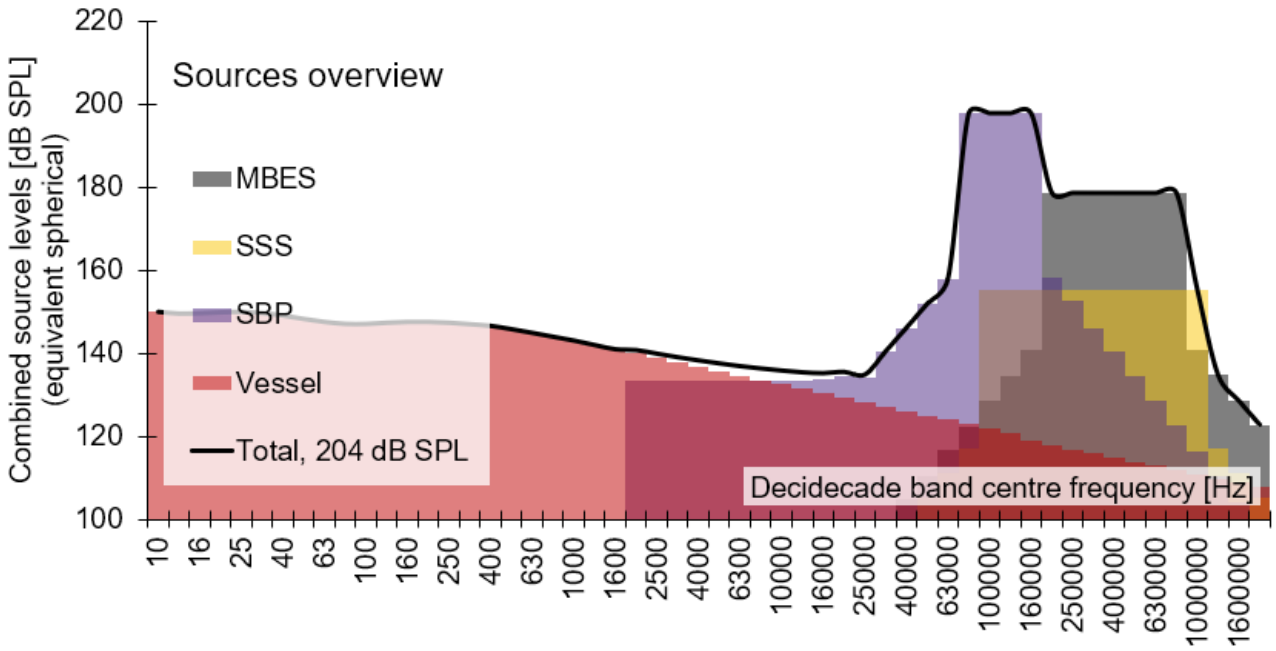

Figure 4-14. Source band level during geophysical survey (parametric SBP & USBL not active).

4.1.2.3 Geophysical Survey (Chirper/Pinger SBP & USBL Active)

This scenario assumes the geophysical survey is using a chirper or pinger type SBP and that a towfish is deployed requiring an active USBL. Total broadband level of 191 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- USBL
- Chirper/pinger SBP

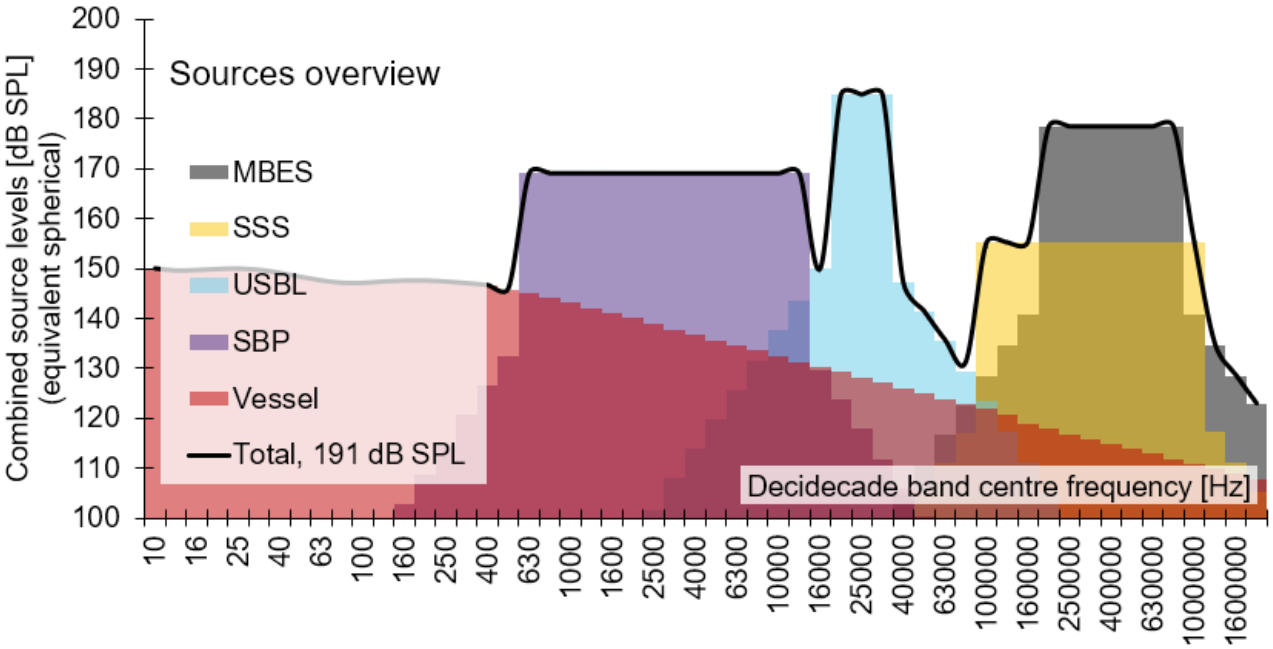

Figure 4-15. Source band level during geophysical survey (chirper/pinger SBP & USBL active).

4.1.2.4 Geophysical Survey (Chirper/Pinger SBP & USBL Not Active)

This scenario assumes the geophysical survey is using a chirper or pinger type SBP and that there is no need for a USBL (hull mounted SBP and SSS, with known positions). Total broadband level of 183 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- Chirper/pinger SBP

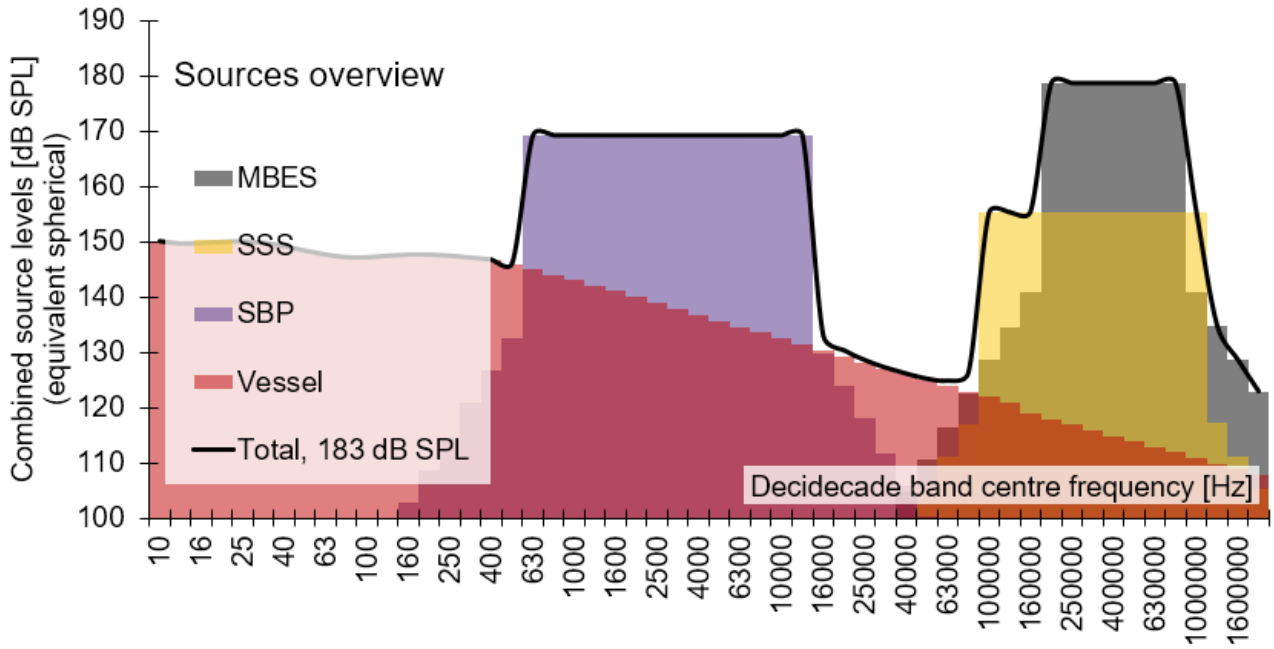

Figure 4-16. Source band level during geophysical survey (chirper/pinger SBP & USBL not active).

4.1.2.5 Geophysical Survey (Sparker SBP & USBL Active)

This scenario assumes the geophysical survey is using a sparker type SBP and that a towfish is deployed requiring an active USBL. Total broadband level of 191 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- USBL
- Sparker

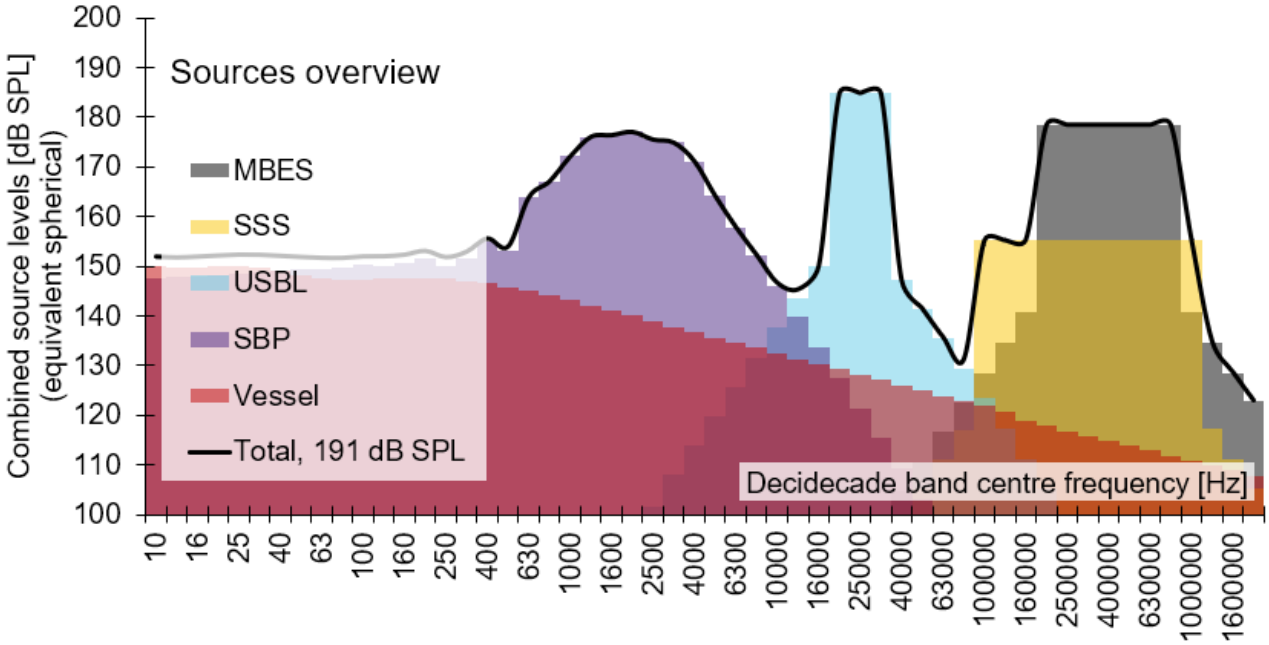

Figure 4-17. Source band level during geophysical survey (sparker SBP & USBL active).

4.1.2.6 Geophysical Survey (Sparker SBP & USBL not Active)

This scenario assumes the geophysical survey is using a sparker type SBP and that there is no need for a USBL (hull mounted SBP and SSS, with known positions). Total broadband level of 185 dB SPL.

Active equipment:

- Vessel
- MBES
- SSS
- Sparker

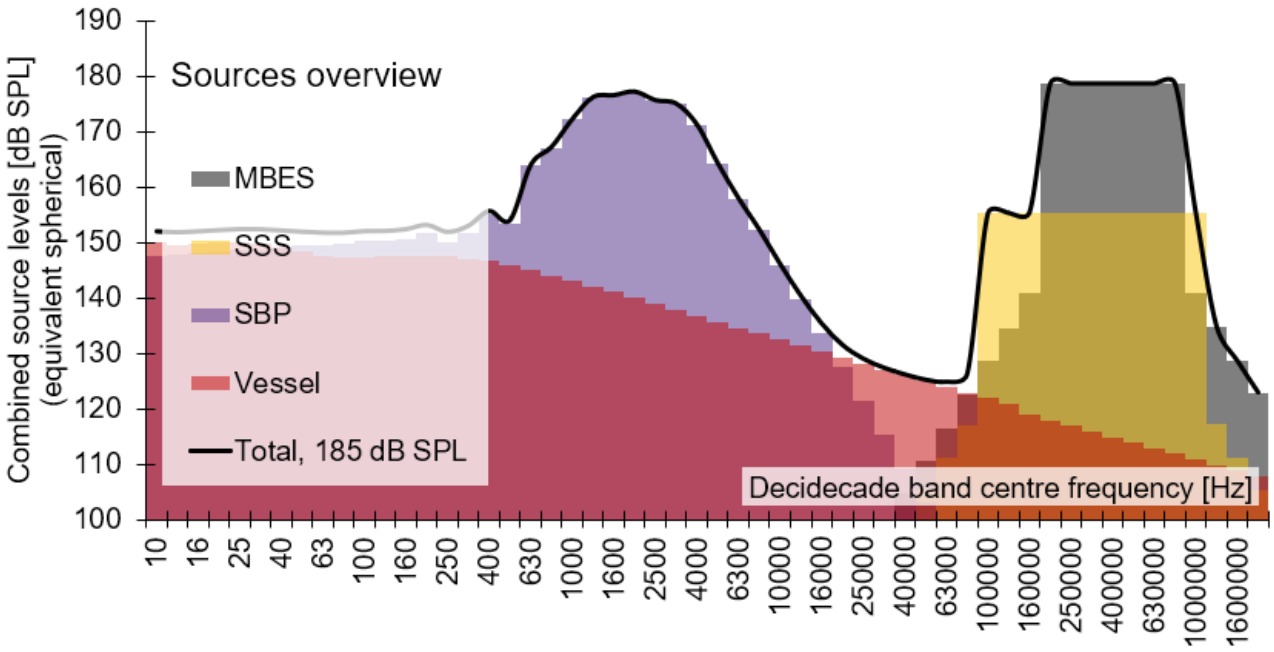

Figure 4-18. Source band level during geophysical survey (sparker SBP & USBL not active).

4.1.2.7 Soft Start Source (Geophysical)

During soft starts, it is assumed that any SBP and USBL will not be active but the MBES and/or the SSS will be active. Total broadband level of 179 dB SPL.

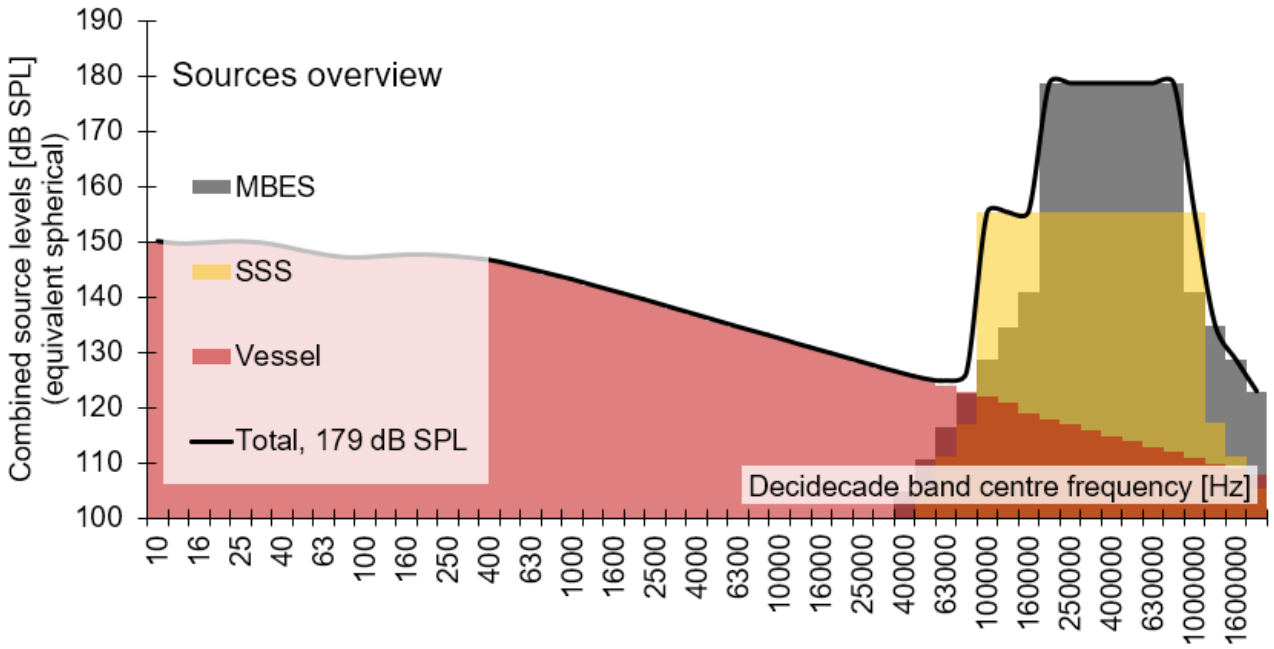

Figure 4-19. Source band level during geophysical survey soft start.

