MERC Consultants
environmental and conservation services

Supporting Information for Screening for Appropriate Assessment Report

Department of Climate, Energy and the Environment (DCEE): South Coast Designated Maritime Area Plan (SCDMAP) geophysical reconnaissance, metocean, geotechnical, benthic and passive acoustic surveys.

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1. Introduction

Ireland has adopted a plan-led approach to achieving its offshore wind targets. The Minister for the Department of Climate, Energy and the Environment (DCEE) has commissioned the preparation of a Marine Usage Licence (MUL) application to conduct and support marine site investigations for the South Coast Designated Maritime Area Plan (DMAP) as shown in Figure 1. The programme is funded for data collection in 2026 and is being developed over a multi-year period, focusing on three of the four SC-DMAP sites: Lí Bán (Area B), Manannán (Area C) and Danu (Area D), but with some additional works planned for Tonn Nua (Area A). Survey activity will also include potential transit lines from Cork Harbour and corridors between the sites, with certain works extending across the wider SC-DMAP area where required.

Site investigations will include geophysical, geotechnical, metocean, and biological surveys (a brief description of the survey specifications is provided in Table 1). Surveying for marine data is a crucial step in the preparation for Offshore Renewable Electricity Support Scheme (ORESS) auctions. Providing extensive, accurate, and high-quality data helps inform and de-risk auctions, leading to more stable energy prices for consumers. It is expected that this multi-disciplinary marine survey programme will contribute to the SC-DMAP Regional Level Surveys. The Regional Level Surveys will support implementation and monitoring of the SC-DMAP and help inform potential cumulative and in-combination assessments at project level for development permission applications within Maritime Areas B, C, and D.

This document constitutes Supporting Information for Screening for Appropriate Assessment (SISAA) to assist the Competent Authority in undertaking screening for Appropriate Assessment (AA). The screening will assess, in view of the best scientific knowledge, if the proposed project, individually or in combination with other plans or projects, is likely to significantly affect any European sites, considering their conservation objectives.

Where likely significant effects cannot be excluded on the basis of objective information, the relevant European site/s are screened in for Appropriate Assessment.

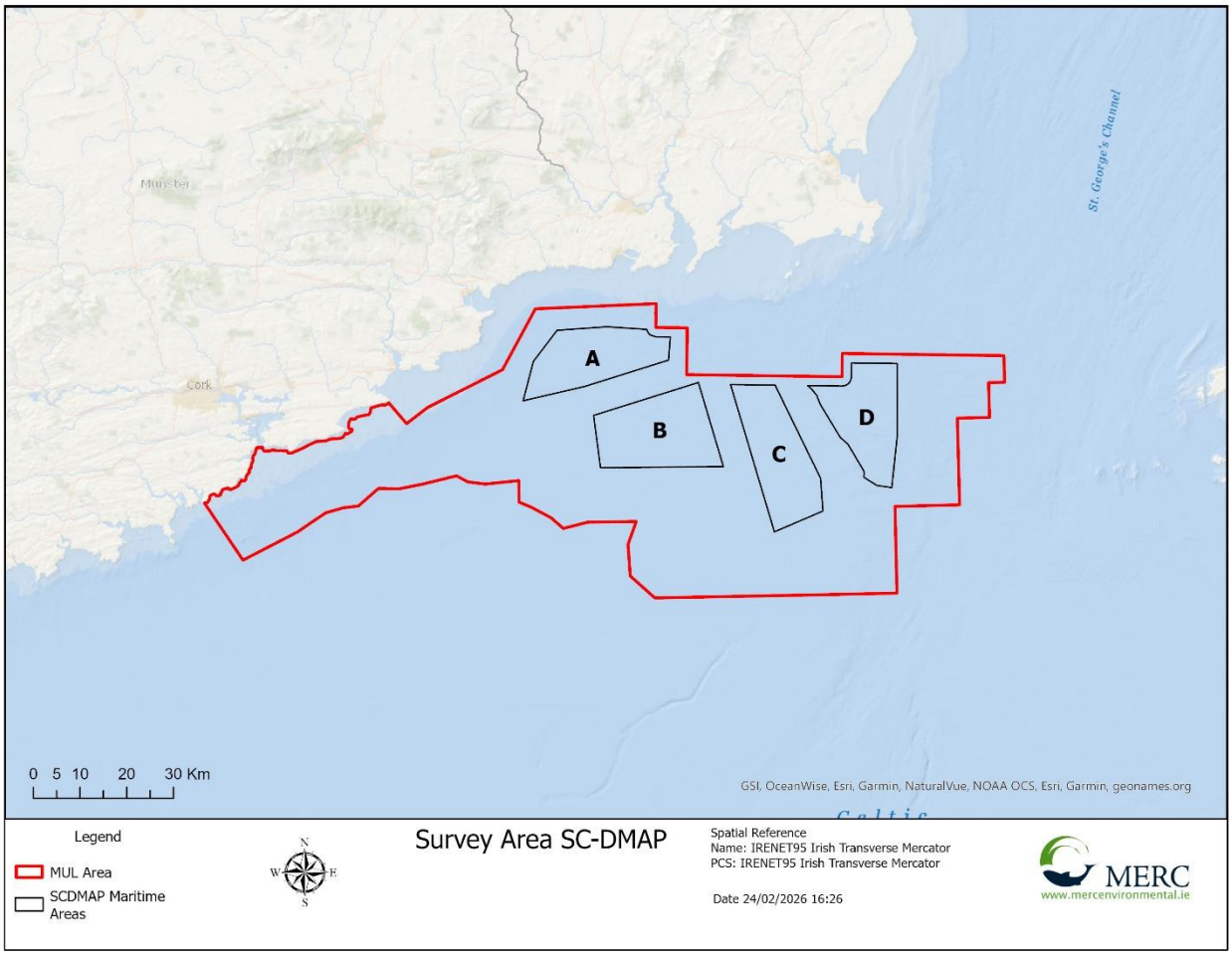

Figure 1. MUL and maritime areas

2. Statement of authority

This report was prepared by Louise Scally and Ronan Browne of MERC Consultants. MERC are a specialist marine ecological survey and consultancy firm. Core staff have many decades of combined experience and specialist knowledge in relation to Irish marine habitats and species in addition to the assessment and management of conservation interests. MERC were responsible for conducting surveillance monitoring and reporting for the NPWS national monitoring of marine Annex I habitats, for compliance under Articles 11 and 17 of the EU Habitats Directive in the periods 2015-2019 and 2022-2025.

In addition to their scientific expertise MERC have an in-depth knowledge of Irish and European Environmental legislation and policy. In 2011 MERC prepared the text describing Activities Requiring Consent (ARCs) for inclusion in a handbook detailing the regulatory framework for all developments within designated sites in Ireland on behalf of the National Parks and Wildlife Service. They have also produced numerous Conservation Management Plans for the same department. To-date MERC have conducted in excess of 200 ecological reports in support of Appropriate Assessment under Article 6(3) of the EU Habitats Directive.

Louise Scally MCIEEM is a professional marine ecologist with a wide range of experience in the field of conservation biology, marine habitat mapping and ecology. She completed a M.Sc. in ecology and taxonomy at Trinity College Dublin in 1989 and a Ph.D. in taxonomy, also at Trinity College Dublin, in 2001. She is a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). For the last 20 years she has specialised in the ecology of marine ecosystems. She has specialised in the

assessment of benthic habitats with a focus on intertidal and subtidal reef habitats and sensitive seabed species and habitats. Over the last 15 years she has conducted extensive marine monitoring surveys and assessments of EU Habitats Directive marine Annex I habitats and their associated species within European sites in Ireland to inform national compliance obligations under the EU Habitats Directive.

Ronan Browne is a marine and environmental scientist with extensive experience in coastal ecology, WFD water-quality monitoring, and the assessment of intertidal and subtidal habitats. He holds qualifications in aquatic biology, shellfish biology, and fisheries (MSc, Bangor), and in fisheries science (PhD, University of Galway). He has worked across national marine monitoring programmes and applied research with organisations including BIM, the Marine Institute, CLS and MERC.

3. Methods

3.1. Guidelines and legislation

This report has been prepared with reference to the following European Directives, national legislation and guidance on the appropriate assessment of projects and plans with regard to the implementation of the provisions of Article 6(3) and (4) of the EU Habitats Directive 92/43/EEC.

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna. Official Journal of the European Communities.
- Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version).
- European Communities (Birds and Natural Habitats) Regulations 2011. SI No. 477 of 2011.
- Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. European Commission 2018. 7621 final. Office for Official Publications of the European Communities, Luxembourg.
- Assessment of plans and projects in relation to Natura 2000 sites-Methodological Guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC 2021/C 437/01-Publication office of the EU (europa.eu).
- Appropriate Assessment Screening for Development Management. OPR Practice Note PN01. Office of the Planning Regulator. March 2021.
- Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. Department of Arts, Heritage and the Gaeltacht, 2014.
- Relevant case law.
- MARA (2025). Guidance for Applicants: Marine Usage Licence (MUL) Applications. Version 7 updated 5 November 2025.
- MARA (n.d.). Marine Usage Licence (MUL) – Application Form. Accessed December 2025.
- MARA (n.d.). Technical Mapping Guidance Notes for MAC/MUL Applications under the Marine Area Planning Act 2021 (MAPA). Accessed December 2025.

3.2. Description of the proposed project and its associated scope of works

A description of the proposed project was compiled and is set out in section 4. The description details all works required to carry out the proposed project.

To fully understand the receiving environment, relative to project-related effects, the literature consulted included the available National Parks and Wildlife Service (NPWS) data sources for all European sites within the Zone of Influence (ZoI) of the proposed project (see section 3.3 for methods used to determine the ZoI). This included the individual site synopsis for the relevant European sites, conservation objectives and GIS layers (habitats and species). Further data was obtained from the following sources (non-exhaustive):

- Biodiversity Data Centre species maps.
- Irish Whale and Dolphin Group live sightings.
- ObSERVE Aerial Surveys.
- INFOMAR Seabed and sediment data.
- Tailte Éireann: High Water Mark and Low Water Mark.
- EMODnet broad-scale seabed habitat map for Europe.Additional fisheries material has been considered in defining the receiving environment and potential project pathways.

3.3. Impact Assessment approach

The zone of influence (ZoI) of a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. In the context of Appropriate Assessment Screening, the ZoI is the area over which a plan or project could affect the receiving environment, such that it could potentially have significant effects on the conservation status of European Sites. Within the ZoI those receptors that are sensitive to change must be identified and considered.

To define the ZoI of a project, the potential for project-related effects on sensitive receptors must first be established. For this purpose, screening follows a Source-Path-Receptor (SPRC) model, and for each plausible SPR linkage, the likely consequence (magnitude/duration/reversibility) is considered qualitatively to inform the Likely Significant Effects (LSE) conclusion. The SPRC model is well established, frequently used to analyse project-related impacts on ecosystems, and is being applied to the assessment of the proposed project.

Source - The origin of a hazard, e.g. underwater noise from survey equipment.

Pathway - The route by which a hazard can reach a receptor (e.g. through water or seabed), noting that a pathway must exist for an effect to occur.

Receptor - The ecological feature that may be affected (e.g. Annex I habitat, marine mammal, fish, bird).

Consequence - The resulting effect (e.g. temporary disturbance/displacement, injury risk, habitat disturbance, or change in supporting processes).

Using this approach, all elements of the proposed project were reviewed to assess potential pathways and receptors which might be affected so that a ZoI could be established. This process involved the following steps:

- The identification of sources of potential impacts and their pathways from the proposed project site to European Sites.
- Consideration of sensitive receptors and their dependent ecosystems within the aforementioned European sites.
- Identifying and characterising project-related impacts and their likely effects, direct, indirect and cumulative on the identified sensitive receptors.

Once the ZoI was established, the following steps were taken to assess the potential for likely significant effects on sensitive receptors:

1. The scale and scope of the project was examined.
2. A desk review of the available literature describing the habitats and species known to occur at the proposed project site and surrounding area was undertaken.
3. Any project related activities likely to affect migratory or highly mobile species was considered.
4. Any use of the proposed project site by mobile species that make regular movements to, from, or across the site was assessed.
5. An assessment was carried out of the key ecological processes and species activity periods including seasonal variations in distribution, abundance and activity.

3.4. Review of European sites

Once the ZoI of the proposed project was determined, European sites within this ZoI were documented, and an analysis of the sensitivity of ecological receptors therein was conducted. In determining the sensitivity of ecological receptors, consideration was given to the scale, scope and location of the proposed project relative to the aforementioned receptors.

4. Scope of works

4.1. Overview

In support of Ireland's Offshore Renewable Electricity Support Scheme (ORESS), the Department of Climate, Energy and the Environment (DCEE) is planning a range of marine surveys. The programme comprises several survey components with the following indicative timings: Geophysical surveys are expected to run for around 1-2months every year to provide coverage for sites B-D, with mobilisation currently anticipated in Q2/Q3 2026 or 2027. Geotechnical works would follow a similar seasonal window, lasting 1-2 months each year to ensure sites B-D are surveyed within a five-year period. Biological surveys will be undertaken periodically over 12–24 months, with benthic sampling anticipated to commence in Q2/Q3 2026 or 2027. Acoustic monitoring (typically for cetacean activity) is proposed over a 24-month period during 2027–2028. Metocean surveys involve fixed deployments over 12–36 months and should also be sufficient to provide data for sites B-D, with intermittent site access for data retrieval and maintenance, with commencement also expected in Q2/Q3 2026 or 2027. Surveys are likely to run within the SC-DMAP until 2030. Specific dates for the vessel schedule are pending. Data acquired will be made publicly available to participants in the ORESS energy auction process and any other interested parties.

The reconnaissance survey data collected by this initial and future survey works will provide information in the upper 100 m of sub-surface geology, to inform the potential suitability of marine areas for possible offshore wind and grid infrastructure development, should these areas be identified as suitable for offshore wind and/or grid development within the final South Coast DMAP.

The proposed broad geophysical target survey area is 5,653.88 km^2. It encompasses an area from the nearshore out to the 75m contour stretching from approximately 37 km southeast of Carnsore Point off the Wexford coast, west to Oyster Haven, County Cork (**Error! Reference source not found.**).

This multi-disciplinary marine survey programme is planned to inform the final South Coast DMAP (SC-DMAP) and contribute to the SC-DMAP Implementation Plan. The works are primarily focused on three maritime areas off Waterford and Wexford. Additional works are proposed in Tonn Nua and along indicative transit lines extending from the Tonn Nua cable corridor (Cork side) to Li Ban, and along a second indicative corridor beyond Li Ban within the SC-DMAP/MUL boundary. The overall objective of the surveys is to characterise seabed and sub-seabed conditions and to collect baseline metocean, benthic, and acoustic data to support the feasibility, design, and environmental assessment of future offshore wind and grid infrastructure. Coverage focuses on the three SC-DMAP maritime areas (Li Ban B, Manannán C, and Danu D) off Waterford/Wexford; some work in the SC-DMAP area Tonn Nua (A); potential transit lines from Cork Harbour; and corridors between sites.

The MUL scope also comprises survey works across the wider SC-DMAP area, including locations outside the development areas. This is relevant to pre- and post-construction monitoring under the SC-DMAP implementation plan, which is expected to focus on biological surveys (benthic monitoring and passive

acoustic monitoring) and may be undertaken at a regional scale. Small-scale benthic sampling is anticipated to inform the selection of long-term monitoring stations. In addition, passive acoustic monitoring will take place within the wider SC-DMAP area to support regional baseline and future monitoring needs. Geophysical transit corridor lines for EirGrid cable route identification may also extend beyond the development areas.

Table 1 summarises the planned surveys and their data-acquisition scopes to support offshore wind site assessment. The works comprise an integrated programme of geophysical, geotechnical, biological, benthic, acoustic, and metocean surveys, designed to characterise seabed and sub-seabed conditions, establish baseline environmental receptors, and provide the datasets required for engineering feasibility, constraint mapping, and subsequent consenting/auction support processes.

Table 1: Survey type and scope.

Survey Type	Survey Scope
Geophysical	• Multibeam echo sounder (MBES) • Sub bottom profiler • Side scan sonar • Magnetometer • Ultra-short baseline (USBL) acoustic positioning system • Sparker system • Mini air gun • Deployment of a Day or Hamon grab (ground truthing)
Geotechnical	• Cone Penetration Testing (CPT/TCPT) • Vibrocore sampling Boreholes (shallow and deep)
Biological / explorative	**Passive acoustic monitoring** • Autonomous Multichannel Acoustic Recorder (AMAR) and/or F-PODs • Hydrophone • Towed hydrophone • Moored deployments (AMARs, F-PODS) **Digital Aerial Survey** • Aerial camera surveys **Benthic** • Day grab and/or Hamon grab • Dropdown video/stills • ROV video/stills • Water sampling • Sediment chemistry sampling • Water sampling
Metocean	• Up to 2 x Metocean Buoys with associated passive monitoring equipment, which may include floating Lidar, wind, current and water quality sensors and solar panels) • Tidal measurements for water level variations • Water Depth – CTD

Survey vessels, jack-up barge and environmental management: The licence application is intended to cover the range of vessels that may be used (including, but not limited to, the *RV Tom Crean* and/or

suitable local vessels). Operational controls described include compliance with MARPOL 73/78 to limit ship-borne pollution and use of vessels compliant with ICES 209 underwater noise standards, with the intent of keeping vessel-noise-related effects low.

Geophysical reconnaissance surveys will acquire high-resolution bathymetry and seabed characterisation data, as well as shallow-to-deep sub-seabed profiles. The programme will deploy multibeam echosounder (MBES) for bathymetry/backscatter, side-scan sonar for seabed features, sub-bottom profiling for shallow stratigraphy, and magnetic sensing (magnetometer and/or gradiometer) to identify ferrous objects and magnetic anomalies. An ultra-short baseline (USBL) acoustic positioning system will provide precise positioning for all towed and underwater sensors.

Sub-seabed seismic data will be collected primarily using a surface-towed sparker system with a hydrophone array. Where local geology requires greater penetration, a mini airgun may be deployed. Equipment selection—profiler type and seismic source—will be matched to the required depth of investigation and resolution, spanning typical engineering zones from cable burial depths (0–5 m) through anchoring/foundations (5–10 m) to deeper targets (10–100 m). Towed equipment will include a single hydrophone streamer and tail buoy, with total tow length in the order of a few hundred metres, which will impose some vessel manoeuvrability constraints.

Benthic sampling and ground-truthing (geophysical support) will include using a high-definition drop-camera system and/or cameras mounted on a ROV to assess suitable areas of the seabed for future geotechnical surveys (e.g. grab sampling, borehole creation, vibrocoring and location of the jack-up barge).

This will be followed by physical sediment sampling using a Day Grab (0.1m^2) and/or Hamon Grab (0.1m^2) over suitable ground (i.e. sediment habitats). These grabs sample surface sediments in the upper 10–20 cm, with the Hamon Grab being better suited to coarser material. A maximum of 250 grabs are proposed (Figure 2), and these grabs will also form part of the assessment of seabed habitats as further detailed under the section on Benthic baseline surveys (ecology) below. The ground-truth imagery will also provide a method to validate acoustic interpretations and provide habitat and species context.

Geotechnical surveys (from survey vessel and/or jack-up barge) will ground-truth subsurface conditions at discrete locations and provide engineering parameters. Methods may include grab sampling (as described above), vibrocore sampling to ~6 m below seabed, borehole drilling with sampling and/or coring (up to ~70 m below seabed; anticipated in the order of ten to forty five locations), and cone penetration testing (CPT) including shallow and deep-drive CPT (up to ~70 m below seabed; anticipated in the order of twenty to forty locations). CPT programmes may incorporate *in situ* pore pressure and thermal measurements, which do not remove seabed material. Final equipment specifications for some components (e.g., vibrocore) will be confirmed through tendering, with contractors required to remain within the assessed parameters so that impacts do not exceed those evaluated for the MUL application.

Marine borehole drilling creates narrow holes in the seabed for geotechnical investigation, using specialised rigs on vessels or platforms to penetrate various marine sediments and rock, employing techniques like rotary drilling, sonic drilling, and mud circulation with casing to maintain stability and collect undisturbed soil samples for analysis.

Metocean surveys will deploy up to two metocean buoys within the survey sites (B–D) for at least 12 consecutive months to measure wave, wind and current conditions, meteorological variables, and selected water quality parameters (e.g., DO, pH, conductivity/salinity, temperature, turbidity, chlorophyll/cyanobacteria). Buoys may incorporate floating LiDAR (either integrated or as a standalone buoy) to support wind resource and energy yield assessment; floating LiDAR systems would typically remain on station for 12–24 months (or longer if needed to capture seasonal variability). Although metocean sensors are largely passive, deployment requires moorings and anchors, with a conservatively estimated seabed interaction footprint for anchoring. Up to three seabed-mounted Acoustic Doppler Current Profilers (ADCPs) may also be deployed for at least 12 months; these will be installed in seabed frames with associated ground line, clump weight and acoustic release/retrieval systems, and will operate at ≥300 kHz. Exact locations for buoys/ADCPs will be selected once survey operators are appointed within the five-year programme.

Benthic baseline surveys (ecology) will collect sediment and habitat data to inform future environmental assessments and monitoring. Surveys will use drop-down video (DDV) and/or ROV inspection. DDV transects (e.g., ~100 m with stills at intervals) will be used to characterise habitats and to confirm suitability for grab sampling. Where stations are deemed suitable, 0.1 m² Day Grab or Hamon Grab samples will be collected across the SC-DMAP area to support sediment and infaunal analyses. A maximum of 250 grabs is proposed to facilitate benthic habitat interpretation (Figure 2).

Acoustic monitoring (marine mammals) will combine fixed and towed passive acoustic methods to characterise cetacean activity within and around the SC-DMAP. Static Acoustic Monitoring (SAM) is proposed within each development area, using moorings comprising an Autonomous Multichannel Acoustic Recorder (AMAR) and a Deep F-PODs. Monitoring will compare canyon and non-canyon slope settings to understand spatial variation in activity. In parallel, a towed hydrophone array will be operated across the survey area (tow cable and sensor section with low- and high-frequency elements) to collect broadband acoustic data over a wide frequency range.