4.1.2.8 Geotechnical Survey (Drilling, boreholes)

Equipment related to drilling boreholes are active. Additionally, the “Vessel” source is active to account for support vessels and general machinery. Total broadband level of 162 dB SPL.

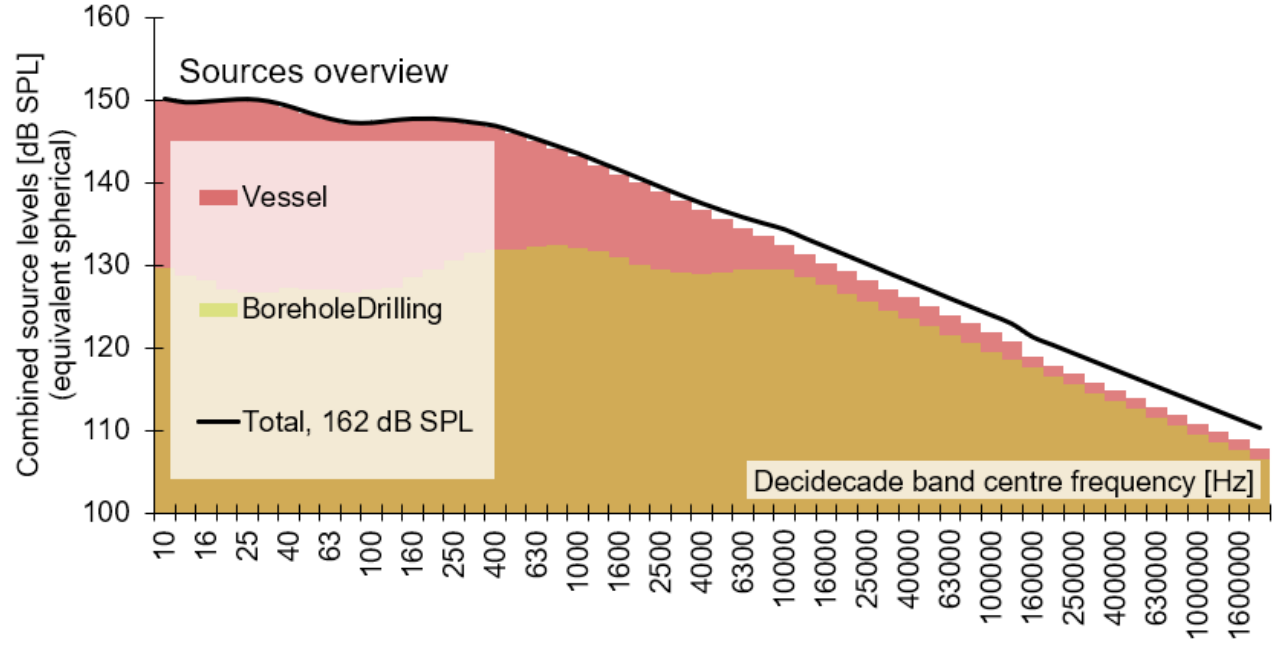

Figure 4-20. Source band level during geotechnical survey – borehole drilling.

4.1.2.9 Geotechnical Survey (Vibro-coring & CPT)

Vibro-coring, CPT, vessel (geotechnical) and USBL are active. Total broadband level of 192 dB SPL.

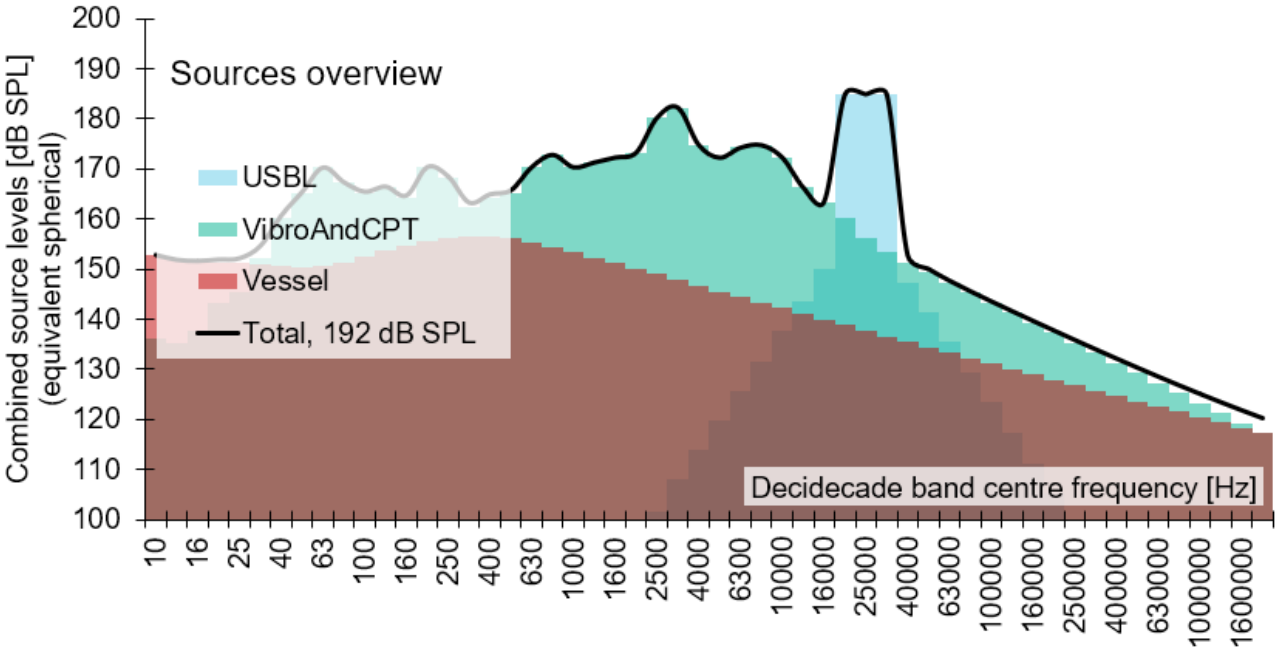

Figure 4-21. Source band level during geotechnical survey – vibro-coring and CPT.

4.1.2.10 Soft Start Source (Geotechnical – Vibro-coring & CPT)

As the geotechnical survey plans to use a USBL, it is likely that some form of soft start will need to be considered. Here, the vessel itself (with no active USBL) will perform this function. Total broadband level of 168 dB SPL.

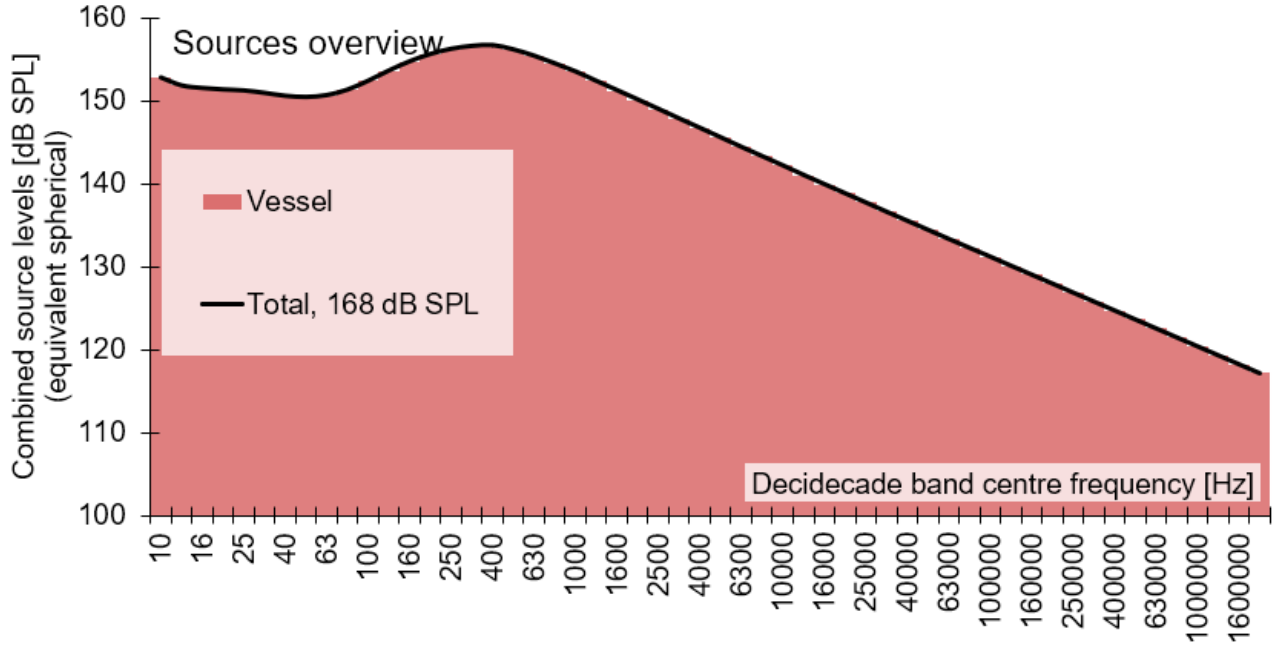

Figure 4-22. Source band level during geotechnical (vibro-core & CPT) survey soft start.

5 SOUND PROPAGATION MODELLING METHODOLOGY

There are several methods available for modelling the propagation of sound between a source and receiver ranging from very simple models which simply assume spreading according to a $10 \cdot \log_{10}$(range) or $20 \cdot \log_{10}$(range) relationship, to full acoustic models (e.g., ray tracing, normal mode, parabolic equation, wavenumber integration and energy flux models). In addition, semi-empirical models are available which lie somewhere in between these two extremes in terms of complexity (e.g., (Rogers, 1981; Weston, 1971))[9].

For simpler scenarios, such as this one, where the sediment is relatively uniform and mostly flat or where great detail in the sound field is not needed, the speed of these simpler models is preferred over the higher accuracy of numerical models and are routinely used for these types of assessments. For this assessment, we have used the “Roger’s” model (Rogers, 1981), which is suitable to depths of c. 200 m and generally softer sediments.

This model will tend to underestimate the transmission losses (leading to estimates greater than actual impact), primarily due to the omission of surface roughness, wind effects and shear waves in the sediment.

5.1 Modelling Assumptions

The main assumptions made for the modelling are:

1. A soft start where no SBP and no USBL is active, but MBES and/or SSS is active (section 4.1.2.7) is a feasible and practical option for the survey operator. This gives the VHF group a c. 9-18 dB reduction in received level for the duration of the soft start, depending on exact equipment configuration.
2. Animals fleeing the area will not return within a 24-hour period.
3. Animals flee for up to 2 hours, after which they will be up to 10.8 km and 3.6 km away for marine mammals and fish, respectively.
4. Modelling assumes high tide; this is a worst-case assumption.
5. Results assume a transition from impulsive (kurtosis >40) to non-impulsive (kurtosis <40) at a 500 m distance from the source. This means that all ranges greater than 500 m are assessed against the non-impulsive thresholds. This assumption is also applicable for the assessment of behavioural disturbance.

5.2 Exposure Calculations (dB SEL)

To compare modelled levels with the two impact assessment frameworks (Southall et al. 2019 & Popper et al. 2014) it is necessary to calculate received levels as exposure levels (SEL), weighted for marine mammals and unweighted for fishes. For ease of implementation, sources have generally been converted to an SPL source level, meaning converting to SEL from SPL or from a number of events. The conversion is relatively easy:

To convert from SPL to SEL, the following relation can be used:

$$SEL = \mathrm{SPL} + 10 \cdot Log_{10}(t_2 - t_1) \quad (1)$$

Or, where it is inappropriate to convert SEL from one event to SEL cumulative by relating to the number of events as:

$$SEL_{,n\ events} = SEL_{\ single\ event} + 10 \cdot Log_{10}(n) \quad (2)$$

[9] This model is compared to measurements in the paper (Rogers, 1981) describing it and is capable of accurate modelling in acoustically simpler scenarios. Simpler meaning shallow in relation to the wavelengths and with no significant sound speed gradient in the water column.

And SPL from SEL:

$$SPL = SEL_{\,single\ event} + 10 \cdot Log_{10}\left(\frac{n}{t_2 - t_1}\right) \quad (3)$$

As an animal swims away from the sound source, the noise it experiences will become progressively more attenuated; the cumulative, fleeing SEL is derived by logarithmically adding the SEL to which the mammal is exposed as it travels away from the source. This calculation is used to estimate the approximate minimum start distance for an animal in order for it to be exposed to sufficient sound energy to result in the exceedance of a threshold, or to check if a set exclusion zone is sufficient for an activity (e.g. will an exclusion zone of 500 m be sufficient to prevent exceeding a PTS threshold). It should be noted that the sound exposure calculations are based on the simplistic assumption that the animal will continue to swim away at a constant speed. The real-world situation is more complex, and the animal is likely to move in a more varied manner. Reported swim speeds are summarised in Table 5-1 along with the source papers for the assumptions.

For this assessment, we used a swim speed of 1.5 m/s for marine mammals, and 0.5 m/s for fishes, including sharks.

For very long fleeing durations, the ambient sound itself can exceed the thresholds, e.g., an ambient sound level of 117.5 dB, weighted for the VHF group, will exceed the non-impulsive TTS threshold of 153 dB SEL after 2 hours' exposure[10]. For this assessment, we consider fleeing durations of 2 hours (7200 seconds, allowing 10800 m of fleeing), meaning that weighted levels of 117.5 dB SPL will exceed the VHF group's non-impulsive TTS threshold in the fleeing model.

Table 5-1: Swim speed examples from literature

Species	Hearing Group	Swim Speed (m/s)	Source Reference
Harbour porpoise	VHF	1.5	Otani *et al.,* 2000
Harbour seal	PCW	1.8	Thompson, 2015
Grey seal	PCW	1.8	Thompson, 2015
Minke whale	LF	2.3	Boisseau *et al.,* 2021
Bottlenose dolphin	HF	1.52	Bailey and Thompson, 2010
White-beaked dolphin	HF	1.52	Bailey and Thompson, 2010
Basking shark	Fish (unweighted)	1.0	Sims, 2000
All other fish groups	Fish (unweighted)	0.5	Popper *et al.,* 2014
Sea turtles	Fish (unweighted)	0.56-0.84 & 0.78-2.8	(F, et al., 1997; SA, 2002)

[10] 117.5 dB SPL + 10*$\log_{10}$(3600 seconds) = 153.1 dB SEL, TTS non-impulsive threshold for the VHF group is 153 dB SEL.

6 RESULTS AND ASSESSMENT

Results are presented here as the geographical "risk range" to an auditory threshold (TTS/PTS/Behavioural), as given in Sections 2.3 and 2.5. A given risk range specifies the expected range, within which, a receiver would exceed the relevant threshold. Risk ranges are given for the 90th percentile value.

Several result types are presented for each activity to inform this assessment and to provide flexibility in mitigation:

1. **"1 second exposure risk range":**
   This is the range of acute risk of impact from the activity (a one second exposure) and is presented to indicate instantaneous risk and for comparison with other studies. This assumes a stationary animal (during the 1-second exposure) with all equipment operating at full power and does not include a soft start.

2. **"Minimal starting range for a fleeing animal with no soft start":**
   The minimal range a fleeing animal needs to start fleeing from to avoid being exposed to noise exceeding its TTS/PTS threshold. Animals are moving in a straight line away from the source at a constant speed of 1.5 m/s (0.5 m/s for fish, including sharks).

3. **"Minimal starting range for a fleeing animal with a 20 min soft start with no SBP and no USBL active":**
   The minimal range a fleeing animal needs to start fleeing from to avoid being exposed to noise exceeding its TTS/PTS threshold. Animals are moving in a straight line away from the source at a constant speed of 1.5 m/s (0.5 m/s for fish, including sharks).

4. **"Behavioural response range":**
   The range at which the behavioural limit for the marine mammals (160/120 dB SPL impulsive/non-impulsive) or the fishes (including sharks) (150 dB SPL) is exceeded. No hearing group weightings are applied when assessing against this threshold.

6.1 Assumptions and Notes on Results

The results should be read while keeping the following in mind:

- Results are rounded to the nearest 2 significant digits. This can lead to some curious appearing overlaps in risk ranges.
- Results for behavioural disturbance mainly rely on the non-impulsive threshold of 120 dB SPL (for marine mammals), as the impulsive noise transitions to non-impulsive at c. 500 m. This means that there are large ranges of disturbance, but should be considered in relation to, for example, the radiated noise from common vessels, which will also exceed this threshold to ranges of 500-5000 m (assuming 160-175 dB SPL source level).
- The soft start has little effect on the TTS ranges for the VHF group when the USBL is active. This is due to the relatively low threshold for TTS for the VHF group (153 dB SEL) and the logarithmic nature of transmission losses. A constant reduction of received level with a multiplication of range – a 3-6 dB reduction per doubling of distance, such as from 2 km to 4 km (until ranges become large enough for absorption to become significant) – means that fleeing is not very effective at reducing received level.
- Animals are modelled as fleeing in straight lines. Where sites are very confined, the maximal risk ranges will be restricted by line-of-sight ranges (and cut short where they meet land).
- Modelling assumed a maximal fleeing time of 7200 seconds (2 hours). This allows for 10.8 km of fleeing for marine mammals (3.6 km for fish).
- Modelling is limited to a range of 15 km from the source.
- No modelling of risk ranges for *mortality* for fishes are presented as risk ranges to PTS (recoverable injury) are all smaller than 30 m.