Table 2 summarises the acoustic and benthic sampling equipment to be operated from the survey vessel, including example models/manufacturers, deployment methods, and the intended purpose of each system. For acoustic sources and sonars, the table also provides indicative operating frequencies and sound pressure levels, where available.

Table 2. Survey equipment and activities with potential acoustic emissions (source levels where available).

Equipment	Model (example)	Deployment	Company (example)	Purpose	Frequency	Sound Pressure Level (dB re 1 µPa @ 1 m)
Multibeam Echo sounder	EM2040 (200/300/400 kHz)	Retractable hull mount	Kongsberg Maritime	Collect topographical data from the seabed	200, 300 and 400 kHz	210
Sparker System & 48-channel hydrophone array	Dura-speak seismic sound source	Towed system	Subsea Technologies	Seismic sound source (sub-seabed profiling)	300 Hz – 1.2 kHz	226
Sparker (backup)	Geospark 200	Towed system	Geus	Identify geological layers and sediment thickness beneath the seabed	250 Hz – 1.75 kHz	223
Sub-bottom Profiler	Knudsen 3250 CHIRP	Vessel mount	Knudsen	Identify geological layers and sediment thickness beneath the seabed	3.5 – 12 kHz	223
Mini airgun	Mini G Gun	Towed system	Sercel	Identify geological layers and sediment thickness beneath the seabed	< 250 Hz	230
Side scan Sonar	4205 sidescan	Towed system	Edgetech	Determine sediment characteristics and seabed features	300 – 900 kHz	228
Magnetometer	N/A	Towed system (towfish)	N/A	Measure the Earth's magnetic field	N/A	N/A
Ultra-Short Baseline (USBL)	N/A	Vessel mounted transceiver + beacon on towed gear	N/A	Determines position of submerged object or vehicle	15 – 40 kHz	190–210

Equipment	Model (example)	Deployment	Company (example)	Purpose	Frequency	Sound Pressure Level (dB re 1 µPa @ 1 m)
Hamon Grab	N/A	Overboard	N/A	Overboard, benthic sampling	N/A	N/A
Day Grab	N/A	Overboard	N/A	Overboard, benthic sampling	N/A	N/A
Camera System	N/A	Overboard (drop frame / towed sledge)	N/A	Overboard benthic imaging	N/A	N/A
Cone Penetration Testing (CPT/TCPT)	CPT/TCPT rig (static push system)	From jack-up / geotechnical vessel (over-the-side or via guide frame)		In-situ sediment strength/stratigraphy profiling	N/A	160–190 dB re 1 µPa @ 1 m (estimate)
Vibrocore sampling	Vibrocorer (electric/hydraulic head)	Jack-up / drilling vessel		In-situ sediment strength/stratigraphy profiling	Typically, 20-50Hz	160–190 dB re 1 µPa @ 1 m (estimate)
Boreholes (shallow and deep)	Geotechnical drill rig (e.g., rotary/wireline coring system)	Jack-up / drilling vessel	Fugro	Obtain cores/log strata	Typically, low frequency dominated up to 600 Hz	145-190 dB @ 1 m
Passive acoustic monitor (click detector)	AMAR/FPOD	Seabed mooring / frame (static deployment)	Chelonia Ltd	Detect and log odontocete echolocation clicks (e.g., harbour porpoise/dolphins) to describe presence and temporal activity patterns	Detection band typically ~20–160 kHz (listening only)	N/A (passive receiver – no sound emission)
Gradiometer (optional magnetic survey tool)	Marine gradiometer towfish	Towed system (towfish)	N/A	Detect spatial gradients in the magnetic field to support UXO/archaeology and seabed characterisation (alternative/adjunct to magnetometer)	N/A	N/A (no acoustic emission)

Equipment	Model (example)	Deployment	Company (example)	Purpose	Frequency	Sound Pressure Level (dB re 1 µPa @ 1 m)
ROV (qualitative soft sediment)	Observation-class ROV (e.g., VideoRay / Saab Seaeye class)	Tethered from a survey vessel (overboard)	N/A	Qualitative seabed inspection/video transects; habitat/feature verification; supports target selection for sampling	N/A (thrusters only)	N/A (no standard published source level; low–moderate localised noise from thrusters)
Static acoustic recorder (fixed array)	AMAR (Autonomous Multichannel Acoustic Recorder)	Seabed mooring/frame with a Deep F-POD (static)	JASCO / others	Passive acoustic monitoring of ambient sound/cetacean vocalisations (presence/activity; soundscape)	Listening only (depends on configuration)	N/A (passive receiver – no emission)
Towed passive acoustic array	4-element hydrophone array (LF/HF elements)	Towed from survey vessel	N/A	Passive acoustic monitoring while underway (cetacean detections, bearing/relative localisation depending on system)	Listening only (e.g., LF ~20 Hz–40 kHz; HF ~2–200 kHz as described)	N/A (passive receiver – no emission)
Metocean wave buoy (if treated separately from "metocean buoys" row)	Directional wave buoy (accelerometer-based)	Surface buoy on mooring	N/A	Wave parameters (Hs, period, direction, etc.); metocean baseline	N/A	N/A (typically passive; minor incidental chain/mooring noise only)
Floating LiDAR buoy/system	FLiDAR (floating LiDAR)	Surface buoy on mooring	N/A	Wind climate (speed/direction/vertical profile) for energy yield and design inputs	Optical (laser); no underwater acoustic emission	N/A (LiDAR itself; minor incidental mooring noise only)
CTD profiler	CTD (with optional turbidity/fluorometer add-ons)	Overboard cast / profiling	N/A	Water column structure: conductivity/salinity, temperature, depth;	N/A	N/A (no acoustic emission)
Water quality sondes/sensors (if not already covered in metocean row)	Sonde (DO, pH, conductivity, turbidity, chlorophyll)	Buoy-mounted or overboard profiling	N/A	Baseline water quality time series and/or profiles - often turbidity and chlorophyll fluorescence	N/A	N/A (no acoustic emission)
GNSS / GPS time synchronisation	GNSS receiver/logger	Vessel mounted / buoy system	N/A	Common time base and accurate positioning for metocean/acoustic systems	RF (above water)	N/A (no underwater acoustic emission)

Towed equipment will be restricted to a single 48 channel hydrophone and tail buoy, active streamer length approximately 150m, total towed instrumentation length approximately 200m. This will slightly restrict vessel manoeuvrability.

Table 3 provides an overview of the survey programme, summarising survey type, expected duration, and indicative commencement window between 2026 and 2030. Activities range from short-term geophysical and geotechnical campaigns (months) to longer, periodic biological, acoustic, and metocean monitoring campaigns extending through to 2030.

Table 3. Survey type, estimated duration, and survey commencement date.

Survey type	Estimated Duration	Estimated Survey Commencement date*
Geophysical surveys	1-2 months	Q2/Q3 2026 up to 2030
Geotechnical	1-2 months	Q2/Q3 2027 up to 2030 (pending approval from the National Monuments Service)
Biological	Periodically, across a 12 to 24-month duration	Benthic sampling to take place in Q2/Q3 2026 and will run intermittently until 2030. Acoustic monitoring (minimum 12 months) during 2027-2030
Metocean Surveys	Fixed 12 to 36-month period, including the need for site access for data collection and maintenance as needed	Q2/Q3 2026 or 2027, in the same periods up to 2030

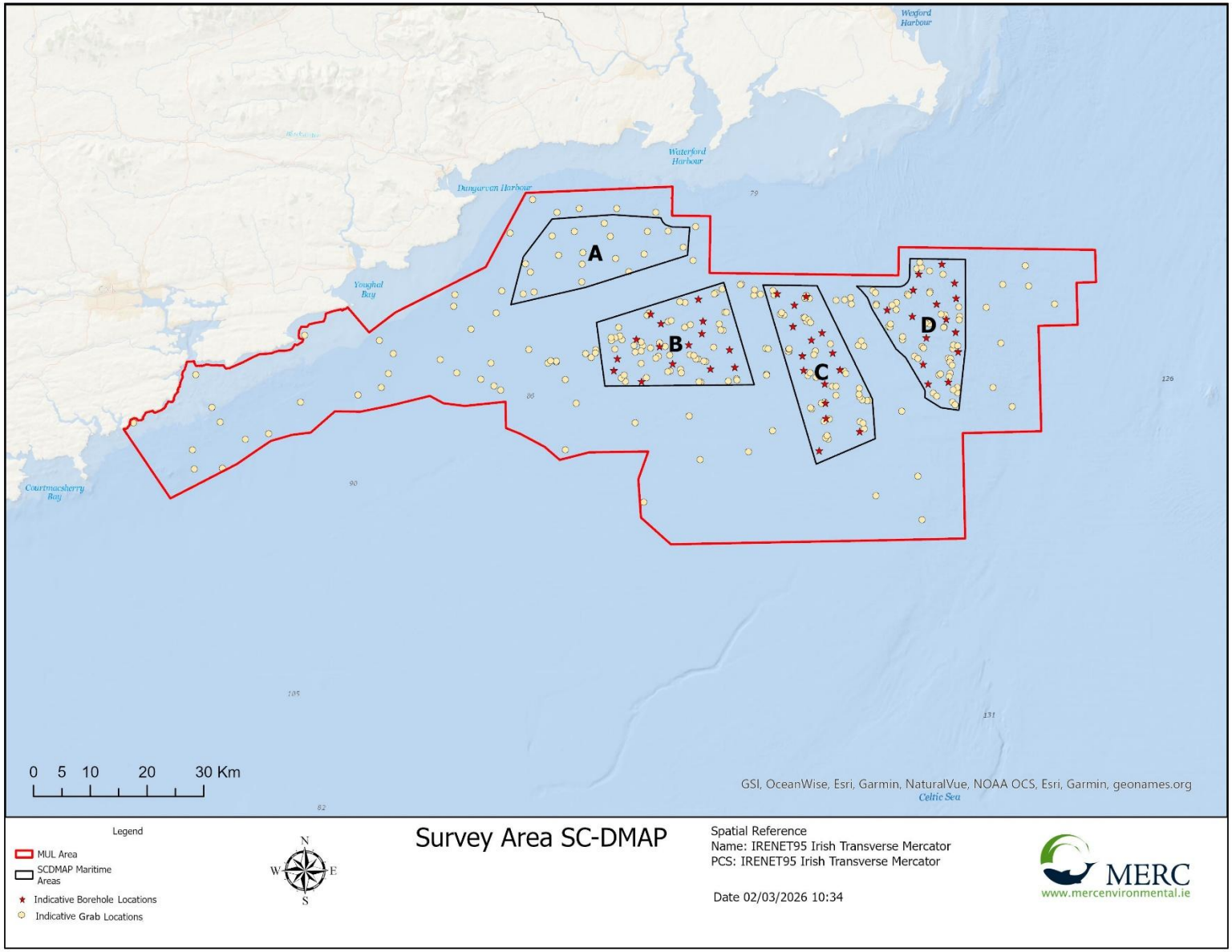

Figure 2. Indicative grab and Borehole locations

4.2. Survey vessel and Jack Up-Barge

Subject to availability, the Irish multi-purpose marine research vessel, *RV Tom Crean*, or a comparable vessel, will be used for the proposed surveys (Figure 3). The *RV Tom Crean* was specifically designed as a low-noise research vessel to meet the stringent requirements of the ICES 209 underwater noise standard for fisheries research. Vessel specifications are provided inTable 4. RV Tom Crean: Vessel specifications Table 4 with the noise profile across a range of operating speeds presented in Figures 3 to 5.

Figure 3. ***R.V. Tom Crean***

Table 4. RV Tom Crean: Vessel specifications

Vessel size	
Vessel length	52.8m
Beam	14m
Draught	5.2m (maximum)
Tonnage (GRT)	1935 Tonnes
Main diesel generators	
Make	Mitsubishi
Type	S16R-(Z3) MPTAW
Number and power	2 x ~1437kW
Speed	1500 rpm
Mounting	Double resilient
Exhaust silencers	SCR system with 45dB(A) attenuation
Auxiliary diesel generators	
Make	Scania
Type	DI 13-91 M
Power	426 kWm
Speed	1500 rpm
Mounting	Resilient
Exhaust silencers	At least 25 dB(A)
Propulsion motor	
Make	Indar
Type	Squirrel cage – Induction motor IMU-710-X/8
Power	2000 kW at 179rpm
Rated frequency	12.6 Hz

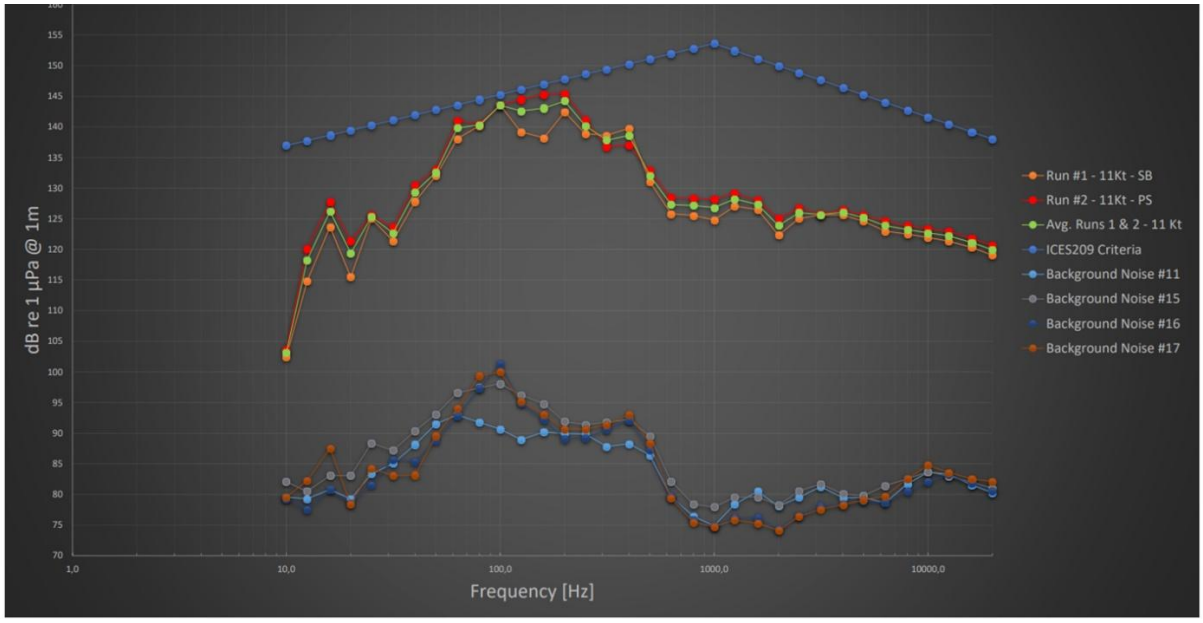

Figure 4. (Run ID no. 1 and 2). Main verification at 11Kt distance corrected and averaged
Distance correction is based on derived correction factors from the transmission loss function.

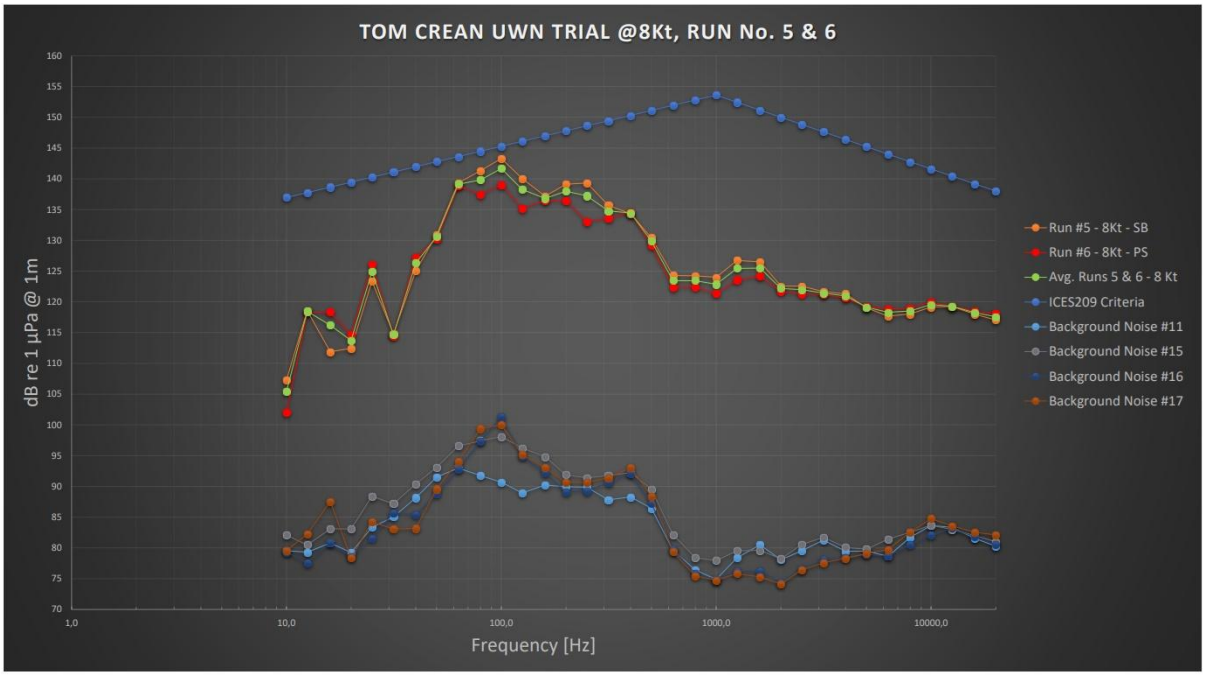

Figure 5. Run Id. no. 5 and 6 at 8Kt distance corrected and averaged.
Distance correction is based on derived correction factors from the transmission loss function.

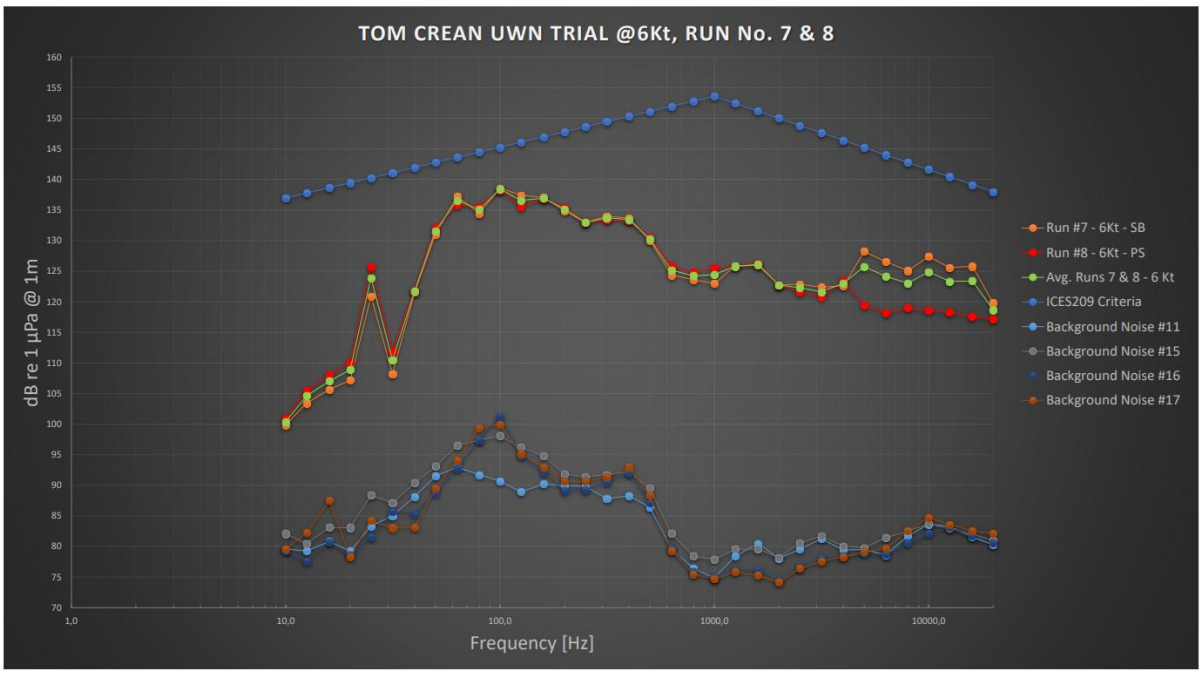

Figure 6. Run Id No. 7 and 8 at 6Kt distance corrected and averaged.

Distance correction is based on derived correction factors from the transmission loss function.

If the RV *Tom Crean* is unavailable, an alternative vessel may have higher noise output; however, this is not expected to add materially to existing background noise levels.

Figure 7 shows an example image of a jack-up barge frequently used as a stable offshore work platform in shallow to moderate water depths. It is brought to the site by a tug vessel with its legs raised, then lowers the legs to the seabed and jacks the hull clear of the water to create a fixed, level platform for operations such as geotechnical drilling, CPT testing and equipment handling. Once on station, the elevated platform reduces motion from waves and swell, improving safety and data quality during site investigation works.

Figure 7. Example Jack Up Barge

4.3. Multibeam echosounder

A multibeam echosounder (MBES) is a type of sonar frequently used to map bathymetry. It operates by emitting an acoustic wave in a fan shape beneath the point of its transceiver attached to the hull of the vessel. The time it takes for sound waves to reflect off the seabed and return to the transceiver is used to determine the water depth within the fan arc. The proposed MBES operates at a sound pressure level of 210 dB re 1µPa at 1m with a peak frequency between 200-400 kHz.

4.4. Sparker system and hydrophone array

A sparker is a device used for sub-seabed investigations where deeper acoustic penetration is required. It is generally more powerful than a Sub-bottom profiler and is used to explore very coarse/compacted seabed's. The sound source is generated by an electrical arc that creates a bubble. As it collapses, the bubble produces a broadband (500 Hz–4 kHz) omnidirectional pulse that penetrates a few hundred meters into the subsurface. Hydrophone arrays towed near the acoustic source receive the returning signals.

4.5. Mini airgun

A mini airgun emits a blast of compressed air, resulting in an acoustic signal consisting of an initial high-amplitude pressure pulse followed by a decaying series of "bubble pulses" formed by oscillations of the resulting air bubble.

4.6. Sub-bottom profiler (SBP)

A Sub-bottom profiler employs an acoustic signal, to provide the information required to identify and measure marine sediment layers that exist below the sediment/water interface. The proposed equipment comprises a Knudsen Chirp system which transmit a sweep of frequencies (e.g. 2-10 kHz) in a single pulse. Depending on the profile of the seabed (rock, sand, mud etc.) and level of compaction, the energy reflected back can be related to the sub-bottom composition.