- No results are presented for assessment against the L_P thresholds as, for all scenarios, the risk ranges to the TTS thresholds were <30 m for fish (TTS: 193 dB L_P) and <20 m for marine mammals (VHF TTS: 196 dB L_P).
- Results are *only* given in relation to the behavioural thresholds (SPL) and TTS/PTS thresholds for sound exposure level (SEL).
- The hearing group "Fish" includes sharks and are for unweighted received levels assessed against the lowest thresholds for fishes as found in guidance (Popper, et al., 2014).

6.2 Results – Tabulated

For all geophysical survey results, the vessel, SSS and MBES sources are active. Only the type of SBP and presence of a USBL is changing between the scenarios modelled.

6.2.1 Geophysical Survey (Parametric SBP & USBL Active)

This scenario assumes that the geophysical survey is using a parametric SBP and that a towfish is deployed, requiring an active USBL (Section 4.1.2.1).

Risk ranges for exceeding PTS is below 50 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 500 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to 50 m.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-1: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	4000	4000	4000	4000	4000	380

Table 6-2: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	40	770	<10	<10	<10
Fleeing receiver, no soft start	80	310	2700	140	<10	130
Fleeing receiver, 20 min soft start	<10	<10	1500	<10	<10	<10

*See Comments, Section 6.1 on results limitations.

Table 6-3. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	240	<10	<10	<10
Fleeing receiver, no soft start	<10	50	500	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.2 Geophysical Survey (Parametric SBP & USBL Not Active)

This scenario assumes that the geophysical survey is using a parametric SBP and that there is no need for a USBL as the SBP and SSS are hull-mounted with known positions (Section 4.1.2.2).

Risk ranges for exceeding PTS is below 40 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 470 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to 50 m.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-4: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL not active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	1100	1100	1100	1100	1100	330

Table 6-5: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL not active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	40	500	<10	<10	<10
Fleeing receiver, no soft start	<10	230	640	30	<10	120
Fleeing receiver, 20 min soft start	<10	<10	160	<10	<10	<10

Table 6-6. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Parametric SBP & USBL not active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	210	<10	<10	<10
Fleeing receiver, no soft start	<10	40	470	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.3 Geophysical Survey (Chirper/Pinger SBP & USBL Active)

This scenario assumes that the geophysical survey is using a chirper or pinger type SBP and that a towfish is deployed requiring an active USBL (Section 4.1.2.3).

Risk ranges for exceeding PTS is below 10 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 490 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to 50 m.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-7: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	5700	5700	5700	5700	5700	270

Table 6-8: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	10	750	<10	<10	<10
Fleeing receiver, no soft start	140	250	2800	160	<10	30
Fleeing receiver, 20 min soft start	<10	<10	1600	<10	<10	<10

Table 6-9. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	110	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	490	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.4 Geophysical Survey (Chirper/Pinger SBP & USBL Not Active)

This scenario that assumes that the geophysical survey is using a chirper or pinger type SBP and that there is no need for a USBL as the SBP and SSS are hull mounted with known positions (Section 4.1.2.4).

Risk ranges for exceeding PTS is below 10 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 120 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to 50 m.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-10: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL not active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	5200	5200	5200	5200	5200	90

Table 6-11: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL not active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	70	<10	<10	<10
Fleeing receiver, no soft start	70	<10	490	30	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	170	<10	<10	<10

Table 6-12. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Chirper/pinger SBP & USBL not active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	10	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	120	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.5 Geophysical Survey (Sparker SBP & USBL Active)

This scenario assumes the geophysical survey is using a Sparker type SBP and that a towfish is deployed requiring an active USBL (Section 4.1.2.5).

Risk ranges for exceeding PTS is below 10 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 490 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to 50 m.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-13: Risk ranges for exceeding the peak pressure level impulsive threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL active).

Risk ranges (L_P thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
TTS	10	<10	20.1	10	<10	30.1
PTS	10	<10	20.1	10	<10	10

Table 6-14: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	8000	8000	8000	8000	8000	290

Table 6-15: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	10	750	<10	<10	<10
Fleeing receiver, no soft start	220	250	2700	180	<10	30
Fleeing receiver, 20 min soft start	<10	<10	1500	<10	<10	<10

Table 6-16. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	110	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	490	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.6 Geophysical Survey (Sparker SBP & USBL Not Active)

This scenario assumes the geophysical survey is using a Sparker type SBP and that there is no need for a USBL as the SBP and SSS are hull mounted with known positions (Section 4.1.2.6).

Risk ranges for exceeding PTS is below 10 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 50 m with no soft start.

A soft start of 20 minutes will not reduce this range for the VHF group.

The soft start itself has a PTS risk range of 50 m for the VHF group. Therefore, extension of the soft start duration will not decrease the PTS risk range further.

Table 6-17: Risk ranges for exceeding the peak pressure level impulsive threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL not active).

Risk ranges (L_P thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
TTS	10	<10	20.1	10	<10	30.1
PTS	10	<10	20.1	10	<10	10

Table 6-18: Risk ranges for exceeding the behavioural threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL not active).

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	7900	7900	7900	7900	7900	120

Table 6-19: Risk ranges for exceeding the TTS threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL not active).

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	50	<10	<10	<10
Fleeing receiver, no soft start	160	<10	330	60	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	160	<10	<10	<10

Table 6-20. Risk ranges for exceeding the PTS threshold for all hearing groups during Geophysical survey (Sparker SBP & USBL not active).

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	<10	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	50	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	50	<10	<10	<10

6.2.7 Geotechnical Survey (Drilling, boreholes)

This scenario assumes the drilling and vessel source is active (Section 6.2.7).

No soft start has been modelled for this activity; this is based on:

1. Risk ranges for exceeding PTS are below 10 meters for all groups.
2. The sampling platform (vessel or barge) will itself emit similar noise to the sampling activity and will serve as a type of soft start exceeding normal soft start durations.
3. The geotechnical equipment itself cannot easily be operated at reduced noise output.

Table 6-21: Risk ranges for exceeding the behavioural threshold for all hearing groups during drilling.

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	<20	<20	<20	<20	<20	<10

Table 6-22: Risk ranges for exceeding the TTS threshold for all hearing groups during drilling.

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	<10	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	<10	<10	<10	<10

Table 6-23. Risk ranges for exceeding the PTS threshold for all hearing groups during drilling.

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	<10	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	<10	<10	<10	<10

6.2.8 Geotechnical Survey (Vibro-coring & CPT)

This scenario assumes the vessel, vibro-corer, CPT and USBL sources are active (Section 4.1.2.9).

Risk ranges for exceeding PTS is below 10 m for all groups except the VHF group, which risks exceeding the PTS threshold to a range of 490 m with no soft start.

A soft start of 20 minutes will allow sufficient time for the VHF group to swim away to reduce the PTS exceedance risk range to less than 10 m.

Table 6-24: Risk ranges for exceeding the behavioural threshold for all hearing groups during Vibro-coring and CPT.

Behavioural Threshold exceedance Risk ranges (SPL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
Non-impulsive	5700	5700	5700	5700	5700	270

Table 6-25: Risk ranges for exceeding the TTS threshold for all hearing groups during Vibro-coring and CPT.

TTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	10	750	<10	<10	<10
Fleeing receiver, no soft start	130	250	2700	160	<10	20
Fleeing receiver, 20 min soft start	<10	<10	1500	<10	<10	<10

Table 6-26. Risk ranges for exceeding the PTS threshold for all hearing groups during Vibro-coring and CPT.

PTS Threshold Exceedance Risk ranges (SEL thresholds)	LF [m]	HF [m]	VHF [m]	PCW [m]	OCW [m]	Fish [m]
One second	<10	<10	110	<10	<10	<10
Fleeing receiver, no soft start	<10	<10	490	<10	<10	<10
Fleeing receiver, 20 min soft start	<10	<10	<10	<10	<10	<10

6.3 Results Summary

6.3.1 Geophysical Survey

PTS – hearing injury

Apart from the VHF hearing group, all risk ranges to PTS exceedance for fleeing receivers is below 50 m with no soft start.

For the VHF hearing group, the risk range for PTS exceedance for fleeing receivers is up to 500 m with no soft start and below 50 m with a 20-minute soft start.

TTS – temporary hearing impairment

Apart from the VHF hearing group, all risk ranges to TTS exceedance for fleeing receivers is below 310 m with no soft start and below 10 m with a 20-minute soft start.

For the VHF hearing group, the risk range for TTS exceedance for fleeing receivers is up to 2800 m with no soft start and below 1600 m with a 20-minute soft start.

Behavioural disturbance

Ranges for behavioural disturbance for all hearing groups except Fish is up to 8 km (driven by the sparker type SBP). For Fish the range for behavioural disturbance is much less at up to 380 m (driven by the parametric SBP & USBL).

6.3.2 Geotechnical Survey

Drilling, Boreholes

The drilling of boreholes has virtually no risk of exceeding PTS or TTS thresholds for any hearing group, with all risk ranges to PTS and TTS exceedance below 10 m.

Behavioural threshold is also not exceeded beyond 20 m.

Vibro-coring & CPT with USBL

PTS – hearing injury

The VHF group has a PTS exceedance risk for moving receivers to 490 m with no soft start, reducing to under 10 m with a 20-minute soft start.

All remaining hearing groups have PTS risk exceedance ranges for moving receivers below 10 m, even with no soft start.

TTS – temporary hearing impairment

The VHF group has a TTS exceedance risk for moving receivers to 2700 m with no soft start, reducing to 1500 m with a 20-minute soft start.

All remaining hearing groups have risk ranges for PTS exceedance for moving receivers at or below 260 m, with no soft start, reducing to below 10 m with a 20-minute soft start.

Behavioural disturbance

Ranges for behavioural disturbance for all hearing groups except Fish is up to 5700 m (driven by the USBL). For Fish the range for behavioural disturbance is much less at up to 270 m (driven by the USBL).

7 CONCLUSIONS

This assessment concludes that the risk of inducing hearing injury (PTS – Permanent Threshold Shift) following noise from the SI Works is below 50 m with no soft start for all hearing groups except the VHF group . The VHF group (harbour porpoise) has an injury risk up to 500m from the active noise sources with no soft start. Applying a 20-minute soft start reduces the injury risk to below 50 m.

There is risk of inducing temporary hearing effects (TTS – Temporary Threshold Shift). This extends to c. 3000 m for the VHF group (harbour porpoise) and below c. 300 m for remaining marine mammals and fishes. Introducing a 20-minute soft start, where only some equipment is active, will reduce the risk of TTS for the VHF group to within 1600 m, and to below 10 m for the remaining marine mammals and fishes.

Behavioural disturbance ranges of up to 8,000 m have been modelled for the geophysical survey for marine mammals while the Sparker type SBP is active. For the geotechnical survey, the use of a USBL means that behavioural disturbance ranges up to 5,700 m. The low noise levels of the borehole drilling means that the behavioural disturbance limit is within 20 m.

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Appendix A – Acoustic Concepts and Terminology

Sound travels through water as vibrations of the fluid particles in a series of pressure waves. The waves comprise a series of alternating compressions (positive pressure variations) and rarefactions (negative pressure fluctuations). Because sound consists of variations in pressure, the unit for measuring sound is usually referenced to a unit of pressure, the Pascal (Pa). The unit usually used to describe sound is the decibel (dB) and, in the case of underwater sound, the reference unit is taken as 1 µPa, one micro-pascal, whereas airborne sound is usually referenced to a pressure of 20 µPa. To convert from a sound pressure level referenced to 20 µPa to one referenced to 1 µPa, a factor of 20 log (20/1) i.e. 26 dB has to be added to the former quantity. Thus, a sound pressure of 60 dB re 20 µPa is the same as 86 dB re 1 µPa, although care also needs to be taken when converting from in air sound to in water sound levels due to the different sound speeds and densities of the two mediums resulting in a conversion factor of approximately 62 dB for comparing intensities (watt/m²), see Table 8-1 , below.

Table 8-1: Comparing sound quantities between air and water.

	Constant intensity		Constant pressure	
Properties	**Air**	**Water**	**Air**	**Water**
Soundspeed (C) [m/s]	340	1500	340	1500
Density (ρ) [kg/m³]	1.293	1026	1.293	1026
Acoustic impedance (Z=C·ρ) [kg/(m²·s) or (Pa·s)/m³]	440	1539000	440	1539000
Sound intensity (I=p²/Z) [Watt/m²]	1	1	22.7469	0.0065
Sound pressure (p=(I*Z)^{½}) [Pa]	21	1241	100	100
Particle velocity (I/p) [m/s]	0.04769	0.00081	0.22747	0.00006
dB re 1 µPa²	146.4	**181.9**	160.0	**160.0**
dB re 20 µPa²	**120.4**	155.9	**134.0**	134.0
Difference dB re 1 µPa² & dB re 20 µPa²	**61.5**		**26.0**	

All underwater sound pressure levels in this report are described in dB re 1 µPa². In water, the sound source strength is defined by its sound pressure level in dB re 1 µPa², referenced back to a representative distance of 1m from an assumed (infinitesimally small) point source. This allows calculation of sound levels in the far-field. For large, distributed sources, the actual sound pressure level in the near-field will be lower than predicted.

There are several descriptors used to characterise a sound wave. The difference between the lowest pressure deviation (rarefaction) and the highest pressure deviation (compression) from ambient is the peak to peak (or pk-pk) sound pressure ($L_{P\text{-}P}$ for the level in dB), Note that $L_{P\text{-}P}$ can be hard to measure consistently, as the maximal duration between the lowest and highest pressure deviation is not standardised. The difference between the highest deviation (either positive or negative) and the ambient pressure is called the peak pressure (L_P for the level in dB). Lastly, the average sound pressure is used as a description of the average amplitude of the variations in pressure over a specific time window (SPL for the level in dB). SPL is equal to the L_{eq} when the time window for the SPL is equal to the time window for the total duration of an event. The cumulative sound energy from pressure is the integrated squared pressure over a given period (SEL for the level in dB). These descriptions are shown graphically in Figure 8-1 and reflect the units as given in ISO 18405:2017, “Underwater Acoustics – Terminology”.

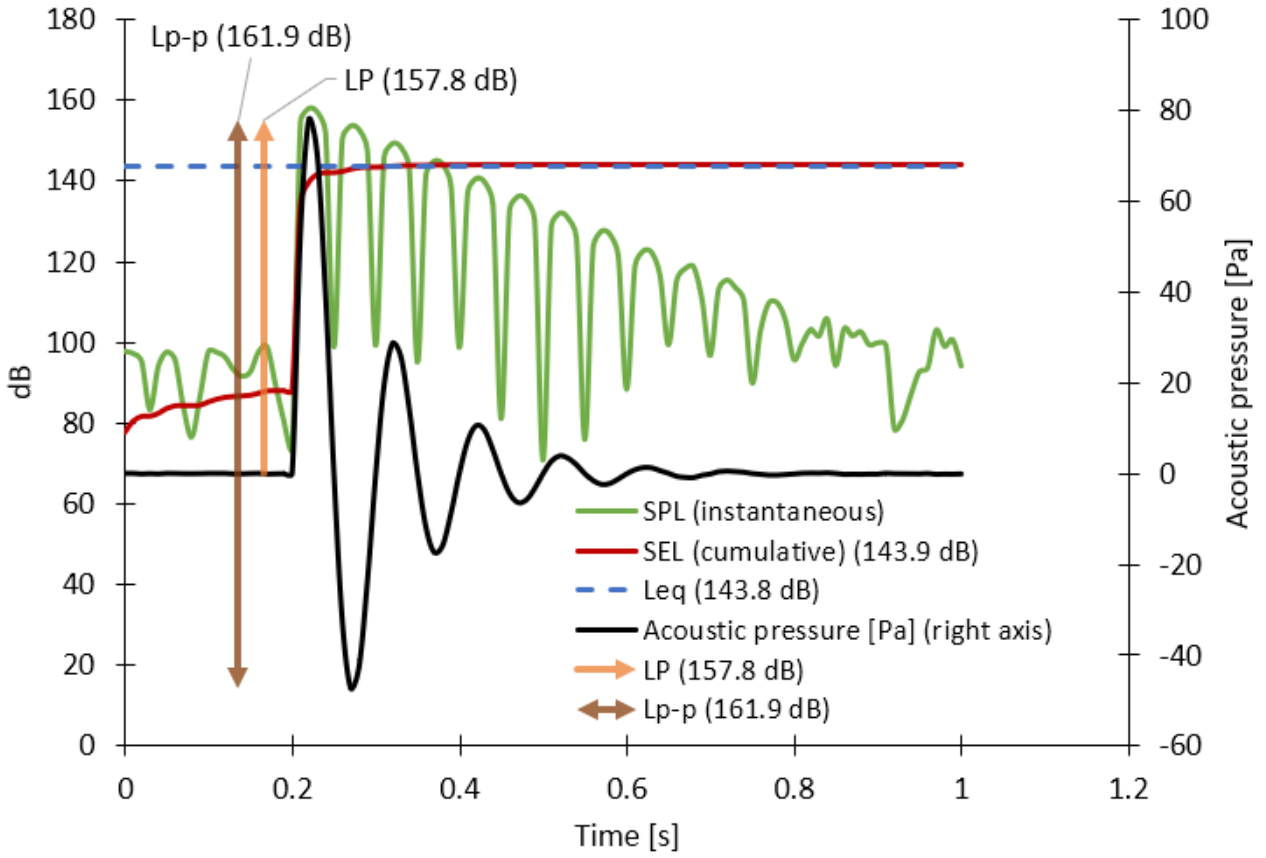

Figure 8-1: Graphical representation of acoustic wave descriptors ("LE" = SEL).