4.7. Side scan

Side scan Sonar (SSS) is another device that transmits sound pulses that provide the information required to map the seabed. It differs from MBES in that SSS has a finer beam width and smaller footprint to MBES and therefore higher resolution. It is generally towed behind the vessel very close to the seabed and emits fan-shaped acoustic pulses directed down toward the seafloor which are recorded as a series of cross-tracks. The sound frequencies used by side-scan sonar range generally range from 100 to 1000kHz; higher frequencies yielding better resolution but less range.

4.8. Magnetometer

A magnetometer is used to detect and measure variations in the Earth's magnetic field and can reveal objects or geological features with magnetic properties. A marine magnetometer (e.g., Geometrics G-882) will be towed behind the survey vessel to detect magnetic anomalies associated with ferrous debris, shipwrecks, or UXO. The instrument is passive and does not generate underwater noise.

4.9. Ultra-Short Baseline (USBL)

USBL systems emit acoustic signals underwater to determine the position of a submerged equipment (e.g., ROVs).
These systems work by sending and receiving sound pulses between a transceiver (on a surface vessel) and a transponder or beacon (attached to the underwater target).
USBL Sound Emission:

- Frequency Range: Operates in the 15 kHz to 40 kHz range, higher frequencies offer better accuracy but shorter range, while lower frequencies provide longer range but less accuracy.
- Pulse Duration: Emits short pulses of sound (milliseconds in duration), often referred to as "pings."
- Signal Type: Signals are usually coded acoustic pulses to avoid interference and ensure accurate signal identification and timing.
- Sound Pressure Level (SPL): Typical SPL values are in the range of 190–210 dB re 1 µPa @ 1m, which is standard for underwater acoustic systems.

4.10. Day Grab and Hamon Grab

A Day grab is an instrument used for sampling soft seabed sediments. When deployed overboard it is lowered on a winch to the seabed where the jaws open to take a small (approx. 15L) sample of the surface sediment (top 20cm). A Hamon grab is a very similar type of sampler, but the jaw mechanism is slightly different which allows it to sample coarser sediments (e.g. gravel and shelly sediments). The samples retained can then be analysed to obtain an overview of the sediment fauna, and particle size. Both samplers are routinely used for surveillance monitoring to support a number of EU Directives such as the Habitats Directive and Water Framework Directive. A 0.1 m^2 Day grab or 0.1 m^2 Hamon grab will be deployed to collect sediment samples. It is envisaged that up to a maximum of 250 samples will be taken throughout the SC-DMAP area as shown in figure 2.

4.11. Camera systems

Dropdown underwater camera systems or camera systems deployed on Remotely Operated Vehicles (ROVs) may be used for visual inspection of the existing environmental conditions within MUL area. This activity will be passive and non-intrusive and will not interact with the seabed. The video footage will be analysed in real time and will provide information on the habitat and associated species present and may aid in determining the suitability of survey stations for grab sampling.

4.12. Mooring systems

Mooring systems will be used for station-keeping of vessel, passive acoustic monitoring devices (F-PODS and AMARs), metocean buoys (2) and ADCPs, which will be installed in seabed frames with associated ground line, clump weight and acoustic release/retrieval systems.

4.13. Aerial surveys

Digital aerial surveys will record standardised information on birds, marine mammals and other megafauna (e.g., position, time, coordinates, species ID, behaviour and movement), alongside survey conditions (sea state, glare, turbidity, wind, cloud cover and flight parameters) to aid interpretation of sightings and potential influencing factors such as vessels or other activities.

4.14. Boreholes

A drill head is lowered to the seabed from the vessel via a drill string and stabilised using a seabed frame. The drill head penetrates the seabed via rotation of the drill string and the application of a downward pressure. Drilling mud may also be used. Soil samples and rock cores are then retrieved for laboratory testing via the drill string. Sampling and coring may be combined with *in-situ* testing such as cone penetration testing or down the hole testing at some investigative locations. Up to 70m below the seabed. Five to forty-five may be created as shown in Figure 2.

4.15. Cone Penetration Testing

In situ Cone Penetration Test (CPT) will be carried out on a seabed frame, and/or deck-push CPT from the vessel via a moonpool. *In situ* thermal tests may be performed using a built-in sensor within the CPT equipment. Up to 70m below the seabed. Ten to forty may be carried out.

Shallow cone penetration tests (CPTs) including thermal testing at certain depth elevations TCPTs) with a minimum thrust at refusal of 50 kN will be undertaken from the geotechnical survey vessel crane or dedicated launch and recovery system to test *in-situ* soil characteristics at the seabed. At shallower water depths, CPTs/TCPTs may be deployed from a JUB. The survey involves pushing an instrumented steel cone into the ground at a constant rate with continuous measurement of the cone end resistance, the friction along the sleeve of the cone, and the pore water pressure and thermal soil properties. No material will be removed from the seabed during CPT testing.

A deep drive CPT device with minimum thrust of 200 kN, and minimum stroke capability of 20m, will be utilized at various points within the survey area. The Deep Drive CPT equipment will be deployed from the geotechnical survey vessel using the same principles as described for the shallow CPT testing.

4.16. Vibrocore

Details of the specific vibrocoring equipment to be used are not currently known and are subject to a tendering process. Appointed survey contractors will be required to use equipment which aligns with the parameters of the standard equipment described and assessed in the MUL in order to ensure that no greater environmental impacts than those assessed in this MUL will arise. Standard vibrocorers consist of steel coring barrel of between 75 – 120 mm diameter housed within a steel support frame designed to enable stable deployment to the sea floor from the survey vessel. The steel coring barrel is equipped with a cutting shoe and contains within it a plastic liner to capture the procured sample. A spring steel core catcher is fitted to the cutting shoe to retain the sample once the corer assembly has advanced to the required depth, or refusal. Linear electric motors enclosed in a pressure housing provide vibratory motion to advance the coring barrel into the seabed to the specified target depth of 6 m below seafloor (BSF). Electrical power is provided from the survey vessel to the vibrocorer assembly through an electrical control umbilical.

4.17. Metocean buoys

Up to two metocean buoys will be deployed within sites B-D to gather metocean data necessary to inform future OSS design. Mounted within the buoy is an accelerometer which registers the rate at which the buoy rises or falls as it follows the pattern of waves. By integrating against time, the acceleration signal can be converted to vertical displacement. The buoy may also incorporate Floating LiDAR (FLiDAR) technology or a stand-alone FLiDAR buoy may be deployed. In addition, the buoy is specified to gather:

- Wind and water current velocities and directions.
- Atmospheric pressure, temperature, humidity, radiation and precipitation.
- Water quality: dissolved oxygen, pH, conductivity, temperature, salinity, turbidity, chlorophyll and cyanobacteria.
- The metocean buoys may be equipped with solar panels, aids to navigation positioning, data recording and telemetry systems. It will be deployed for a minimum of twelve consecutive months.

Although the wave buoy is passive equipment, deployment will require an anchoring system that will necessarily interact with the seabed. Although the details of the buoy and associated anchor system are subject to a tendering exercise and not confirmed, it is conservatively estimated based on standard metocean buoy equipment that 10 m^2 area of the seabed will be potentially disturbed by the anchor system for the duration of deployment. Appointed metocean buoy survey contractors will be required to use equipment which aligns with these parameters in order to ensure that no greater environmental impacts than those assessed in this MUL will arise.

Location: The metocean buoys will be deployed within the sites B-D at a location not yet specified until the survey operator has been appointed over the five-year programme licence.

4.18. Acoustic Doppler Current Profiler (ADCP)

An Acoustic Doppler Current Profiler (ADCP) is used to collect data on water movements, current speeds, and directions. The ADCP will be deployed to the seabed via a crane from a survey vessel for a duration of at least twelve months. Up to three ADCP units may be deployed at any one time within the sites. The ADCP unit is mounted in a seabed frame (1.8m wide and 0.6m high) with a weight of 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. ADCPs will operate at or above a frequency of 300 kHz to avoid impacts on marine species.

Location: The ADCP will be deployed within the sites B-D at a location not yet specified until the survey operator has been appointed over the five-year programme licence.

4.19. Floating Lidar (FLS)

The purpose of the FLS is to collect accurate wind-climate and metocean information from the project site, which will be used to conduct energy-yield assessments for the wind farm design. The FLS normally consists of the following essential components: LiDAR, FLS operating system, power system, data logging and communication, safety system, and the floating platform and station-keeping system. The supplier shall supply all components as an integrated system suitable for use in a marine environment and have certification and/or warranties that meet the planned campaign duration. One per site is proposed. A surface FLS will be deployed within the survey area and held in position via a suitable specified mooring configuration comprising a mooring chain/rope and anchor. FLS will be deployed on-site for a minimum of 12–24 months to capture the full seasonal variations of the site. The FLS may be deployed for a longer period if data recovery does not accurately capture seasonal variations or to better understand site conditions.

Location: The FLS will be deployed within the sites B-D.

4.20. Acoustic Monitoring

A combined approach of using towed and fixed array acoustic monitoring will be utilised in the SC-DMAP. It is envisaged that Static Acoustic Monitoring (SAM) will be carried out within each one of the SC-DMAP development areas and and in within the wider SC-DMAP area. Each SAM mooring will consist of one Autonomous Multichannel Acoustic Recorder (AMAR) unit and one Deep F-POD.

Acoustic data will also be collected using a towed hydrophone array throughout the MUL area. It is envisaged that this will consist of a 400 m tow cable and a 10 m oil-filled streamlined sensor section, which contains four hydrophone elements.

5. Receiving environment

The surveys will be concentrated within the four maritime areas of the SC-DMAP (Figure 1). It also includes transit survey lines from Cork Harbour to the SC-DMAP sites, transition/corridor areas between the sites. The proposed broad survey area is 5,653.88 km^2. It encompasses an area from the nearshore out to the 75m contour stretching from approximately 37 km southeast of Carnsore Point off the Wexford coast, west to Oyster Haven, County Cork (**Error! Reference source not found.**).

There is no spatial overlap between the proposed project area and any Special Area of Conservation (SAC). Shipek samples collected through the INFOMAR programme show a range of sediment types throughout the area, from muddy sand through sand, gravelly muddy sand, sandy gravel, and gravelly mud.

A mosaic of different sediment types are recorded for this area. Shallow sublittoral sand and shallow sublittoral coarse sediment dominate the area is the deeper (>40m) sections of the proposed survey area. Closer inshore, a greater range of habitats are present which includes the aforementioned habitats in mosaic with shallow sublittoral mixed sediment, shallow sublittoral rock and biogenic reef and shelf sublittoral rock and biogenic reef. It is important to note these data do not distinguish between geogenic and biogenic reef. No sensitive subtidal habitats are recorded for the proposed project area.

While there is no spatial overlap with any Special Protection Area (SPA), this area provides foraging habitat for seabird species likely to be connected to nearby SPAs, such as those at Seas off Wexford SPA, Saltee Islands SPA, Keeragh Islands SPA and Lady's Island Lake SPA and more distant SPAs within foraging range of the proposed project site.