The sound pressure level (SPL[11]) is defined as follows (ISO 18405:2017, 3.2.1.1):

$$SPL = 10 \cdot Log_{10}\left(\frac{\overline{p^2}}{1 \cdot 10^{-12} Pa}\right) \quad (1)$$

Here $\overline{p^2}$ is the arithmetic mean of the squared pressure values. Note that L_P is simply the instantaneous SPL (ISO 18405:2017, 3.2.2.1).

The peak sound pressure level, L_P, is the instantaneous decibel level of the maximal deviation from ambient pressure and is defined in (ISO 18405:2017, 3.2.2.1) and can be calculated as:

$$L_P = 10 \cdot Log_{10}\left(\frac{max(p^2)}{1 \cdot 10^{-12} Pa}\right)$$

Another useful measure of sound used in underwater acoustics is the Exposure Level, or SEL. This descriptor is used as a measure of the total sound energy of a single event or a number of events (e.g. over the course of a day). This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like for like basis. Historically, use was primarily made of SPL and L_P metrics for assessing the potential effects of sound on marine life. However, the SEL is increasingly being used as it allows exposure duration and the effect of exposure to multiple events over e.g. a 24-hour period to be taken into account. The SEL is defined as follows (ISO 18405:2017, 3.2.1.5):

$$SEL = 10 \cdot Log_{10}\left(\frac{\int_{t_1}^{t_2} p(t)^2 dt}{1 \cdot 10^{-12} Pa}\right) \quad (2)$$

To convert from SEL to SPL the following relation can be used:

$$SEL = \mathrm{SPL} + 10 \cdot Log_{10}(t_2 - t_1) \quad (3)$$

[11] Equivalent to the commonly seen "RMS-level".

Converting from a single event to multiple events for SEL:

$$SEL_{n\ events} = SEL_{single\ event} + 10 \cdot Log_{10}(n) \quad (4)$$

The frequency, or pitch, of the sound is the rate at which these oscillations occur and is measured in cycles per second, or Hertz (Hz). When sound is measured in a way which approximates to how a human would perceive it using an A-weighting filter on a sound level meter, the resulting level is described in values of dB(A). However, the hearing faculties of marine mammals and fish are not the same as humans, with marine mammals hearing over a wider range of frequencies, fish over a typically smaller range of frequencies and both with different sensitivities. It is therefore important to understand how an animal's hearing varies over the entire frequency range to assess the effects of sound on marine life. Consequently, use can be made of frequency weighting scales to determine the level of the sound in comparison with the auditory response of the animal concerned. A comparison between the typical hearing response curves for fish, humans and marine mammals is shown in Figure 8-2. Note that hearing thresholds are sometimes shown as audiograms with sound level on the y axis rather than sensitivity, resulting in the graph shape being the inverse of the graph shown. It is also worth noting that some fish are sensitive to particle velocity rather than pressure, although paucity of data relating to particle velocity levels for anthropogenic sound sources means that it is often not possible to quantify this effect. Marine reptiles (mostly sea turtles) have relatively poor hearing underwater, lacking a good acoustic coupling mechanism from the sea water to the inner ear.

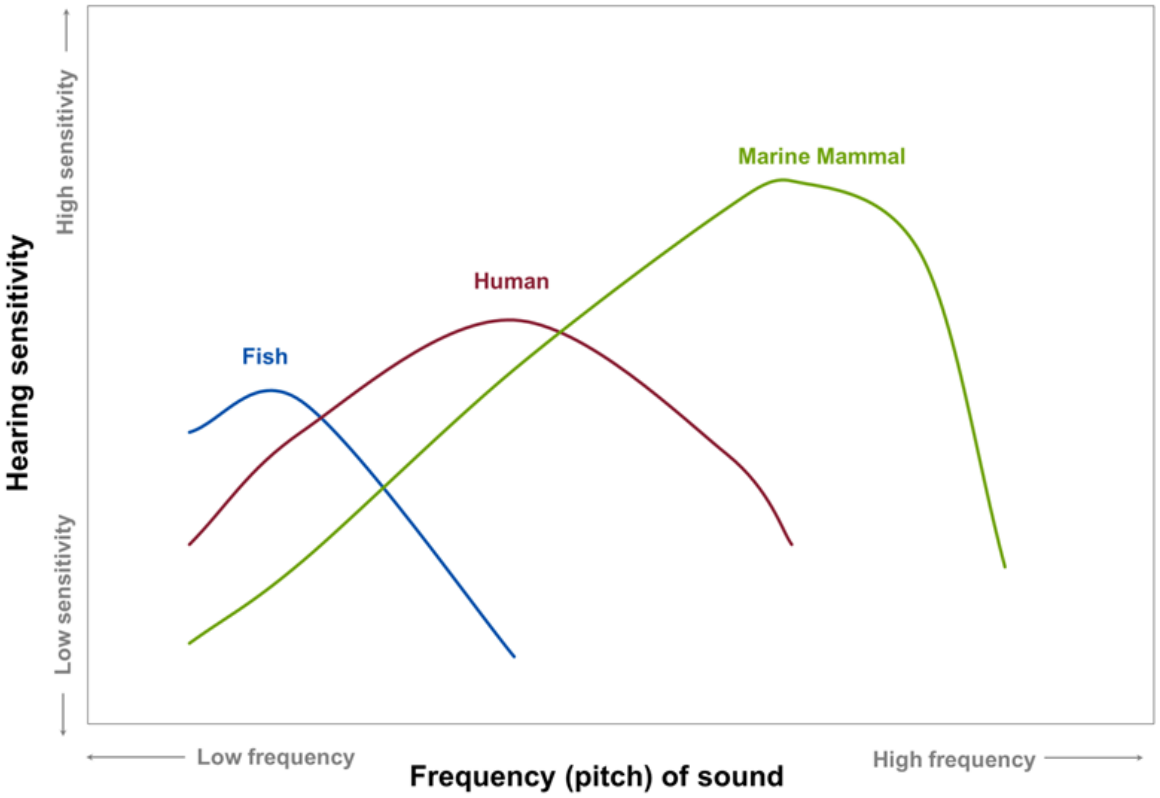

Figure 8-2: Comparison between hearing thresholds of different marine animals and humans.

Impulsiveness

The impulsiveness of a source can be estimated from the kurtosis of the weighted signal (as suggested by Matin et al. in "Techniques for distinguishing between impulsive and non-impulsive sound in the context of regulating sound exposure for marine mammals", Journal of the Acoustical Society of America, 2020)

The consequence of this is that the same equipment can be both impulsive and non-impulsive, depending o marine mammal presence and the local environment.

Below is an example of a hull mounted echo sounder at 15 m depth and at 250 m depth.

In shallow water the ping rate can be high as reflections from the sediment return quickly, but the single pulse duration is usually shorter as less energy in the signal is required due to the short range the pulse must travel. This leads to high repetition rate (decreases kurtosis) and shorter pulses (increases kurtosis). Figure 8-3 shows an example where this leads to a non-impulsive source, to be compared to the thresholds for non-impulsive noise.

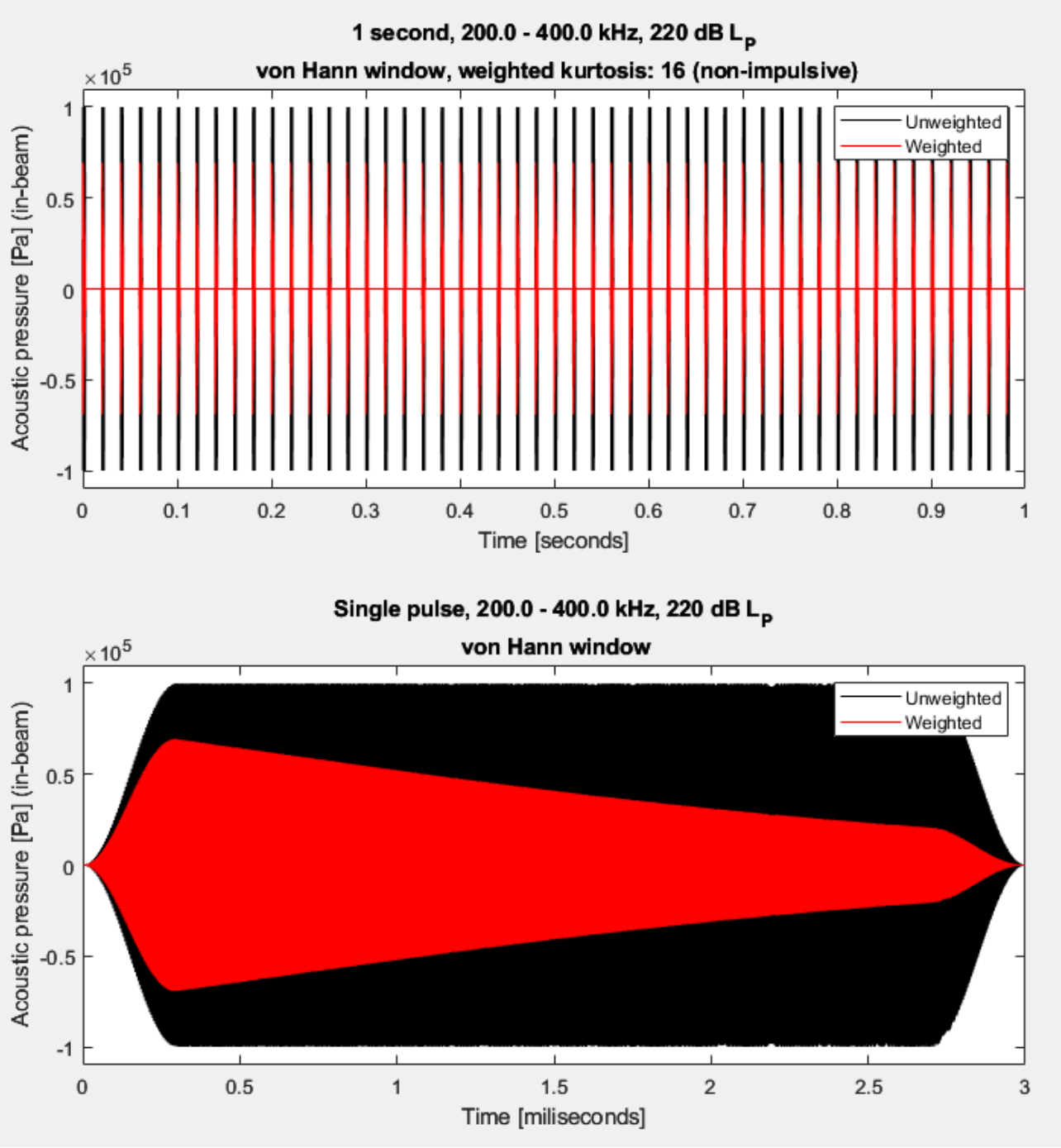

Figure 8-3. Example of a multibeam echosounder at 15 m depth (achieving 50 ping/sec) with a 3 ms ping duration. VHF-weighted kurtosis of 16 – non-impulsive.

In deeper water, the ping rate will usually be slower as echoes take longer to return to the sediment and the pulses will be longer to increase the energy in the pulses and make their echoes easier to detect. This leads to low repetition rate (increases kurtosis) and longer pulses (decreases kurtosis). Figure 8-4 shows an example where this combination resulted in an impulsive source, to be compared to the thresholds for impulsive noise.

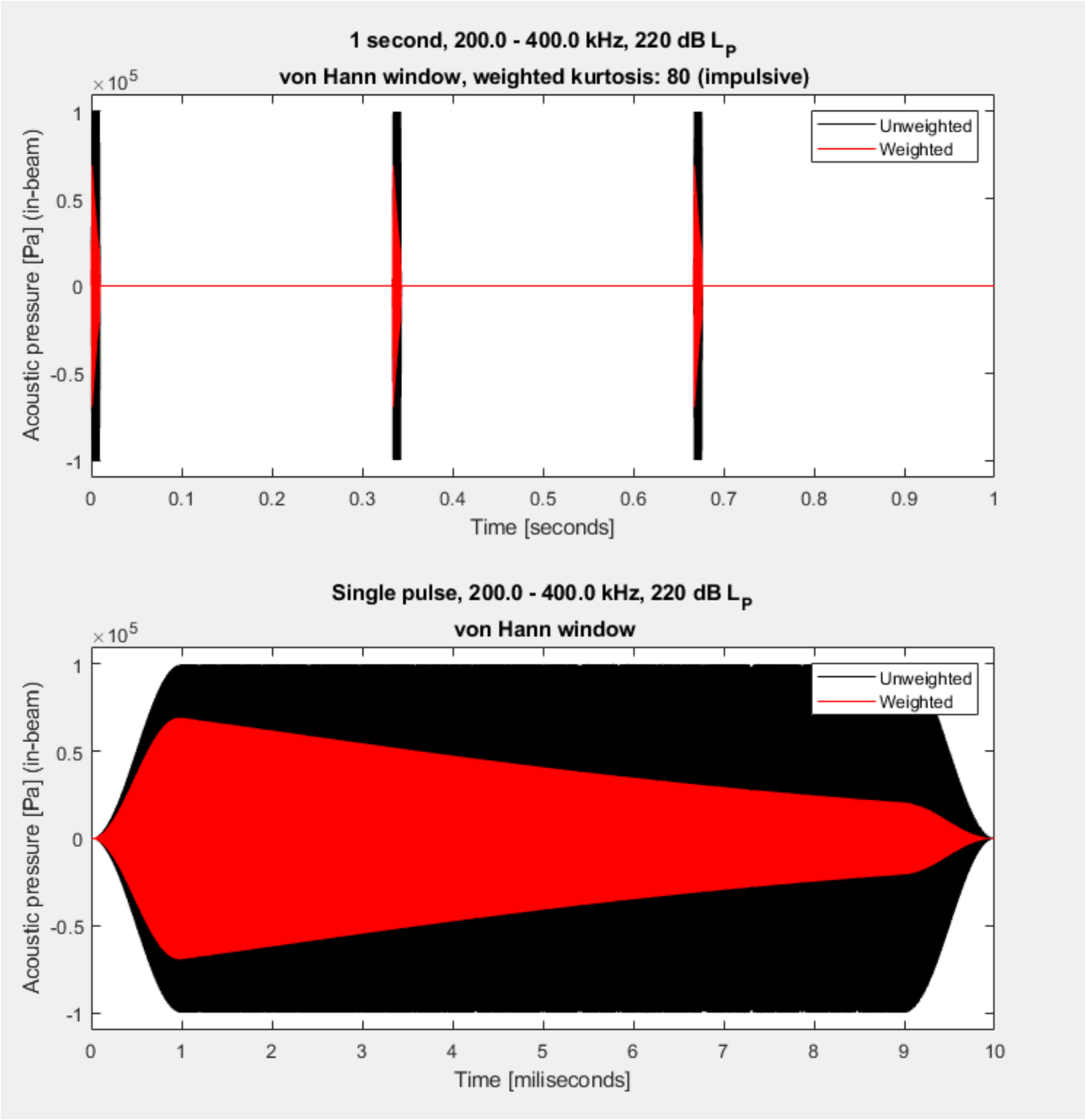

Figure 8-4. Example of a multibeam echosounder at 250 m depth (achieving 3 ping/sec) with a 10 ms ping duration. VHF-weighted kurtosis of 80 – impulsive.

With range, due to multiple reflections and scattering, the kurtosis will decrease with increased range, for shallow water this decrease will be quicker than for deeper water, compare Figure 8-5 & Figure 8-6, where a kurtosis <40 is reached at c. 200 m in 20 m depth, but at over 1000 m at 200 m depth.

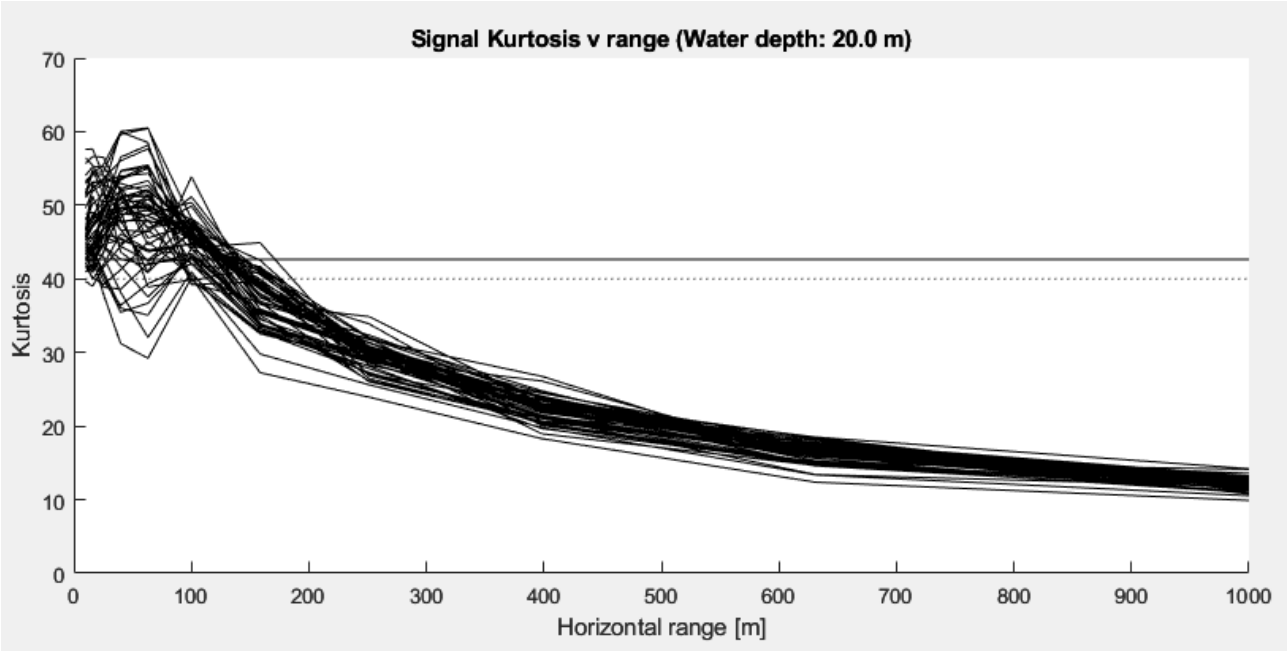

Figure 8-5. Example of USBL signal kurtosis decreasing with range at 20 m depth. Multiple lines are various combinations of source and receiver depths.

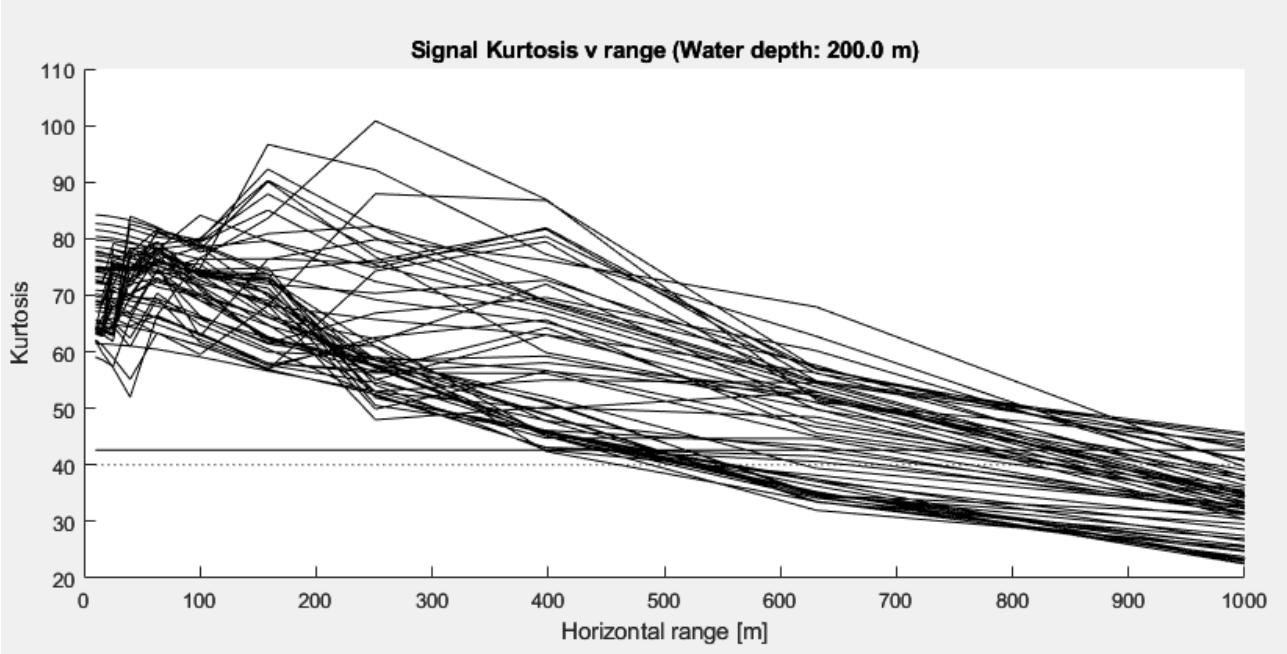

Figure 8-6. Example of USBL signal kurtosis decreasing with range at 200 m depth. Multiple lines are various combinations of source and receiver depths.

Review of Sound Propagation Concepts

Increasing the distance from the sound source usually results in the level of sound getting lower, due primarily to the spreading of the sound energy with distance, analogous to the way in which the ripples in a pond spread after a stone has been thrown in.

The way that the sound spreads will depend upon several factors such as water column depth, pressure, temperature gradients, salinity, as well as water surface and seabed conditions. Thus, even for a given locality, there are temporal variations to the way that sound will propagate. However, in simple terms, the

sound energy may spread out in a spherical pattern (close to the source, with no boundaries) or a cylindrical pattern (much further from the source, bounded by the surface and the sediment), although other factors mean that decay in sound energy may be somewhere between these two simplistic cases.

In acoustically shallow waters[12] in particular, the propagation mechanism is coloured by multiple interactions with the seabed and the water surface (Lurton, 2002; Etter, 2013; Urick, 1983; Brekhovskikh and Lysanov 2003, Kinsler et al., 1999). Whereas in deeper waters, the sound will propagate further without encountering the surface or bottom of the sea, in shallower waters the sound is reflected many times by the surface and sediment.

At the sea surface, the majority of sound is reflected back into the water due to the difference in acoustic impedance (i.e. sound speed and density) between air and water. However, scattering of sound at the surface of the sea is an important factor with respect to the propagation of sound from a source. In an ideal case (i.e. for a perfectly smooth sea surface), the majority of sound wave energy will be reflected back into the sea. However, for rough waters, much of the sound energy is scattered (Eckart, 1953; Fortuin, 1970; Marsh, Schulkin, and Kneale, 1961; Urick and Hoover, 1956). Scattering can also occur due to bubbles near the surface such as those generated by wind or fish or due to suspended solids in the water such as particulates and marine life. Scattering is more pronounced for higher frequencies than for low frequencies and is dependent on the sea state (i.e. wave height). However, the various factors affecting this mechanism are complex. Generally, the scattering effect at a particular frequency depends on the physical size of the roughness in relation to the wavelength of the frequency of interest.

As surface scattering results in differences in reflected sound, its effect will be more important at longer ranges from the source sound and in acoustically shallow water (i.e. where there are multiple reflections between the source and receiver). The degree of scattering will depend upon the water surface smoothness/wind speed, water depth, frequency of the sound, temperature gradient, grazing angle and range from source. Depending upon variations in the aforementioned factors, significant scattering could occur at sea state 3 or more for higher frequencies (e.g. 15 kHz or more). It should be noted that variations in propagation due to scattering will vary temporally (primarily due to different sea-states/wind speeds at different times) and that more sheltered areas (which are more likely to experience calmer waters) could experience surface scattering to a lesser extent, and less frequently, than less sheltered areas which are likely to encounter rougher waters. However, over shorter ranges (e.g. within 10-20 times the water depth) the sound will experience fewer reflections and so the effect of scattering should not be significant. Consequently, over the likely distances over which injury will occur, this effect is unlikely to significantly affect the injury ranges presented in this report, and not including this effect will overestimate the impact.

When sound waves encounter the seabed, the amount of sound reflected will depend on the geoacoustic properties of the seabed (e.g. grain size, porosity, density, sound speed, absorption coefficient and roughness) as well as the grazing angle (see Figure 8-7[13]) and frequency of the sound (Cole, 1965; Hamilton, 1970; Mackenzie, 1960; McKinney and Anderson, 1964; Etter, 2013; Lurton, 2002; Urick, 1983). Thus, seabeds comprising primarily of mud or other acoustically soft sediment will reflect less sound than acoustically harder seabeds such as rock or sand. This effect also depends on the profile of the seabed (e.g. the depth of the sediment layers and how the geoacoustic properties vary with depth below the sea floor). The sediment interaction is less pronounced at higher frequencies (a few kHz and above) where interaction is primarily with the top few cm of the sediment (related to the wavelength). A scattering effect (similar to that which occurs at the surface) also occurs at the seabed (Essen, 1994; Greaves and Stephen, 2003; McKinney and Anderson, 1964; Kuo, 1992), particularly on rough substrates (e.g. pebbles and larger).

[12] Acoustically, shallow water conditions exist whenever the propagation is characterised by multiple reflections with both the sea surface and seabed (Etter, 2013). Consequently, the depth at which water can be classified as acoustically deep or shallow depends upon numerous factors including the sound speed gradient, water depth, sediment type, frequency of the sound and distance between the source and receiver.

[13] The density of “rays” indicate difference in effective propagation angle from the source, with acoustically harder sediments (gravel) having better reflection at steeper angles leading to more “rays” being effectively propagated (no significant bottom attenuation) in the waveguide. Beam shape indicated in left chart, with the black line showing the same received level.

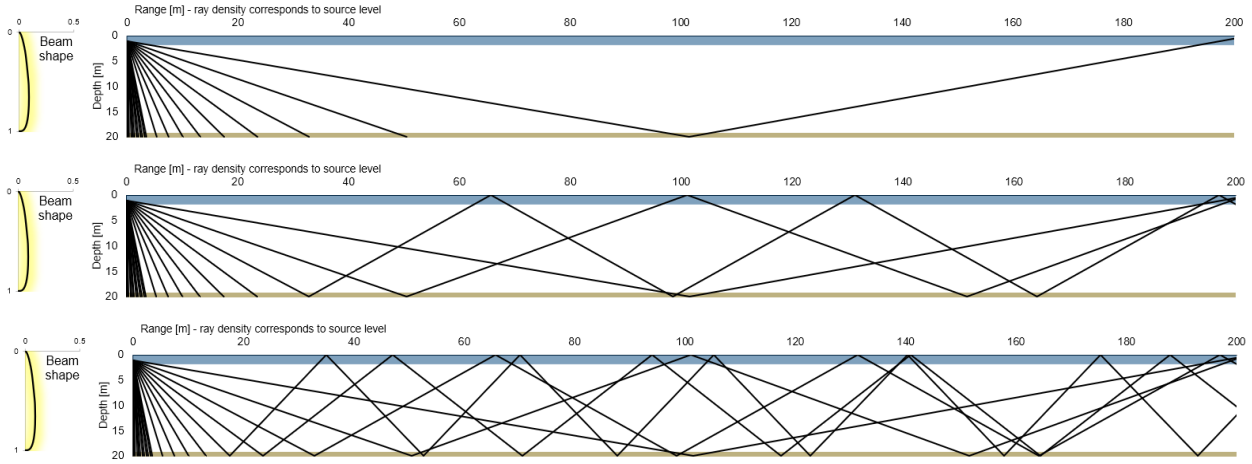

Figure 8-7: Schematic of the effect of sediment on sources with narrow beams. Sediments range from fine silt (top panel), sand (middle panel), and gravel (lower panel).

These sediment effects mean that the directivity of equipment such as sub-bottom profilers have a profound effect on the effective source level – the apparent source level to a far-away receiver.

A parametric SBP such as the “Innomar Medium” or “Standard” sub-bottom profiler use two higher frequencies (“primary frequencies”) to generate an interference pattern at lower frequencies (“secondary frequencies”). This means that the secondary beam can be made extraordinarily narrow, e.g. 5 degrees at -10 dB (Figure 8-8), versus c. 50 degrees for a chirper/pinger type, leading to a much smaller sound impact – even when a parametric sub-bottom profiler has higher sound output within the main beam. We account for these differences in beam pattern by including the sediment reflection loss at high incidence angles (Figure 8-7) to reduce the effective source level accordingly.

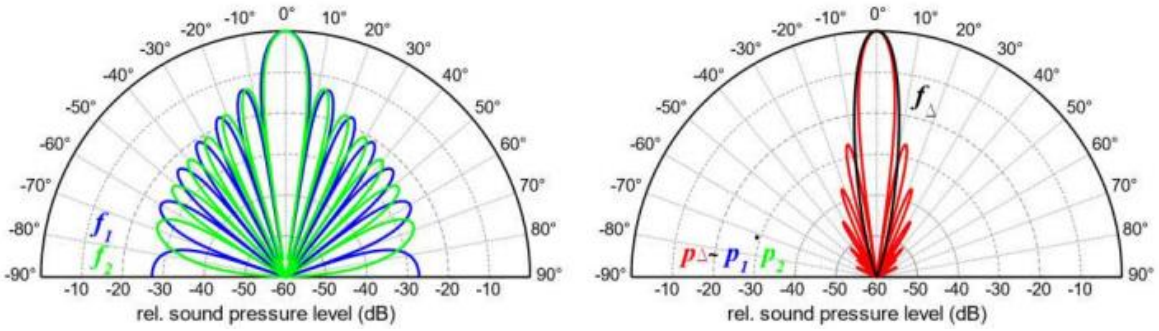

Figure 8-8. Example of a beam pattern on an Innomar SES 2000. Primary frequencies left (f1 & f2), the interference pattern between the primary frequencies means that the beam pattern for the secondary frequency (right plot) is very narrow (Source: Innomar technical note TN-01).

Another phenomenon is the waveguide effect which means that shallow water columns do not allow the propagation of low frequency sound (Urick, 1983; Etter, 2013). The cut-off frequency of the lowest mode in a channel can be calculated based on the water depth and knowledge of the sediment geoacoustic properties. Any sound below this frequency will not propagate far due to energy losses through multiple reflections. The cut-off frequency as a function of water depth is shown in Figure 8-9 for a range of seabed types. Thus, for a water depth of 10m (i.e. shallow waters typical of coastal areas and estuaries) the cut-off frequency would be approximately 70Hz for sand, 115Hz for silt, 155Hz for clay and 10Hz for bedrock.

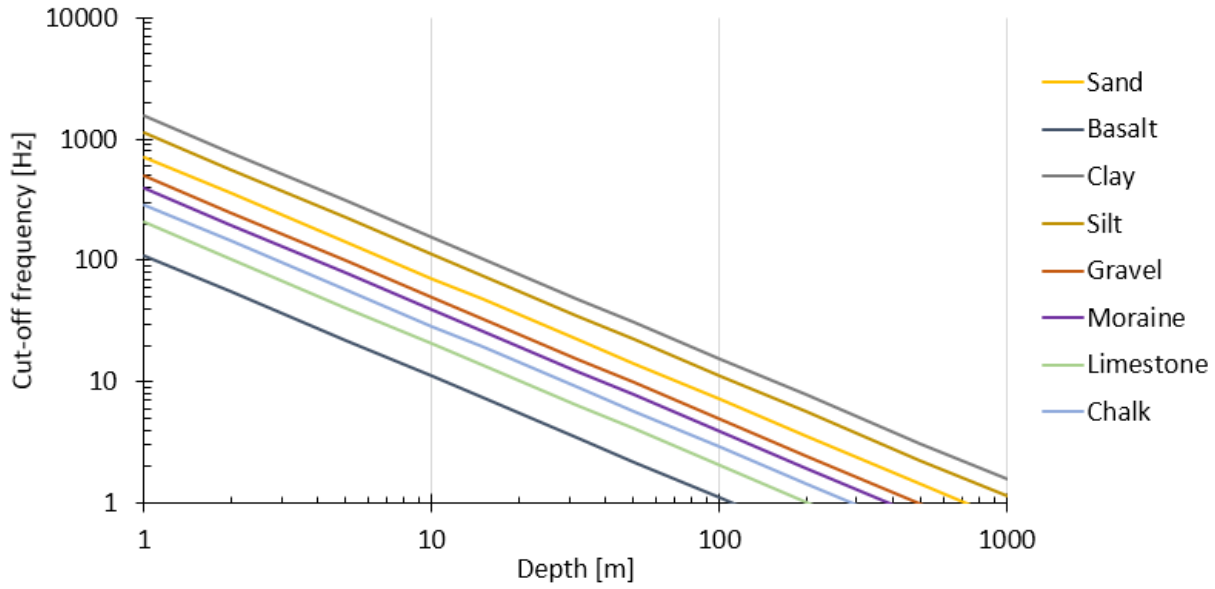

Figure 8-9: Lower cut-off frequency as a function of depth for a range of seabed types.

Changes in the water temperature and the hydrostatic pressure with depth mean that the speed of sound varies throughout the water column. This can lead to significant variations in sound propagation and can also lead to sound channels, particularly for high-frequency sound. Sound can propagate in a duct-like manner within these channels, effectively focussing the sound, and conversely, they can also lead to shadow zones. The frequency at which this occurs depends on the characteristics of the sound channel but, for example, a 25m thick layer would not act as a duct for frequencies below 1.5 kHz. The temperature gradient can vary throughout the year and thus there will be potential variation in sound propagation depending on the season.

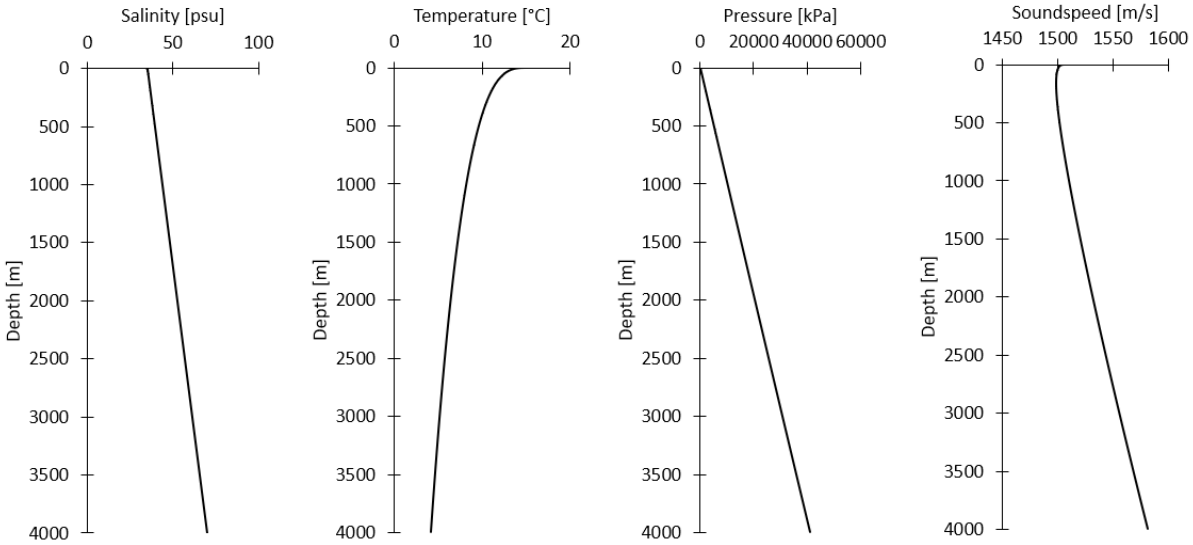

Figure 8-10: Soundspeed profile as a function of salinity, temperature and pressure.