Data derived from the IWDG live sightings database and the ObSERVE aerial survey programme indicate a diverse range of marine mammals utilise this area of the coast. There are records for frequent live sightings of Common dolphin (*Delphinus delphis*), Common Porpoise (*Phocoena phocoena*), Fin Whale (*Balaenoptera physalus*), Humpback Whale (*Megaptera novaeangliae*), Minke Whale (*Balaenoptera acutorostrata*) and Grey Seal (*Halichoerus grypus*) within the ZoI of the proposed project. While occasional records for live sightings of additional cetacean species including Bottlenose Dolphin (*Tursiops truncates*) and Risso's Dolphin (*Grampus griseus*) are also available.

The survey area and surrounding waters provide foraging habitat for marine mammals associated with SACs, including Grey Seal, Harbour Seal and Common Porpoise. Given the extent of the survey area, it is also likely that otter (*Lutra lutra*) utilise sections of the proposed project area.

The European Commission established a Biologically Sensitive Area (BSA) off the south-west coast of Ireland under Council Regulation (EC) No. 1954/2003. The BSA was designated to provide additional protection for spawning and nursery grounds for a range of commercial fish species.

The receiving environment includes fisheries for brown crab, lobster, shrimp, and whelk, as well as demersal and pelagic fish species such as cod, whiting, sprat, and herring. The Waterford estuary and adjacent offshore areas are associated with seasonal spawning activity for species such as herring and sprat (in the winter months), while the wider offshore region supports migratory species. These fisheries and ecological processes are considered in assessing potential survey impacts.

6. Zone of Influence

The first step in screening for appropriate assessment is to identify which European sites are likely to be within the ZoI of the proposed project and thereby have the potential to be affected by project related impacts. This was carried out by applying the SPR model. The proposed scope of the surveys and type of equipment to be used, to include the use of the vessels required for deployment, are described in section 4. This information was reviewed to establish if a source/pathway existed and if so, what sensitive receptors might be affected

The determination of the ZoI was based on the scale and scope of the project, hydrological corridors of connectivity (direct and indirect source-path-receptor links) and potential cumulative impacts for the duration of the proposed project, see Table 5.

Table 5. Source-Path-Receptor matrix

Element	Potential Source (pressure)	Path	Receptor	Area of impact (Direct)
Vessel presence	Disturbance, harm or injury as a result of vessel operations	water, air	Marine mammals, birds, fish	Negligible (see section 8.2.3. for rationale)
Vessel	Accidental spillage of hydrocarbons	water	Benthic habitats, Marine mammals, Birds, fish	N/A Vessel compliant with MARPOL regulations*
Vessel	Introduction of Invasive Alien Species (IAS)	water	Benthic habitats, fish	N/A Vessel compliant with MARPOL regulations**
Multibeam echosounder	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	Marine mammals: 3km to include area of impact identified for cumulative TTS*** (See section 8.2.4. for details). Fish: 14km to include area of impact identified for behavioural response (See section 8.2.4. for details). Birds: Negligible (see section 8.2.4. for details)
Sparker System & hydrophone array	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	
Sparker (backup)	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	
Sub-Bottom Profiler	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	

Mini airgun	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	
Side scan Sonar	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, Birds, fish	
Benthic sampling (Day grab or Hamon grab)	Physical damage/ Sediment disturbance	Water and sediment	Benthic invertebrates	Direct area of impact (<0.5m) plus 15m sediment dispersion area. (See section 8.2.5. for details)
Magnetometer (towfish)	Disturbance or injury as a result of towed gear interaction/snag risk	water	Benthic habitats, fish	Localised to tow corridor and turning circles; negligible footprint where gear remains off seabed (method-dependent)
Ultra-Short Baseline (USBL)	Disturbance, harm or injury as a result of underwater noise	water	Marine mammals, birds, fish	Localised; to be aligned with the ZoI approach applied for other active acoustic sources (See section 8.2.4)
Camera system (drop frame / towed sledge)	Physical disturbance (contact/drag) and temporary turbidity	water	Benthic habitats, benthic invertebrates, fish	Localised to contact points / short tow track; small sediment plume (method-dependent)
CPT/TCPT	Physical disturbance of seabed/subsurface; localised sediment disturbance; underwater noise/vibration during push	Water and sediment	Benthic habitats/invertebrates; fish; marine mammals	Localised to each test location; footprint limited to probe location (plus immediate vicinity) See section 8.2.5. for details.
Vibrocore sampling	Physical disturbance; sediment resuspension/turbidity; underwater noise/vibration	Water and sediment	Benthic habitats/invertebrates; fish; marine mammals	Localised to each core location; small sediment plume around the station (see geotechnical methods section). See section 8.2.5. for details.
Boreholes (shallow and deep)	Physical disturbance; drilling noise/vibration; sediment/cuttings generation; potential contaminant mobilisation (if encountered)	Water and sediment	Benthic habitats/invertebrates; fish; marine mammals; birds	Localised to each borehole and immediate working area (incl. drill spread/anchoring where relevant). See section 8.2.5. for details.
Passive acoustic monitor (F-POD)	No pressure source (monitoring only; passive receiver)	water	N/A (monitoring of marine mammals)	N/A (does not emit sound; mooring footprint localised)
Metocean buoys	Physical presence/entanglement/snags (buoy, mooring line, anchors/weights); minor underwater noise from buoy motion/chain movement; vessel activity during deployment/retrieval	Water and sediment	Marine mammals; birds; fish; benthic habitats	Localised to buoy location and mooring/anchor footprint; short-duration disturbance during deployment/retrieval. See section 8.2.2. for details.
ADCPs (Acoustic Doppler Current Profilers)	Active acoustic emissions (low power) for current profiling; physical disturbance from the seabed frame/mooring during deployment/retrieval	Water and sediment	Marine mammals; fish; benthic habitats/invertebrates	Localised to deployment location; small seabed footprint; acoustic influence typically near-field only. See section 8.2.2. for details.

Jack-up barge	Seabed disturbance from legs placement and removal; underwater noise/vibration during positioning/jacking; increased vessel activity; accidental spill risk	Water and sediment	Benthic habitats/invertebrates; marine mammals; birds; fish	Localised direct footprint at leg locations plus immediate vicinity; localised disturbance during placement/removal; noise effects depend on activity and duration
Moorings	Physical presence/entanglement/snag risk from mooring lines, ground chain, anchors/weights; minor seabed disturbance at anchor/weight contact points; minor underwater noise from line/chain movement; vessel activity during deployment/retrieval	Water and sediment	Marine mammals; birds; fish; benthic habitats/invertebrates	Localised to mooring footprint and line sweep zone; short-duration disturbance during deployment/retrieval; ongoing low-level presence while deployed. See section 8.2.2. for details.
Surface buoys	Physical presence/collision risk at the surface; entanglement/snag risk from attached lines; attraction/interaction risk for birds; minor underwater noise from buoy motion and line/chain movement; vessel activity during deployment/retrieval/servicing	water	Birds; marine mammals; fish	Highly localised to buoy location and immediate vicinity; short-duration disturbance during deployment/retrieval/servicing; ongoing low-level presence while deployed

** The RV Tom Crean, and any alternative vessel that may be used should the Tom Crean not be available, is covered by MARPOL regulations. The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships – both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes.*

********The dumping of ballast water and fouling of vessel hulls are considered to be the main vectors for the spread of Invasive Alien Species (IAS) in marine environments. The MARPOL convention includes annexes governing the management of ballast water and the anti-fouling of hulls. The RV Tom Crean is governed by MARBOL regulations and as such the vessel takes all actions required to prevent the introduction of IAS.*

*********Temporary Threshold Shift.*

Based on the areas of impact for the individual project components, documented in Table 5 it is concluded that the proposed project has a maximum direct area of impact extending to 14 km (fish) from the outermost boundary of the geophysical survey area.

With due regard to mobile species that may be transiting through or using the potential area of impact, including breeding seabirds and Annex II marine mammals, the ZoI of the project is taken to include all European sites where the potential for either a direct or indirect connection between such species and these sites is possible. There is no potential for impact (no SPR link) to any SAC that does not have a direct connection to the marine. Therefore, SACs designated for terrestrial habitats and species, or freshwater habitats upstream of a hydrological gradient are considered outside of the ZoI.

7. European sites

The maximum area of direct impact is estimated at 14 km (for fish). However, indirect impacts may extend to greater distances in the case of European sites for which mobile species are included as a Qualifying Interest (QI).

The ZoI is defined with reference to the full MUL scope, including survey corridors and transits. Species and habitats with no plausible linkage, or credible pathway, to the marine environment, including coastal habitats with mapped areas above mean highwater spring tides, and no reliance on marine habitats are therefore outside of the ZoI.

Based on the identified sources of impact, there is no potential for adverse effects on the Conservation Objectives of any habitat (including marine habitats) or any species, with the exception of marine mammals or species with a marine phase in their life cycle, within a number of these SACs

Similarly, there is no potential for adverse effects on wintering waterbirds or the wetland and waterbirds habitat, which may form a SCI for a number of SPAs. Therefore, sites designated solely for waterbirds or species (e.g. Chough) without a reliance on marine habitats, are considered to be outside the ZoI.

Seabirds foraging ranges are well studied and vary widely between species (see Appendix 13.1). There are likely to be a range of **breeding** seabird species associated with SPAs adjacent to the proposed project site, or within foraging range of it. Site specific surveys of the proposed project area for seabirds have not been undertaken. However, for seabird species during the summer breeding months, the zone of influence is considered to extend to all those SPAs within foraging range of the proposed project site. We have undertaken a screening exercise using the mean max foraging distances published in Woodward *et al*. (2019). This brings in a large number of SPAs for those species with a wide foraging range such as Manx Shearwater, Gannet and Fulmar. The screening exercise was undertaken using ArcGIS and the results are presented in Appendix 13.1.

The foraging ranges for Grey seal can be large, travelling up to several hundred kilometres from their breeding areas (Kiely *et al*, 2000) while the foraging distance travelled by Harbour seals is generally less, it can also extend for 100's of kilometres (Vance *et al,* 2021, Carter, *et al*, 2022). Harbour porpoise and Bottlenose dolphin are wide ranging and highly mobile, although some populations do appear to be relatively site faithful. However, it can be assumed they travel many 100's of kilometres depending on prey availability and distribution. It is not appropriate to give definitive foraging areas for any of the aforementioned species. However, given the scale and scope of the project and the small zone of impact relative to marine mammals and relatively low magnitude of impact we have assumed a ZoI of 100km for these four species recognising that their foraging ranges are potentially greater.

Table 6 gives all European sites within the ZoI which have been further assessed here i.e. the sites contain habitats or species which are considered to be sensitive receptors.