Wind can make a significant difference to the soundspeed in the uppermost layers as the introductions of bubbles decreases the soundspeed and refracts (bends) the sound towards the surface, where the increased roughness and bubbles from the wind will cause increased transmission loss.

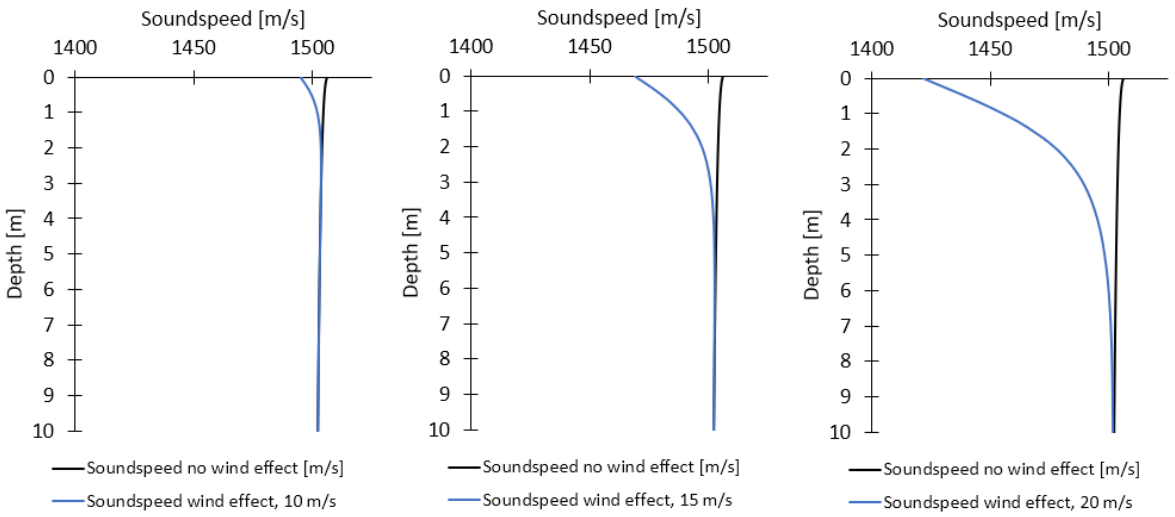

Figure 8-11: Effect of wind (at 10 m height) on upper portion of soundspeed profile.

Sound energy can also be absorbed due to interactions at the molecular level converting the acoustic energy into heat. This is another frequency dependent effect with higher frequencies experiencing much higher losses than lower frequencies. This is shown in Figure 8-12 where the variation of the absorption (sometimes called volume attenuation) is shown for various salinities and temperatures. As the effect is proportional to the wavelength, colder water, with slower soundspeed/period and being slightly more viscous, will have more absorption. Higher salinity slightly decreases absorption at low frequencies (mostly due to increase in soundspeed and wavelength/period), but much higher absorption at higher frequencies where interaction with pressure sensitive molecules of magnesium sulphite and boric acid increase the conversion acoustic energy to heat.

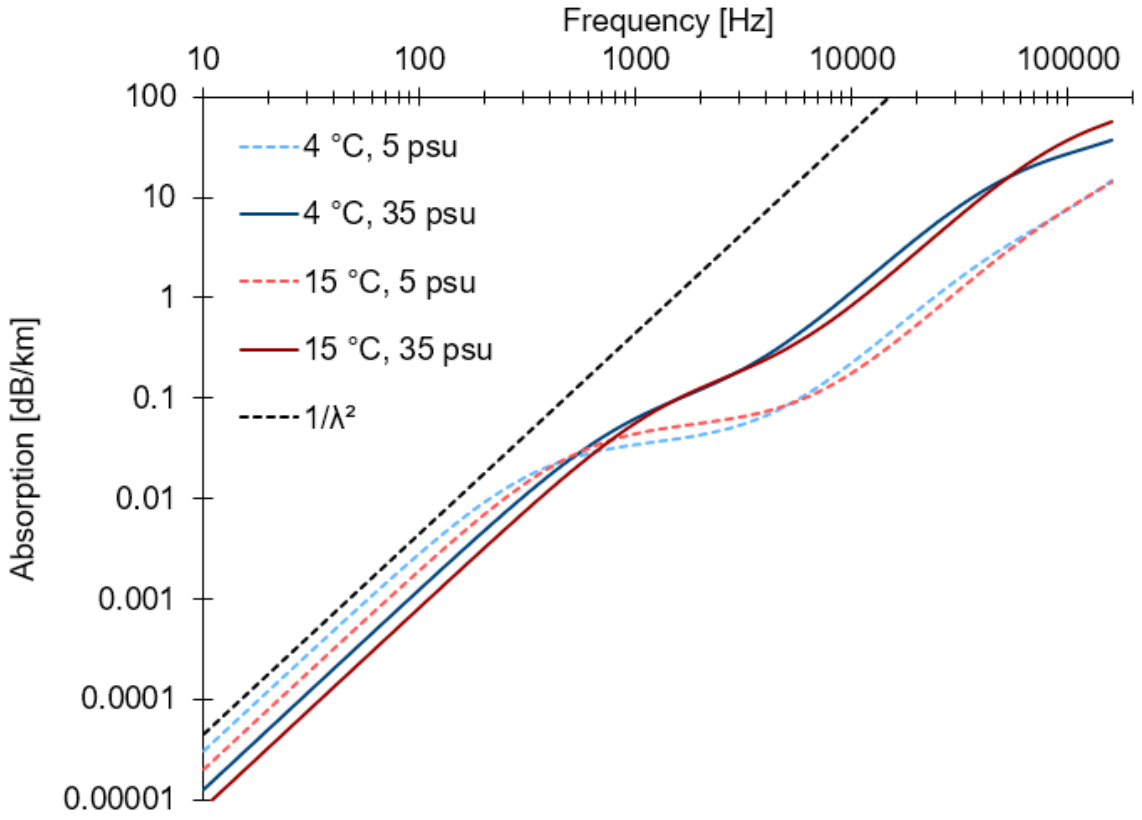

Figure 8-12: Absorption loss coefficient (dB/km) for various salinities and temperature.

Appendix C
List of Projects for In-combination Assessment

Table C.1 List of projects identified as potential in-combination projects following a search of the relevant databases undertaken on the 21/10/2024.

Application reference no.	Project	Approximate Distance from MUL Area	Project Status	In-combination Effect
FS007472	Mac Lir Offshore Wind Limited benthic ecology surveys for proposed Offshore Wind Farm, off Counties Wexford, Wicklow and Dublin	Overlaps with Dublin Cables MUL application area	Applied-22/09/2022	No in-combination effects.
FS007367	Greystones OWL Windfarm Limited is proposing to develop an offshore wind farm at a site off the Wicklow/Dublin coast.	Overlaps with Dublin Cables MUL application area	Applied-29/06/2022	No in-combination effects.
FS007546	Codling Wind Park Ltd. site investigation works	Overlaps with Dublin Cables MUL application area	Determination-19/05/2023 Grant with Conditions Applied	Spatial and temporal overlap with SI works AoI.
MUL230034	Codling Wind Park Ltd. site investigation works	Overlaps with Dublin Cables MUL application area	Applied to MARA but not determined.	Spatial and temporal overlap with SI works AoI.
320768	Codling Wind Park Limited Offshore Wind Farm.	Overlaps with Dublin Cables MUL application area	Applied to An Bord Pleanála. Due to be decided April 2025.	No in-combination effects.
FS007188	RWE Renewables Ireland Ltd. Site Investigations for the proposed Dublin Array Offshore Wind Farm.	Overlaps with Dublin Cables MUL application area	Determination 13/01/2023	Spatial overlap with AoI. Within the CESS. Possible temporal overlap.
FS007029	Innogy Renewables Ireland Ltd. Site Investigation - Dublin Array at Kish and Bray Banks.	Overlaps with Dublin Cables MUL application area	Determination 28/01/2021	Spatial overlap with AoI. Within the CESS. Possible temporal overlap.
FS007134	ESB Wind Development Limited (ESB), Site Investigations at Sea Stacks Offshore Wind off Dublin and Wicklow.	Overlaps with Dublin Cables MUL application area	Consultation 2020-11-23	No in-combination effects.
320250	Dublin Port 3FM Project	Overlaps the MUL application area to the north east (east of Poolbeg lighthouse).	Lodged 23/07/2024, case is due to be decided by 06/02/2025	No in-combination effects.
313509	BusConnects Belfield/Blackrock to City Centre Core Bus Corridor Scheme	Less than 1 km	Approve with Conditions-27/03/2024	No in-combination effects.
LIC230016	Microsoft Ireland Operations Ltd.	Less than 1 km	Granted	No spatial overlap with AoI.

Supporting Information for Screening for Appropriate Assessment

Application reference no.	Project	Approximate Distance from MUL Area	Project Status	In-combination Effect
	Geophysical survey and site investigations for a proposed subsea fibre optic cable having a landfall in Dublin Port, County Dublin and to evaluate options for the route traversing Dublin Bay, across the Irish Sea to Anglesey, Wales.			Within the CESS. Possible temporal overlap.
FS007290	Fendering replacement at Carlisle Pier	Less than 1 km	Determination 03/11/2023	No in-combination effects.
FS007132	Dublin Port Maintenance Dredging	Less than 1 km	Determination-12/08/2022	No in-combination effects.
FS007164	Dublin Port Capital Dredging Project	Less than 1 km	Determination-09/01/2024	No in-combination effects.
FS006893	Dublin Port Company MP2 Project. Construction of a new Ro-Ro Jetty (Berth 53), the re-orientation of the already consented Berth 52, the lengthening of Berth 50A, the redevelopment of Oil Berth 3, the construction of passenger terminal buildings and a heritage zone, dredging and ancillary site works.	Less than 1 km	Determination 23/09/2022	No in-combination effects.
FS006786	Dun Laoghaire Harbour Company. Use, occupy and maintain St Michael's Pier, associated ramps and part of the new terminal building.	Less than 1 km	Determination 17/05/2022	No in-combination effects.
301798	10-year permission for development of the Ringsend wastewater treatment plant upgrade project including a regional biosolids storage facility	Less than 1 km	Grant Perm. w Conditions-24/04/2019	No in-combination effects.
307080	Land to the south of the existing Dublin Bay Power Station, Pigeon House Road. Electrical development associated with a proposed Flexible Thermal Generation Facility (FlexGen) and Battery Energy Storage System (BESS).	Less than 1 km	Is not Strat. Infrast. Dev. 16/09/2020	No in-combination effects.

Supporting Information for Screening for Appropriate Assessment

Application reference no.	Project	Approximate Distance from MUL Area	Project Status	In-combination Effect
304888	Dublin Port, 15-year permission for development at Oil Berth 3 and Oil Berth 4, Eastern Oil Jetty and at Berths 50A, 50N, 50S, 51, 51A, 49, 52, 53 and associated terminal yards to provide for various elements including new Ro-Ro jetty and consolidation of passenger terminal buildings.	1 km	Grant Perm. w Conditions- 01/07/2020	No in-combination effects.
309812	Increase the capacity of the Dublin Waste to Energy Facility from 600,000 tonnes per annum to 690,000 tonnes per annum	1 km	Approve subject to conditions- 17/12/2021	No in-combination effects.
LIC230007	Environmental survey and ground investigation works in order to inform the design of proposed Point Bridge and Tom Clarke Widening Project.	1 km	Applied	No in-combination effects.
FS006806	Dublin Port Company. Foreshore lease application for the provision of a new Pontoon at Berth 50 to accommodate Dublin Port Company Tug Boats	2 km	Determination 16/01/2019	No in-combination effects.
313727	St. Vincent's University Hospital Campus, Elm Park, Dublin 4 Proposed alterations to permitted application PL29S.PA0049 National Maternity Hospital	2 km	Alter decision - Not a material Alteration (EIAR Case)- 05/08/2022	No in-combination effects.
316225	St. Vincent's University Hospital Campus, Elm Park, Dublin 4 Proposed installation of a new 110kV/MV station	2 km	Is not Strat. Infrast. Dev. 01/06/2023	No in-combination effects.
313738	Grand Canal Storm Water Outfall Extension comprising of the construction of pipework, transition chambers, floating platforms and new outfall structure at Sir John Rogerson's Quay at the River Liffey including all ancillary site works.	3 km	Approve subject to conditions 21/11/2023	No in-combination effects.

Supporting Information for Screening for Appropriate Assessment

Application reference no.	Project	Approximate Distance from MUL Area	Project Status	In-combination Effect
313918	North Wall Power Generating Station, Alexandra Road, Dublin 1.	3 km	Approve with Conditions-13/09/2022	No in-combination effects.
FS007180	Tech Works Marine Ltd Data Buoy Deployment-Deployment of a small Data Buoy with multiple environmental (non-acoustic) sensors to test communications technology for data acquisition.	3 km	Determination-2024-05-07	No in-combination effects.
FS005691	Dublin City Council Outfall Culvert	4 km	Determination 08/04/2022	No in-combination effects.

Appendix D Long List of European Sites

Table D.1 Long List of European Sites considered, listing qualifying interests, conservation objectives, SPR and QIs brought forward for further assessment.

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
South Dublin Bay SAC (000210)	Within SAC boundary	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Salicornia and other annuals colonising mud and sand [1310]	To maintain the favourable conservation condition of the Qualifying Interests (QIs) in South Dublin Bay SAC, which is defined by the following list of attributes and target, outlined in ConservationObjectives.rdl (npws.ie) *Note: Conservation objectives for annual vegetation of drift lines, salicornia and other annuals colonising mud and sand and Embryonic shifting dunes were taken from the North Dublin Bay SAC as none were available for the SAC in question.*	Yes- there is SPR connection with Annex I habitats.	Yes	No- refer to Section 5.2.
North Dublin Bay SAC (000206)	1	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110]	To maintain and restore the favourable conservation condition of QIs in North Dublin Bay SAC, which is defined by the following list of attributes and targets: available at: ConservationObjectives.rdl (npws.ie)	No-no SPR connection with Annex I habitats	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Petalophyllum ralfsii* (Petalwort) [1395]				
Rockabill to Dalkey Island SAC (003000)	3/ Within Management Unit for Harbour Porpoise (JNCC, 2023)[11]	Reefs [1170]	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 available at: ConservationObjectives.rdl (npws.ie)	No-no SPR connection with Annex I habitats	No	No
		Phocoena phocoena (Harbour Porpoise) [1351]		Yes- within the 100km buffer from AoI.	Yes- possible disturbance from underwater noise.	Yes
Howth Head SAC (000202)	4	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030]	To maintain the favourable conservation condition of s of the QIs in Howth Head SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No-no SPR connection with Annex I habitats	No	No
Balydoyle Bay SAC (000199)	6	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 maritimae*) [1330]	To maintain the favourable conservation condition of QIs in Baldoyle Bay SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie)	No-no SPR connection with Annex I habitats	No	No

11 JNCC 2023 - IAMMWG. 2023. Review of Management Unit boundaries for cetaceans in UK waters (2023). JNCC Report 734, JNCC, Peterborough, ISSN 0963-8091.