Table 6. European sites within the ZoI (100km) which have been screened for further assessment.
*Distances (Hydrological for SACs, As the Crow flies for SPAs) *Fish refers to Lamprey, salmon and shad species.*

European site	Distance (nearest point) to Site	SPR link & species/habitat with potential for impact	Screened in/out for <u>further assessment</u>
SACs			
Raven Point Nature Reserve	42	No sensitive receptors within ZoI	Screened out
Slaney River Valley SAC	40	Fish, Harbour seal, otter	Screened in
Blackwater Bank SAC	31	Harbour porpoise	Screened in
Long Bank SAC	31	No sensitive receptors within ZoI	Screened out
Carnsore Point SAC	19.5	Harbour porpoise	Screened in
Saltee Islands SAC	11.5	Grey seal	Screened in
Lady's Island Lake SAC	24	No sensitive receptors within ZoI	Screened out
Hook Head SAC	Adjoining	Harbour porpoise, Bottlenose dolphin	Screened in
Ballyteige Burrow SAC	25.1	No sensitive receptors within ZoI	Screened out
Bannow Bay SAC	20	No sensitive receptors within ZoI	Screened out
River Barrow and River Nore SAC	13.7	Fish, otter	Screened in
Tramore Dunes and Backstrand SAC	8.4	No sensitive receptors within ZoI	Screened out
Helvick Head SAC	6.8	No sensitive receptors within ZoI	Screened out
Ardmore Head SAC	5.9	No sensitive receptors within ZoI	Screened out
Blackwater River (Cork/Waterford) SAC	7.2	Fish, otter	Screened in
Ballymacoda (Clonpriest and Pillmore) SAC	3	No sensitive receptors within ZoI	Screened out
Great Island Channel SAC	11.4	No sensitive receptors within ZoI	Screened out
Courtmacsherry Estuary SAC	21.2	No sensitive receptors within ZoI	Screened out
Clonakilty Bay SAC	33.7	No sensitive receptors within ZoI	Screened out
Lough Hyne Nature Reserve & Environs SAC	64.2	No sensitive receptors within ZoI	Screened out
Roaringwater Bay and Islands SAC	72	Harbour porpoise, Grey seal, otter	Screened in
Barleycove to Ballyrisode Point SAC	95.6	No sensitive receptors within ZoI	Screened out
SPAs			
Wicklow Head SPA	111	No sensitive receptors within ZoI	Screened out
Cahore Marshes SPA	62	No sensitive receptors within ZoI	Screened out
The Raven SPA	39	No sensitive receptors within ZoI	Screened out
Wexford Harbour and Slobs SPA	33	No sensitive receptors within ZoI	Screened out
Seas off Wexford SPA	Adjoining	Diving seabirds within foraging range	Screened in
Lady's Island Lake SPA	24	No sensitive receptors within ZoI	Screened out
Tacumshin Lake SPA	25	No sensitive receptors within ZoI	Screened out
Saltee Islands SPA	19.2	Diving seabirds within foraging range	Screened in
Ballyteige Burrow SPA	26	No sensitive receptors within ZoI	Screened out
Keeragh Islands SPA	23	Diving seabirds within foraging range	Screened in
Bannow Bay SPA	19	No sensitive receptors within ZoI	Screened out
Tramore Backstrand SPA	8.2	No sensitive receptors within ZoI	Screened out
Mid-Waterford Coast SPA	7.3	Diving seabirds within foraging range	Screened in
Dungarvan Harbour SPA	8.4	No sensitive receptors within ZoI	Screened out
Helvick Head to Ballyquin SPA	6.8	Diving seabirds within foraging range	Screened in
Blackwater Estuary SPA	8.7	No sensitive receptors within ZoI	Screened out
Ballymacoda Bay SPA	2.4	No sensitive receptors within ZoI	Screened out
Ballycotton Bay SPA	1.4	No sensitive receptors within ZoI	Screened out
Cork Harbour SPA	1.1	Seabirds within foraging range	Screened in
Sovereign Islands SPA	1.0	No sensitive receptors within ZoI	Screened out

Old Head of Kinsale SPA	10	No sensitive receptors within ZoI	Screened out
Courtmacsherry Bay SPA	17.5	No sensitive receptors within ZoI	Screened out
Seven Heads SPA	20	No sensitive receptors within ZoI	Screened out
Clonakilty Bay SPA	31	No sensitive receptors within ZoI	Screened out
Galley Head to Duneen Point SPA	32	No sensitive receptors within ZoI	Screened out
Sheep's Head to Toe Head SPA	58	No sensitive receptors within ZoI	Screened out
Beara Peninsula SPA	96	No sensitive receptors within ZoI	Screened out

In 2003 the EU Commission established a "Biologically Sensitive Area (BSA)" off the south west of Ireland (Council Regulation (EC) No 1954/2003). In 2003, the EU also established a specific fishing effort regime for demersal fishing vessels, as well as for scallop and crab fisheries, both inside and outside the BSA.

8. Impact prediction

This section identifies and considers potential impacts, direct and indirect, on the conservation status of the QIs and SCIs for all sites within the ZoI by reference to their defined attributes, measures and targets as set out by NPWS in the relevant site-specific **Conservation objectives** for each site.

The results of the SPR analysis (Table 5) indicated that impacts resulting from the potential for vessel noise and disturbance and underwater noise associated with the deployment of acoustic instrumentation had the potential to impact marine mammals, birds and fish. These potential impacts are further assessed in section 8.1 below. Direct and indirect impacts related to the project are discussed in section 8.2. Cumulative impacts are considered under section 9.

8.1. Review of sources of impact

8.1.1. Noise

Vessels produce what is referred to as non-pulse (non-impulsive) sounds with acoustic characteristics represented by single or multiple discrete sound events within 24 hrs with a continuous sound event without a rapid pulse rise time. MBES, sparkers and airguns and sub-bottom profilers all produce pulsed (impulsive) sounds. Sound waves, from such sources, dissipate through the water with distance from the source. While local oceanographic conditions affect the path of the sound and its transmission.

Marine mammal sensory systems are adapted to life in the water or, in the case of seals, both in water and on land. Marine mammals rely on sound to navigate, to communicate with one another and to sense and interpret their surroundings. Behavioural responses of marine mammals to a sound are known to be strongly influenced by the context of the event and individual factors such as the animal's experience, motivation, conditioning and activity (Nowacek *et al*, 2007, Southall *et al*, 2007, 2019) and Wartzok, *et al* 2003). Healthy new-born and younger animals may have the greatest hearing sensitivity while individual hearing ability declines progressively with age and prior exposure to harmful sound levels, disease, etc. Such features and variability may also require consideration in a case-specific assessment of impact on marine mammals from introduced sound sources (NPWS 2014).

Marine mammals are generally divided into different functional hearing groups as shown in Table 7.

Table 7. Marine mammal functional hearing groups (after NPWS, 2014)

	Low frequency	Mid frequency	High Frequency	Pinnipeds (Underwater)
Range	7 Hz-22 kHz	150 Hz-160 kHz	200 Hz–180 kHz	75 Hz–75 kHz
Examples species	Minke whale Humpback whale	Bottlenose dolphin	Harbour porpoise	Grey seal Harbour seal

Otter (*Lutra lutra*) hearing is not adapted to water and functional hearing in otters in water is poorly known. Voight *et al* 2019 reported that their hearing range in air is within the range of 200 Hz to 32 kHz, with lowest thresholds around 4 kHz. Stepien (2020) reported behaviour changes in *lutra lutra* underwater at frequencies of both 1Khz and 14KHz,

Fish are susceptible to underwater noise due to anthropogenic sources, which have been shown to cause widespread effects on fish. It has the potential to alter an individual's physiology, causing stress, and shifts in hearing thresholds in a number of species (Smith *et al*., 2004; Wysocki *et al*., 2006). While exposure to very intense sounds (e.g. seismic guns) may result in mortal injuries, less intense sounds that are detectable by fishes may affect their behaviour, causing them to move away from their migration routes or leave favoured habitats (Normandeau Associates, Inc., 2012). Hearing range and sensitivity varies considerably among fish species depending on the hearing mechanism of the species e.g. whether a swim bladder is involved in the hearing mechanism or not. Furthermore, within that class, some species with a swim bladder are sound pressure-sensitive at higher frequencies while others having a swim bladder are not e.g. Atlantic salmon (Hawkins, 1978).

The U.S. National Marine Fisheries Service (NMFS, 2018), as well as other agencies, currently uses 150 dB re 1 µPa (rms) as the sound pressure level that may result in onset of behavioural effects (Caltrans, 2015). Sound pressure above the 150 dB_{rms} level are expected to cause temporary changes in behaviour and these might include startle responses, feeding disruption, area avoidance, etc. Popper *et al* (2014).

Popper *et al* (2014) gives guidelines for estimating the effects of continuous noise sources on a range of potential injuries and behavioural responses in fish. Table 8 provides the guidelines for fish such as Atlantic salmon.

Table 8. Recommended guidelines for shipping and other continuous sources.

Fish type	Mortality and potential mortal injury	Recoverable injury	TTS	Masking	Behaviour
Swim bladder not involved in hearing (particle motion detection) e.g. Atlantic salmon	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Relative risk given has high, moderate or low relative to distance from the sound source. N = near, I = Intermediate, F = Far					

To better inform the potential for noise associated impacts as a result of the proposed project, on the marine mammal and fish community of the receiving environment, a noise modelling and environmental risk report was commissioned by the Marine Institute. This report (Thomsen *et al*, 2023) is provided as a separate appendix to this report (appendix 13.2). The report focused on two species; minke whale (*Balaenoptera acutorostrata*) and Atlantic herring (*Clupea harengus*) in order to provide representative

data on the possible effects on baleen whales and fishes where the swim bladder is involved in hearing (primarily pressure detection).

Diving seabirds: The impact of underwater noise on diving seabirds in poorly understood. However, limited research has shown that one species (*Uria aalge*) reacts to underwater noise in the region of 110 to 137 dB re 1 µPa (Anderson *et a*l, 2020). Therefore, it is plausible that some species of diving seabirds may be affected by, and therefore vulnerable to, underwater noise. However, further research is needed to assess the potential for adverse significant effects on diving seabirds.

8.1.2. Benthic habitats and associated species

Benthic habitats and their associated species can be impacted by direct physical damage and/or sediment mobilisation. The extent to which sediments will mobilise is dependent on the nature of the sediment (coarse sediments settle out rapidly following disturbance), the exposure of the site (sediments in exposed sites will frequently be subject to natural disturbance due to wave action), the tidal regime of the area (tide swept sediments are generally devoid of "fines"). The impact of sediment mobilisation on benthic habitats and their constituent species is dependent on the sensitivity of those species to burial and smothering resulting from sediment mobilisation and transport. The species found in exposed sediments are generally robust specialists capable of withstanding disturbance and smothering. The impacts of physical disturbance on the species associated with highly exposed coarse sediments are generally low and greatest in areas of low natural disturbance where the species present are less well adapted to withstand physical stress.

On the other hand, the epifaunal species associated with geogenic and biogenic reef habitat, while able to withstand natural exposure from wave and swell action, are generally sensitive to abrasion and damage.

8.2. Assessment of Impact

An assessment of the impact on the QIs and SCIs of all European sites within the ZoI is provided below and summarised in Table 11.

8.2.1 Sediment disturbance and dispersion (boreholes, grab samples and cone penetration testing)

Borehole drilling, grab sampling, and CPT/CPu activities will cause short-duration seabed disturbance at discrete locations, generating localised increases in suspended sediment concentrations during penetration, sampling/coring and retrieval of equipment. Any sediment plume is expected to be small and temporary, with rapid dilution and settling in the offshore receiving environment (water depths c. 15–70 m) and a limited potential for deposition outside the immediate works area. The principal pathway for suspended sediment effects is therefore confined to the near field around each investigative location.