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Mediterranean salt meadows (*Juncetalia maritimi*) [1410]				
Irelands Eye SAC (002193)	8	Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition of QIs in Ireland's Eye SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No-no SPR connection with Annex I habitats	No	No
Lambay Island SAC (000204)	18	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain the favourable conservation condition of Reefs in Lambay Island SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Harbour Porpoise was not included for Conservation Objectives for Lambay Island SAC (000204). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats	No	No
		Phocoena phocoena (Harbour Porpoise) [1351] *Halichoerus grypus* (Grey Seal) [1364] *Phoca vitulina* (Harbour Seal) [1365]		Yes – within 100 km buffer from AoI.	Yes – possible disturbance from underwater noise.	Yes
Codling Fault Zone SAC (003015)	30/Within Harbour Porpoise Management Unit	Submarine structures made by leaking gases [1180]	To maintain the favourable conservation condition of QIs in Codling Fault Zone SAC, which is defined by the following list of attributes and targets, available at: CO003015.pdf (npws.ie). *Note: Harbour Porpoise was not included for Conservation Objectives for Codling Fault Zone SAC (003015). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]),*	No- no SPR connection for Annex I habitats	No	No
		Phocoena phocoena (Harbour Porpoise) [1351]		Yes- within 100km buffer from AoI.	Yes – possible disturbance from underwater noise.	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			available at: *ConservationObjectives.rdl (npws.ie)*			
Blackwater Bank SAC (002953)	88/Within Harbour Porpoise Management Unit	Sandbanks which are slightly covered by sea water all the time [1110]	To maintain the favourable conservation condition of QIs in Blackwater Bank SAC, which is defined by the following list of attributes and targets, available at: CO002953.pdf (npws.ie) *Note: Harbour Porpoise was not included for Blackwater Bank SAC (002953). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats.	No	No
		Phocoena phocoena (Harbour Porpoise) [1351]		Yes- within 100 km buffer from AoI.	Yes – possible disturbance from underwater noise.	No
Slaney River Valley SAC (000781)	109	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis and Callitricho-Batrachion* vegetation [3260] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion*	To maintain and restore the favourable conservation condition of QIs in the Slaney River Valley SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: The status of the freshwater pearl mussel (Margaritifera margaritifera) as a qualifying Annex II species for the Slaney River Valley SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species.* *Note: Atlantic salt meadow and Mediterranean salt meadows was not included for Conservation Objectives for Slaney River Valley SAC (000781). As a result, a site-specific for these QIs was taken from a nearby SAC*	No- no SPR connection for Annex I habitats.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		incanae, Salicion albae) [91E0]	*(Balydoyle Bay SAC (000199)) available at: Site_specific_cons_obj (npws.ie)*			
		Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Alosa fallax fallax* (Twaite Shad) [1103] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]		No Beyond the 100 km buffer from the AoI for marine mammals. SAC is outside the range of lamprey. and shad (JNCC, 2019)[12] (35 km).	No	No
Carnsore Point SAC (002269)	118/Within Harbour Porpoise Management Unit	Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] *Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain the favourable conservation condition of QIs in Carnsore Point SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Harbour Porpoise was not included for Cansore Point SAC (002269). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

12 JNCC (2019) The UK Approach to assessing Conservation Status for the 2019 Article 17 reporting under the EU Habitats Directive. Joint Nature Conservation Committee, Peterborough. Available to download from https://data.jncc.gov.uk/data/6420776d-2a25-4575-8b6f-1922a6a13806/Article17-UK-Approach-2019-A.pdf Accessed October 2024

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Saltee Islands SAC (000707)	128	Mudflats and sandflats not covered by seawater at low tide [1140] Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Submerged or partially submerged sea caves [8330] *Halichoerus grypus* (Grey Seal) [1364]	To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Saltee Islands SAC, which is defined by the following list of attributes and target, available at: Site_specific_cons_obj (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Hook Head SAC (000764)	130/Within Harbour Porpoise and Bottlenose Dolphin Management Unit	Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain the favourable conservation condition of Large shallow inlets and bays in Hook Head SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Harbour Porpoise was not included for Conservation Objectives for Hook Head SAC (000764). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]), available at: ConservationObjectives.rdl (npws.ie)* *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for Hook Head SAC (000764). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (Lower River Shannon SAC [002165]),*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			available at: Site_specific_cons_obj (npws.ie)			
Lower River Shannon SAC (002165)	152/Within Bottlenose Dolphin Management Unit	Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	To maintain and restore the favourable conservation condition of QIs in the Lower River Shannon SAC which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Alluvial forests with *Alnus glutinosa and Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]				
Galway Bay Complex SAC (000268)	186	Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonising mud and sand [1310]	To maintain and restore the favourable conservation condition of QIs at low tide in Galway Bay Complex SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Conservation objectives for Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] were taken from the North Lower River Shannon SAC [002165] as none were available for the SAC in question. Conservation Objectives were extracted from a nearby SAC (Lower River Shannon SAC). Available at: Site_specific_cons_obj (npws.ie)* *Note: Conservation objectives for Limestone pavements [8240] were*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Turloughs [3180] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Calcareous fens with C*ladium mariscus* and species of the *Caricion davallianae* [7210] Alkaline fens [7230] Limestone pavements [8240] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	*taken from the Coole-Garryland Complex SAC [000252] as none were available for the SAC in question. Available at: CO000252.pdf (npws.ie)*			
Ballysadare Bay SAC (000622)	186	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190]	To maintain the favourable conservation condition of Estuaries in Ballysadare Bay SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Vertigo angustior (Narrow-mouthed Whorl Snail) [1014] *Phoca vitulina* (Harbour Seal) [1365]				
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (000627)	189	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Petrifying springs with tufa formation (Cratoneurion) [7220] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099] *Phoca vitulina* (Harbour Seal) [1365]	To maintain the favourable conservation condition of QIs in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC, which is defined by the following list of attributes and targets, available at: CO000627.pdf (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Donegal Bay (Murvagh) SAC (000133)	191	Mudflats and sandflats not covered by seawater at low tide [1140] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] *Phoca vitulina* (Harbour Seal) [1365]	To maintain and restore the favourable conservation condition of QIs in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (000625)	198/Within Harbour Porpoise Management Unit	Mudflats and sandflats not covered by seawater at low tide [1140] Large shallow inlets and bays [1160] Reefs [1170] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] Machairs (* in Ireland) [21A0] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Alkaline fens [7230]	To maintain or restore the favourable conservation condition of QIs in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Conservation objectives for Humid Dune Slacks were taken from the Donegal Bay (Murvagh) SAC as none were available for the SAC in question. Available at: Site_specific_cons_obj (npws.ie)* *Note: Conservation objectives for Euphydryas aurinia (Marsh Fritillary) were taken from the West Of Ardara/Maas Road SAC (000197) as none were available for the SAC in question. Available at: ConservationObjectives.rdl (npws.ie)* *Note: Harbour Porpoise was not included for Conservation Objectives for Hook Head SAC (000764). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Euphydryas aurinia (Marsh Fritillary) [1065] *Petalophyllum ralfsii* (Petalwort) [1395] *Phocoena phocoena* (Harbour Porpoise) [1351]	*containing Harbour Porpoise ((Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)*			
St Johns Point SAC (000191)	204/Within Bottlenose Dolphin Management Unit	Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Alkaline fens [7230] Limestone pavements [8240] Submerged or partially submerged sea caves [8330] *Euphydryas aurinia* (Marsh Fritillary) [1065] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition of QIs in St. John's Point SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for St Johns Point SAC (000191). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (West Connacht Coast SAC [002998]), available at: ConservationObjectives.rdl (npws.ie)* N*ote: Vegetated sea cliffs of the Atlantic and Baltic coasts was not included for Conservation Objectives for St Johns Point SAC (000191). As a result, a site-specific for Vegetated sea cliffs of the Atlantic and Baltic coasts was taken from a nearby SAC containing Vegetated sea cliffs of the Atlantic and Baltic coasts (Slieve League SAC [000189]), available at: ConservationObjectives.rdl (npws.ie)* *Note: The Marsh Fritillary was not included for Conservation Objectives for St Johns Point SAC (000191). As a result, a site-specific for Marsh Fritillary*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			was taken from a nearby SAC containing (Marsh Fritillary s (West of Ardara/Maas Road SAC [000197]), available at: ConservationObjectives.rdl (npws.ie)			
Lough Swilly SAC (002287)	206/Within Harbour Porpoise Management Unit	Estuaries [1130] Coastal lagoons [1150] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Old sessile oak woods with *Ilex and Blechnum i*n the British Isles [91A0] *Lutra lutra* (Otter) [1355] *Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain and restore the favourable conservation condition of QIs in Lough Swilly SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Conservation objectives for Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410] were taken from the Lough Melvin SAC as none were available for the SAC in question. Available at: Lough Melvin SAC | National Parks & Wildlife Service (npws.ie)* *Note: Harbour Porpoise was not included for Conservation Objectives for Lough Swilly SAC (002287). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise ((Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Killala Bay/Moy Estuary SAC (000458)	213	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain and restore the favourable conservation condition of QIs in Killala Bay/Moy Estuary SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Conservation objectives for Mudflats and sandflats not covered by seawater at low tides were taken from*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Petromyzon marinus* (Sea Lamprey) [1095] *Phoca vitulina* (Harbour Seal) [1365]	*the Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (000625) as none were available for the SAC in question. Available at: Bunduff Lough and Machair/Trawalua/Mullaghmore SAC | National Parks & Wildlife Service (npws.ie)*			
West Of Ardara/Maas Road SAC (000197)	213	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Large shallow inlets and bays [1160] Annual vegetation of drift lines [1210] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows *(Juncetalia maritimi*) [1410]	To maintain and restore the favourable conservation condition of QIs in West of Ardara/Maas Road SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Pearlwort was not included for Conservation Objectives for West Of Ardara/Maas Road SAC. As a result, a site-specific for Pearlwort was taken from a nearby SAC containing Pearlwort (Bunduff Lough and Machair/Trawalua/Mullaghmore SAC [000625]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Decalcified fixed dunes with *Empetrum nigrum* [2140] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with Salix repens ssp. argentea (*Salicion arenari*ae) [2170] Humid dune slacks [2190] Machairs (* in Ireland) [21A0] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or Isoeto-Nanojuncetea [3130] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Alpine and Boreal heaths [4060] *Juniperus communis* formations on heaths or calcareous grasslands [5130]				

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410] Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) [6510] Blanket bogs (* if active bog) [7130] Depressions on peat substrates of the Rhynchosporion [7150] Alkaline fens [7230] *Vertigo geyeri* (Geyer's Whorl Snail) [1013] *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] *Euphydryas aurinia* (Marsh Fritillary) [1065] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] *Petalophyllum ralfsii* (Petalwort) [1395] *Najas flexilis* (Slender Naiad) [1833] *Phoca vitulina* (Harbour Seal) [1365]				

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190)	222	Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Decalcified fixed dunes with *Empetrum nigrum* [2140] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Alpine and Boreal heaths [4060] Blanket bogs (* if active bog) [7130] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Lutra lutra* (Otter) [1355] *Halichoerus grypus* (Grey Seal) [1364]	To maintain or restore the favourable conservation condition of QIs in Slieve Tooey/Tormore Island/Loughros Beg Bay SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Atlantic salt meadows was not included for Conservation Objectives for Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190). As a result, a site-specific for Atlantic salt meadows was taken from a nearby SAC containing Atlantic salt meadows (Lough Swilly SAC [002287]]), available at: Site_specific_cons_obj (npws.ie)* *Note: Mediterranean salt meadows was not included for Conservation Objectives for Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190). As a result, a site-specific for Mediterranean salt meadows was taken from a nearby SAC containing Mediterranean salt meadows (Gweedore Bay and Islands SAC [001141]), available at: Site_specific_cons_obj (npws.ie)* *Note: Fixed coastal dunes with herbaceous vegetation was not included for Conservation Objectives for Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190). As a result, a site-specific for Fixed coastal dunes with herbaceous vegetation was taken from a nearby SAC containing Fixed coastal dunes with herbaceous vegetation (Gweedore*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			Bay and Islands SAC [001141]), available at: Site_specific_cons_obj (npws.ie) *Note: Dunes with Salix repens ssp. argentea (Salicion arenariae was not included for Conservation Objectives for Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190). As a result, a site-specific for Dunes with Salix repens ssp. argentea (Salicion arenariae was taken from a nearby SAC containing Dunes with Salix repens ssp. argentea (Salicion arenariae (Gweedore Bay and Islands SAC [001141]), available at: Site_specific_cons_obj (npws.ie)* *Note: Humid dune slacks was not included for Conservation Objectives for Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (000190). As a result, a site-specific for Humid dune slacks was taken from a nearby SAC containing Humid dune slacks (Gweedore Bay and Islands SAC [001141]), available at: Site_specific_cons_obj (npws.ie)*			
Kilkieran Bay and Islands SAC (002111)	228	Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	To maintain the favourable conservation condition of QIs in Kilkieran Bay and Islands SAC, which is defined by the following list of attributes and targets: *Note: Harbour Porpoise was not included for Conservation Objectives for Kilkieran Bay and Islands SAC (002111). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise ((Blasket Islands SAC*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Mediterranean salt meadows (*Juncetalia maritimi)* [1410] Machairs (* in Ireland) [21A0] Oligotrophic to mesotrophic standing waters with vegetation of the L*ittorelletea uniflorae and/or Isoeto-Nanojuncetea* [3130] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510] *Lutra lutra* (Otter) [1355] *Najas flexilis* (Slender Naiad) [1833] *Phocoena phocoena* (Harbour Porpoise) [1351] *Phoca vitulina* (Harbour Seal) [1365]	*[002172]), available at: ConservationObjectives.rdl (npws.ie)* *Note: Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea was not included for Conservation Objectives for Kilkieran Bay and Islands SAC (002111). As a result, a site-specific for Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea was taken from a nearby SAC containing Harbour Porpoise (Rockabill to Dalkey Island SAC [003000]), available at: ConservationObjectives.rdl (npws.ie)*			
Clew Bay Complex SAC (001482)	233	Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Embryonic shifting dunes [2110]	To maintain or restore the favourable conservation condition of QIs in Clew Bay Complex SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Machairs was not included for Conservation Objectives for Clew Bay Complex SAC. As a result, a site-specific for Clew Bay Complex SAC was taken from a nearby SAC containing Machairs (Doogort Machair/Lough Doo SAC [001497), available at: ConservationObjectives.rdl (npws.ie)* *Note: Old sessile oak woods with Ilex and Blechnum in the British Isle was not included for Conservation*	No No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Machairs (* in Ireland) [21A0] Old sessile oak woods with Ilex and *Blechnum* in the British Isles [91A0] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	*Objectives for Clew Bay Complex SAC. As a result, a site-specific for Clew Bay Complex SAC was taken from a nearby SAC containing Machairs (Brackloon Woods SAC [000471), available at:* ConservationObjectives.rdl (npws.ie) *Note: The status of Geyer's whorl snail as a qualifying Annex II species for Clew Bay Complex SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this species*			
Kilkiernan Bay and Islands SAC (002111)	231/Within Harbour Porpoise Management Unit	Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Machairs (* in Ireland) [21A0] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) [6510] *Lutra lutra* (Otter) [1355]	To maintain or restore the favourable conservation condition of QIs in Kilkieran Bay and Islands SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea was not included for Conservation Objectives for Kilkiernan Bay and Islands SAC (002111). As a result, a site-specific for Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea was taken from a nearby SAC containing Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea (Aughrusbeg Machair and Lake SAC [001228]), available at: CO001228.pdf (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Najas flexilis (Slender Naiad) [1833] *Phocoena phocoena* (Harbour Porpoise) [1351] *Phoca vitulina* (Harbour Seal) [1365]	*Note: Harbour Porpoise was not included for Conservation Objectives for Kilkiernan Bay and Islands SAC (002111). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)*			
Rutland Island and Sound SAC (002283)	231	Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Phoca vitulin*a (Harbour Seal) [1365]	To maintain the favourable conservation condition of QIs in Rutland Island and Sound SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Horn Head and Rinclevan SAC (000147)	237	Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Machairs (* in Ireland) [21A0] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] *Vertigo geyeri* (Geyer's Whorl Snail) [1013] *Petalophyllum ralfsii* (Petalwort) [1395] *Najas flexilis* (Slender Naiad) [1833] *Halichoerus grypus* (Grey Seal) [1364]	To maintain or restore the favourable conservation condition of QIs in Horn Head and Rinclevan SAC, which is defined by the following list of attributes and targets, available at: CO000147.pdf (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Gweedore Bay and Islands SAC (001141)	238/Within Harbour Porpoise Management Unit	Coastal lagoons [1150] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	To maintain or restore the favourable conservation condition of QIs in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Harbour Porpoise was not included for Conservation Objectives for Gweedore Bay and Islands SAC (001141)).. As a result, a site-specific*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Decalcified fixed dunes with *Empetrum nigrum* [2140] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with *Salix repens* ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Machairs (* in Ireland) [21A0] Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* [3130] European dry heaths [4030] Alpine and Boreal heaths [4060] *Juniperus communis* formations on heaths or calcareous grasslands [5130] *Euphydryas aurinia* (Marsh Fritillary) [1065]]	*for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at:* ConservationObjectives.rdl (npws.ie) *Note: The Marsh Fritillary was not included for Conservation Objectives for Gweedore Bay and Islands SAC (001141). As a result, a site-specific for Marsh Fritillary was taken from a nearby SAC containing Marsh Fritillary s (West of Ardara/Maas Road SAC [000197]), available at:* ConservationObjectives.rdl (npws.ie) *Note: Atlantic salt meadows was not included for Conservation Objectives for Gweedore Bay and Islands SAC (001141). As a result, a site-specific for Atlantic salt meadows was taken from a nearby SAC containing Atlantic salt meadows (Lough Swilly SAC [002287]]), available at:* Site_specific_cons_obj (npws.ie) *Note: Vegetated sea cliffs of the Atlantic and Baltic coasts was not included for Conservation Objectives for Gweedore Bay and Islands SAC (001141). As a result, a site-specific for Vegetated sea cliffs of the Atlantic and Baltic coasts was taken from a nearby SAC containing Vegetated sea cliffs of the Atlantic and Baltic coasts (Aran Island (Donegal) Cliffs SAC [000111], available at:* ConservationObjectives.rdl (npws.ie) ConservationObjectives.rdl (npws.ie)			

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Lutra lutra (Otter) [1355] *Petalophyllum ralfsii* (Petalwort) [1395] *Najas flexilis* (Slender Naiad) [1833] *Phocoena phocoena* (Harbour Porpoise) [1351]	*Note: Conservation objectives for Euphydryas aurinia (Marsh Fritillary) was taken from the West Of Ardara/Maas Road SAC (000197) as none were available for the SAC in question. Available at: ConservationObjectives.rdl (npws.ie)*			
Inishmore Islands SAC (000213)	239/Within Harbour Porpoise Management Unit	Coastal lagoons [1150] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190] Machairs (* in Ireland) [21A0] European dry heaths [4030] Alpine and Boreal heaths [4060] Semi-natural dry grasslands and scrubland facies on calcareous substrates	To maintain or restore the favourable conservation condition of QIs in Inishmore Island SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: The status of Alpine and Boreal heaths as a qualifying Annex I habitat in Inishmore Island SAC is currently under review. The outcome of this review will determine whether a sitespecific conservation objective is set for this habitat* *Note: Harbour Porpoise was not included for Conservation Objectives for Inishmore Islands SAC (000213). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		(*Festuco-Brometalia*) (* important orchid sites) [6210] Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510] Limestone pavements [8240] Submerged or partially submerged sea caves [8330] *Vertigo angustior* (Narrow-mouthed Whorl Snail) [1014] *Phocoena phocoena* (Harbour Porpoise) [1351]				
West Connacht Coast SAC (002998)	250/within Bottlenose Dolphin and Harbour Porpoise Management Unit	*Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain the favourable conservation condition of QIs in West Connacht Coast SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Harbour Porpoise was not included for Conservation Objectives for West Connacht Coast SAC (002998).. As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)*	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Inishbofin and Inishshark SAC (000278)	265	Coastal lagoons [1150] Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) [3110] Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030]	To maintain or restore the favourable conservation condition of QIs in Inishbofin and Inishshark SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Halichoerus grypus (Grey Seal) [1364]				
Slyne Head Islands SAC (0003280	266/within Bottlenose Dolphin Management Unit	Reefs [1170] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Halichoerus grypus* (Grey Seal) [1364]	To maintain the favourable conservation condition of QIs in Slyne Head Islands SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for Slyne Head Islands SAC (0003280). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (: Lower River Shannon SAC [002165]), available at: Site_specific_cons_obj (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Duvillaun Islands SAC (000495)	276/ within Bottlenose Dolphin Management Unit	*Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Halichoerus grypus* (Grey Seal) [1364]	To maintain the favourable conservation condition of QIs in Duvillaun Islands SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for Duvillaun Islands SAC (000495). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (: Lower River Shannon SAC [002165]), available at: Site_specific_cons_obj (npws.ie)*	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Inishkea Islands SAC (000507)	280	Machairs (* in Ireland) [21A0] *Petalophyllum ralfsii* (Petalwort) [1395] *Halichoerus grypus* (Grey Seal) [1364]	To maintain or restore the favourable conservation condition of QIs in Inishkea Islands SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Kenmare River SAC (002158)	281/Within Harbour Porpoise Management Unit	Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] European dry heaths [4030] *Juniperus communis* formations on heaths or calcareous grasslands [5130] Calaminarian grasslands of the *Violetalia calaminariae* [6130] Submerged or partially submerged sea caves [8330]	To maintain or restore the favourable conservation condition of QIs in Kenmare River SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie) *Note: Harbour Porpoise was not included for Conservation Objectives for Kenmare River SAC (002158). As a result, a site-specific for Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)* *Note: Juniperus communis formations on heaths or calcareous grasslands was not included for Conservation Objectives for Kenmare River SAC (002158). As a result, a site-specific Conservation Objectives for was taken from a nearby SAC containing Juniperus communis formations on heaths or calcareous grasslands : Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC [000365]), available at: ConservationObjectives.rdl (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Vertigo angustior (Narrow-mouthed Whorl Snail) [1014] *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] *Lutra lutra* (Otter) [1355] *Phocoena phocoena* (Harbour Porpoise) [1351] *Phoca vitulina* (Harbour Seal) [1365]				
Glengarriff Harbour and Woodland SAC (000090)	288	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] *Geomalacus maculosus* (Kerry Slug) [1024] *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303] *Lutra lutra* (Otter) [1355] *Phoca vitulina* (Harbour Seal) [1365]	To maintain the favourable conservation condition of QIs in Glengarriff Harbour and Woodland SAC, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Roaringwater Bay and Islands SAC (000101)	299/Within Management Unit for Harbour Porpoise	Large shallow inlets and bays [1160] Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030] Submerged or partially submerged sea caves [8330]	To maintain or restore the favourable conservation condition of QIs in Roaringwater Bay and Islands SAC, which is defined by the following list of attributes and targets, available at: Site_specific_cons_obj (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Lutra lutra (Otter) [1355] *Phocoena phocoena* (Harbour Porpoise) [1351] *Halichoerus grypus* (Grey Seal) [1364]				
Blasket Islands SAC (002172)	321/Within Management Unit for Harbour Porpoise	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] European dry heaths [4030] Submerged or partially submerged sea caves [8330] *Phocoena phocoena* (Harbour Porpoise) [1351] *Halichoerus grypus* (Grey Seal) [1364]	To maintain or restore the favourable conservation condition of QIs in Blasket Islands SAC, which is defined by the following list of attributes and targets, available at: : ConservationObjectives.rdl (npws.ie)	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Belgica Mound Province SAC (002327)	Within Harbour Porpoise and Bottlenose Dolphin Management Unit	Reefs [1170] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain the favourable conservation condition of QIs in Belgica Mound Province SAC, which is defined by the following list of attributes and targets, available at: CO002327.pdf (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for Belgica Mound Province SAC (002327). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (: Lower River Shannon SAC [002165]), available at: Site_specific_cons_obj (npws.ie)* *Note: Harbour Porpoise was not included for Conservation Objectives for Belgica Mound Province SAC (002327). As a result, a site-specific for*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			Harbour Porpoise was taken from a nearby SAC containing Harbour Porpoise (Blasket Islands SAC [002172]), available at: ConservationObjectives.rdl (npws.ie)Site_specific_cons_obj (npws.ie)			
Porcupine Bank Canyon SAC (003001)	Within Bottlenose Dolphin Management Unit	Reefs [1170] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition of QIs in Porcupine Bank Canyon SAC, which is defined by the following list of attributes and targets, available at: CO003001.pdf (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for Porcupine Bank Canyon SAC (003001). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (: Lower River Shannon SAC [002165]), available at: Site_specific_cons_obj (npws.ie)*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
South-West Porcupine Bank SAC (002329)	Within Bottlenose Dolphin Management Unit	Reefs [1170] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	To maintain the favourable conservation condition of QIs in South-west Porcupine Bank SAC, which is defined by the following list of attributes and targets, available at: CO002329.pdf (npws.ie) *Note: Common Bottlenose Dolphin was not included for Conservation Objectives for South-West Porcupine Bank SAC (002329). As a result, a site-specific for Common Bottlenose Dolphin was taken from a nearby SAC containing Common Bottlenose Dolphin (: Lower River Shannon SAC*	No- no SPR connection for Annex I habitats. No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			[002165]), available at: [Site_specific_cons_obj (npws.ie)]			
Northern Ireland SACs						
Murlough (UK0016612)	89	*Phoca vitulina* (Harbour Seal) [1365]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	Yes- within the 100 km buffer from the AoI for marine mammals.	Yes- possible disturbance from underwater noise.	No
North Channel (UK0030399)	104	*Phocoena phocoena* (Harbour Porpoise) [1351]	Maintain site integrity by ensuring: 1. Harbour porpoise are a viable component of the site. 2. There is no significant disturbance of the species. 3. The condition of supporting habitats and processes, and the availability of prey is maintained.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Strangford Lough (UK0016618)	115	*Phoca vitulina* (Harbour Seal) [1365]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
The Maidens (UK0030384)	178	*Halichoerus grypus* (Grey Seal) [1364]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Skerries and Causeway (UK0030383)	212	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition. Available at: Rathlin Island SAC Conservation Objectives 2015 (daera-ni.gov.uk)	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
UK SACs						
North Anglesey Marine SAC (UK0030398)	60/Within Management Unit for	*Phocoena phocoena* (Harbour Porpoise) [1351]	Maintain site integrity by ensuring: 1. Harbour porpoise are a viable component of the site.	Yes- within the 100 km buffer from	Yes- possible disturbance from	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
	Harbour porpoise		2. There is no significant disturbance of the species. 3. The condition of supporting habitats and processes, and the availability of prey is maintained.	the AoI for marine mammals.	underwater noise.	
West Wales Marine SAC (UK0030397)	109/Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	Maintain site integrity by ensuring: 1. Harbour porpoise are a viable component of the site. 2. There is no significant disturbance of the species. 3. The condition of supporting habitats and processes, and the availability of prey is maintained.	Yes- within the 100 km buffer from the AoI for marine mammals.	Yes- possible disturbance from underwater noise.	No
Lleyn Peninsula and the Sarnau SAC (UK0013117)	111/Within Management Unit for Bottlenose Dolphin	*Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status	Yes- within the 100 km buffer from the AoI for marine mammals.	Yes- possible disturbance from underwater noise.	No
Cardigan Bay SAC (UK0012712)	151/Within Management Unit for Bottlenose Dolphin	*Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Bristol Channel Approaches SAC (UK003039)	204/Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Pembrokeshire Marine/ Sir Benfro Forol (UK0013116)	170	*Halichoerus grypus* (Grey Seal) [1364]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
South-East Islay Skerries (UK0030067)	256	*Phoca vitulina* (Harbour Seal) [1365]	1. To ensure that harbour seals at South-East Islay Skerries SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status. 2. To ensure that the integrity of South-East Islay Skerries SAC is maintained in the context of environmental changes by meeting objectives 2a, 2b and 2c: 2a. The population of harbour seal is a viable component of the site. 2b. The distribution of harbour seal throughout the site is maintained by avoiding significant disturbance of harbour seal. 2c. The supporting habitats relevant to harbour seal are maintained.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Isles of Scilly Complex (UK0013694)	371	*Halichoerus grypus (*Grey Seal) [1364]	To maintain (or restore where appropriate) the qualifying interests to favourable condition	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Lundy (UK0013114)	257	Halichoerus grypus (Grey Seal) [1364]	To maintain (or restore where appropriate) the qualifying interests to favourable condition	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Treshnish Isles (UK0030289)	352	*Halichoerus grypus* (Grey Seal) [1364]	To ensure for the qualifying species that the following are maintained in the long term, available at: Conservation_Objectives_8398.pdf : Population of the species as a viable component of the site Distribution of the species within site Distribution and extent of habitats supporting the species	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
			Structure, function and supporting processes of habitats supporting the species No significant disturbance of the species			
EU SACs						
hRécifs et landes de la Hague SAC (FR2500084)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Anse de Vauville SAC (FR2502019)	Within Management Unit for Harbour porpoise	P*hocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Banc et récifs de Surtainville SAC (FR2502018)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Chausey (FR2500079)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Baie du Mont Saint-Michel (FR2500077)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Estuairie de la Rance SAC (FR5300061)	Within Management Unit for	Phocoena phocoena (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
	Harbour porpoise					
Baie de Lancieux, Baie de l'Arguenon, Archipel de Saint Malo et Dinard (FR5300012)	Within Management Unit for Harbour porpoise	Phocoena phocoena (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Cap d'Erquy-Cap Fréhel (FR5300011)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Baie de Saint-hBrieuc (FR5300066)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Tregor Goëlo (FR5310070)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Côte de Granit rose-Sept-Iles (FR5300009)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Nord Bretagne DH (FR2502022)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Baie de Morlaix SAC (FR5300015)	Within Management Unit for	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
	Harbour porpoise			the AoI for marine mammals.		
Abers - Côte des legends (FR5300017)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Ouessant-Molène (FR5300018)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Côtes de Crozon (FR5302006)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Mers Celtiques – Talus du golfe de Gascogne (FR5302015)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Riviére Leguer, forêts de Beffou, Coat an Noz et Coat an Hay (FR5300008)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Estuairie de la Rance (FR53000061)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
Chaussée de Sein (FR5302007)	Within Management Unit for	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from	No	No

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
	Harbour porpoise			the AoI for marine mammals.		
Récifs du talus du golfe de Gascogne (FR5302016)	Within Management Unit for Harbour porpoise	*Phocoena phocoena* (Harbour Porpoise) [1351]	To maintain (or restore where appropriate) the qualifying interests to favourable condition.	No- Beyond the 100 km buffer from the AoI for marine mammals.	No	No
SPAs						
South Dublin Bay and River Tolka Estuary SPA (004024)	Within SPA boundary	Light-bellied Brent Goose (*Branta bernicla hrota)* [A046] Oystercatcher (*Haematopus ostralegus*) [A130] Ringed Plover (*Charadrius hiaticula*) [A137] Grey Plover (*Pluvialis squatarola*) [A141] Knot (*Calidris canutus*) [A143] Sanderling (*Calidris alba*) [A144] Dunlin (*Calidris alpina*) [A149] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirun*do) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Wetland and Waterbirds [A999]	To maintain the favourable conservation condition of the QIs in South Dublin Bay and River Tolka Estuary SPA as a resource for the regularly occurring migratory waterbirds that utilise it. This is defined by the following attribute and target, available at: ConservationObjectives.rdl (npws.ie) *Note: Grey Plover is proposed for removal from the list of Special Conservation Interests for South Dublin Bay and River Tolka Estuary SPA. As a result, a site-specific conservation objective has not been set for this species.*	Yes - geophysical and geotechnical surveys to take place within SPA boundary.	Yes - possible visual & above water noise disturbance including potential habitat loss to non-annexed wetland habitat.	Yes

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
North Bull Island SPA (004006)	1	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Teal (*Anas crecca*) [A052] Pintail (*Anas acuta*) [A054] Shoveler (*Anas clypeata*) [A056] Oystercatcher (*Haematopus ostralegus*) [A130] 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] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Wetland and Waterbirds [A999]		Yes - geophysical and geotechnical surveys to take place in close proximity c. 1 km south from the SPA boundary	Yes - possible visual & above water noise disturbance	Yes

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
North-West Irish Sea SPA (004236)	1	Red-throated Diver (*Gavia stellata*) [A001] Great Northern Diver (*Gavia immer*) [A003] Fulmar (*Fulmarus glacialis*) [A009] Manx Shearwater (*Puffinus puffinus*) [A013] Common Scoter (*Melanitta nigra*) [A065] Little Gull (*Larus minutus*) [A177] Black-headed Gull (*Chroicocephalus ridibundus*) [A179] Common Gull (*Larus canus*) [A182] Lesser Black-backed Gull *(Larus fuscus*) [A183] Herring Gull (*Larus argentatus*) [A184] Great Black-backed Gull (*Larus marinus*) [A187] Kittiwake (*Rissa tridactyla*) [A188] Roseate Tern (*Sterna dougallii*) [A192] Common Tern (*Sterna hirundo*) [A193] Arctic Tern (*Sterna paradisaea*) [A194] Little Tern (*Sterna albifrons*) [A195] Puffin (*Fratercula arctica*) [A204]	To maintain the favourable conservation condition of the SCIs at North-west Irish Sea SPA, which is defined by the following list of attributes and targets, available at: CO004236.pdf (npws.ie)	Yes - geophysical and geotechnical surveys to take place in close proximity c. 1 km south from the SPA boundary	Yes - possible visual & above water noise disturbance	Yes

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200]				
Dalkey Island SPA (004172)	5	Arctic Tern (*Sterna paradisaea*) [A194] Common Tern (*Sterna hirundo*) [A193] Roseate Tern (*Sterna dougallii*) [A192]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.	Yes- foraging	Yes - possible visual & above water noise disturbance	Yes
Howth Head Coast SPA (004113)	6	Kittiwake (*Rissa tridactyla*) [A188]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA	Yes- foraging	Yes - possible visual & above water noise disturbance	No- refer to Section 5.2
Baldoyle Bay SPA (004016)	7	Light-bellied Brent Goose (Branta bernicla hrota) [A046] Shelduck (*Tadorna tadorna*) [A048 Ringed Plover (*Charadrius hiaticula*) [A137] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (P*luvialis squatarola*) [A141] Bar-tailed Godwit (*Limosa lapponic*a) [A157] Wetland and Waterbirds [A999]	To maintain the favourable conservation condition of the SCIs in Baldoyle Bay SPA, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No	No	No
Irelands Eye SPA (004117)	8	Cormorant (Phalacrocorax carbo) [A017] Herring Gull (*Larus argentatus*) [A184] Kittiwake (*Rissa tridactyla*) [A188] Guillemot (*Uria aalge*) [A199] Razorbill (*Alca torda*) [A200]	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA.	Yes- foraging and diving species	Yes - possible above water and underwater noise disturbance.	No- refer to Section 5.2.

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
Wicklow Mountains SPA (004040)	10	Merlin (*Falco columbarius*) [A098] Peregrine (*Falco peregrinus*) [A103]	To maintain the Favourable conservation condition of SCIs in Wicklow Mountains SPA, which is defined by the following list of attributes and targets, available at: CO004040.pdf (npws.ie)	No- no SPR connection between these non-marine SCIs, beyond typical breeding habitat for Merlin (300m typical foraging range from suitable breeding habitat)[13] and 2 km typical foraging range from nest for peregrine[14]	No	No
Malahide Estuary SPA (004025)	11	Great Crested Grebe (*Podiceps cristatus*) [A005] Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] Shelduck (*Tadorna tadorna*) [A048] Pintail (*Anas acuta*) [A054 Goldeneye (*Bucephala clangula*) [A067] Red-breasted Merganser (*Mergus serrator*) [A069] Oystercatcher (*Haematopus ostralegus*) [A130] Golden Plover (*Pluvialis apricaria*) [A140] Grey Plover (*Pluvialis squatarola*) [A141]	To maintain the favourable conservation condition of GSCIs in Malahide Estuary SPA, which is defined by the following list of attributes and targets, available at: ConservationObjectives.rdl (npws.ie)	No	No	No

13 https://www.npws.ie/sites/default/files/publications/pdf/IWM139.pdf Accessed October 2024

14 https://assets.publishing.service.gov.uk/media/5eb27090e90e0723b766f31b/ne-peregrine-falcon-habitat-regulation-assessment.pdf Accessed October 2024

Supporting Information for Screening for Appropriate Assessment

European Site Code	Distance from the Proposed Development (km)	List of Qualifying Interests	Conservation Objectives	Connections (Source-Pathway Receptors)	Qualifying Interests considered further in Screening Y/N	European Site Screened In for stage 2 Appropriate Assessment
		Knot (*Calidris canutus*) [A143] Dunlin (*Calidris alpina*) [A149] Black-tailed Godwit (*Limosa limosa*) [A156] Bar-tailed Godwit (*Limosa lapponica*) [A157] Redshank (*Tringa totanus*) [A162] Wetland and Waterbirds [A999]				