8.2.2 ADCP Seabed frames and associated moorings, metocean buoys with anchors/mooring lines, and jack-up barge legs

Deployment and use of ADCP frames and associated moorings, metocean buoys with anchors/mooring lines, and jack-up barge legs will each result in localised seabed interaction at discrete locations, with small areas of direct disturbance (compression/penetration at jack-up legs; anchor/clump-weight and frame footprints for moorings). These activities may generate near-field increases in suspended sediment concentrations during installation, any maintenance visits, and retrieval, but any sediment plume is

expected to be minor, spatially confined and rapidly diluted/settled in the offshore receiving environment, with limited potential for deposition outside the immediate contact area.

Each activity is also associated with low-level underwater noise, primarily from vessel positioning, winch operations, intermittent chain/rope movement (for moorings), and short-duration jacking/positioning operations (for jack-up legs); overall, noise is expected to be localised, not continuous and insignificant.

Entanglement, it is proportionate to acknowledge a low residual risk where lines extend through the water column to the surface (e.g., buoy moorings and any surface-marked systems), because interaction with marine mammals and, less commonly, diving birds is a recognised pathway in principle: However, for metocean/ADCP configurations the likelihood is considered insignificant.

The small footprints and non-continuous nature of the described effects, and the combined pressures from these seabed-contact features, are assessed as negligible, with effects confined to the near-field and with no potential to lead to Likely Significant Effects (LSEs) on the conservation objectives of the relevant European sites.

8.2.3 Vessel disturbance and vessel noise

The R.V. *Tom Crean* was designed as a silent research vessel, in order to meet the stringent criteria of the ICES 209 noise standard. As such vessel noise will be at a level below which impacts on either fish or marine mammals would occur. The southeast coast of Ireland, where the proposed survey will occur, is a relatively busy shipping area with freight, fishing and leisure craft having a constant presence. The noise levels contributed by the R.V *Tom Crean* would be well below the background level of underwater noise in this area, and marine mammals and fish would be habituated to such levels of noise. In the unlikely event that the RV *Tom Crean* is unavailable, alternative vessels are likely to have a higher noise output level, however it is not considered that this would contribute significantly to the existing background noise levels in this area of the south coast.

Disturbance due to the presence of the vessel would not significantly contribute to the overall vessel traffic in this area which marine mammals and fish would be habituated to. While disturbance to grey or harbour seal haul out sites may occur should the vessel be close to (<1 km) of haul-out sites, there are no haul out sites within 19 km of the proposed project area.

Temporary disturbance to seabirds, should they be foraging in the area at the same time as the proposed survey, may occur. However, given the scale of the available foraging habitat, the magnitude of the disturbance would not have the potential to impact their fitness and therefore does not have the potential to lead to any population-level effects at the SPAs or other adjacent colonies within the ZoI.

There are no haul out sites for either grey or harbour seal within close proximity to the proposed project area. The nearest haul out sites, for grey seal, are on the Saltee Islands (within Saltee Islands SAC). These haul out sites are over 19 km from the nearest point of the proposed project. The nearest haul out sites for harbour seal are within the Slaney River Valley SAC, greater than 40km from the proposed project area.

Disturbance to fish or seabirds within or associated with any European site is not considered possible.

8.2.4 Acoustic surveys

Marine mammals

The noise modelling and environmental risk assessment (Thomsen *et al*, 2023) carried out for specified underwater noise inducing activities indicated that the use of the sparker would have a limited area of impact on minke whales, and therefore other marine mammals with a functional hearing range that includes all or part of the frequency range emitted by the sparker (e.g. Bottlenose dolphin, Harbour porpoise, Grey and Harbour seal and otter). The results (Table 9) indicated that the impact distance from source would be a maximum of 1.1 km relative to a behavioural response and 0.9km relative to cumulative TTS.

With regard to the use of the mini airgun, the results (Table 10) show that area of impact would increase to 1.9 km relative to behavioural response and 2.9 km relative to cumulative TTS with an impact area of 19.7 km.

Table 9. Threshold distances and impact areas obtained for the minke whale, resulting from operation of sparker in the study area. (from Thomsen *et al*, 2023).

Impact on minke whales when the sparker is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	0.9	1.1	2.7
TTS single strike	0.1	0.1	0.03
TTS cumulative	0.9	1.1	2.5
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.2	0.2	0.12

Table 10. Threshold distances and impact areas obtained for the minke whale, resulting from operation of mini airgun in the study area. (from Thomsen *et al*, 2023).

Impact on minke whales when the mini airgun is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	1.4	1.9	6.3
TTS single strike	0.1	0.1	0.03
TTS cumulative	2.5	2.9	19.7
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.3	0.3	0.3

The sites with marine mammal QIs within the ZoI are:

- Hook Head SAC: Bottlenose dolphin
- Carnsore Point SAC: Harbour porpoise
- Roaringwater Bay and Islands SAC: Harbour porpoise, Grey seal and Otter,
- Blackwater Bank SAC: Harbour porpoise
- Slaney River Valley SAC: Harbour seal and Otter,
- Saltee Islands SAC: Grey seal
- River Barrow and River Nore SAC: Otter
- Blackwater River (Cork/Waterford) SAC: Otter

Grey seal, Common Seal, Harbour Porpoise and Bottlenose Dolphin

Taking a worst-case scenario, for the use of the mini airgun, the mini airgun has the potential to lead to TTS over a distance of 2.9 km from source. TTS has the potential to lead to disturbance and injury to an animal. With regard to PTS, the data indicates a potential range of 0.3 km for cumulative PTS.

Grey seal are a QI for Saltee Islands SAC and Roaringwater Bay and Islands SAC and are present within these SACs throughout the year during all aspects of its annual life cycle. While it is recognised that individual grey seals associated with either of these sites may use the proposed project area for foraging, noise related impacts leading to behavioural/foraging disturbance to grey seal within these SACs are not considered possible due to the distance of the proposed survey and its ZoI relative to underwater noise and the large area of available foraging habitat. While use of the mini airgun has the potential to lead to TTS over a distance of 2.9 km from source, it is considered that, due to the distance of Saltee Islands SAC (11.5 km) and Roaringwater and Bay Islands SAC (48 km) from the proposed survey area, no noise related barriers would result that could impact the targets set for the conservation objectives for this species within the site. The source path receptor link being considered too weak for any potential for impact.

As such, impacts on grey seal associated within more distant European sites are similarly not considered possible.

Even in the absence of the measures recommended in the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014), the proposed surveys are not likely to give rise to significant effects on any European Site designated for grey seal. However, with due regard to the precautionary principle, the potential for LSEs on Grey seal within Saltee Islands SAC are considered possible.

Harbour seal (*Phoca Vitulina*) are a QI for Slaney River Valley SAC (>40 km distant to the proposed survey area) and are present within this SAC throughout the year during all aspects of its annual life cycle.

While it is recognised that individual harbour seals associated with Slaney River Valley SAC may use the proposed project area for foraging, noise related impacts leading to behavioural/foraging disturbance to harbour seal within the SAC are not considered possible due to the distance of the proposed survey and its ZoI relative to underwater noise and large area of available foraging habitat. While use of the mini airgun has the potential to lead to TTS over a distance of 2.9 km from source, it is not possible that, due to the distance of Slaney River Valley SAC (>40 Km) from the proposed survey area, noise related barriers would result that could impact the targets set for the conservation objectives for this species within the site. The source path receptor link being considered too weak for any potential for impact.

As such, impacts on harbour seal associated within more distant European sites are similarly not considered possible.

Even in the absence of the measures recommended in the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014), the proposed surveys are not likely to give rise to significant effects on any European Site designated for harbour seal. However, with due regard to the precautionary principle, the potential for LSEs on Harbour seal within Slaney River Valley SAC are considered possible.

Harbour porpoise (*Phocoena phocena*) breeds annually in Ireland, predominantly during the months of May-September. The principal calving period in Irish waters is thought to occur in the months of May and June although it may extend throughout the summer months and early autumn. Mating commonly occurs several weeks after the calving season.

Harbour porpoise are a QI for Carnsore Point SAC, Hook Head SAC, Blackwater Bank SAC and Roaringwater Bay and Islands SAC and may use the proposed project area for foraging. Noise related impacts from the use of the mini airgun has the potential to lead to TTS over a distance of 2.9 km from source, it is therefore considered that the proposed project has the potential to lead to noise barriers causing to LSEs to Harbour porpoise within Hook Head SAC and Carnsore Point SAC. The remaining sites being too far distant for any meaningful SPR link.

Underwater noise may have the potential to lead to LSEs to Harbour Porpoise within Carnsore Point SAC which lies approximately 19 km north of the proposed MUL area and Hook Head SAC which is immediately adjacent to the proposed MUL area.

Bottlenose Dolphin (*Tursiops truncatus*) are recorded all around the Irish coast and far offshore but are most often encountered close to land. They primarily calve during the summer months, with activity peaking in July and August. Mating can occur throughout the year.

Bottlenose dolphin area a QI for Hook Head SAC and may use the proposed project area for foraging. Noise related impacts from the use of the mini airgun has the potential to lead to TTS over a distance of 2.9 km from source, it is therefore considered that the proposed project has the potential to lead to noise barriers causing LSEs to Bottlenose dolphin within Hook Head SAC.

Underwater noise may have the potential to lead to LSEs to Bottlenose Dolphin within Hook Head SAC which is immediately adjacent to the proposed MUL area.

Fish

With regard to Atlantic Herring, the noise modelling and environmental risk assessment (Thomsen *et al*, 2023) indicated that the use of the sparker would result in a distance of impact of 1.0 km, relative to behavioural response from source, with a cumulative PTS of only 0.1 km (Table 11). While the use of the mini airgun (Table 12) would result in a far greater area of impact with regard to a behavioural response distance (13.6 km) but with the same cumulative PTS of 0.1 km.

Table 11. Threshold distances and impact areas obtained for the Atlantic herring, resulting from the operation of the sparker in the study area.

Impact on herring when the sparker is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	0.8	1.0	2.2
TTS single strike	0.1	0.1	0.03
TTS cumulative	0.1	0.1	0.03
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.1	0.1	0.03

Table 12. Threshold distances and impact areas obtained for the Atlantic herring, resulting from operation of the mini airgun in the study area.

Impact on herring when the mini airgun is on operation			
Noise effect	**Average distance all transects [km]**	**Max. distance [km]**	**Impact area [km²]**
Behavioural response	12.1	13.6	460.5
TTS single strike	0.1	0.1	0.03
TTS cumulative	0.6	0.7	1.1
PTS single strike	0.1	0.1	0.03
PTS cumulative	0.1	0.1	0.03

Atlantic Herring is being used as a proxy for Atlantic Salmon and Twaite Shad in the present case as both species have swim bladders and it is considered here that they would be likely to have similar behaviour responses. The Slaney River Valley SAC and the Blackwater River (Cork/Waterford) SAC are designated for Atlantic Salmon and Twite Shad. The River Barrow and River Nore SAC is also designated for Twite Shad. All sites are within the ZoI of the proposed project.

Depending on the time of year, inward migrating salmon returning to their natal rivers will have entered the river once suitable conditions allow. Where conditions are not suitable for upstream migration, they are generally understood to congregate along the coast, frequently in estuaries and nearby sea areas awaiting favourable conditions. Inbound fish are generally not foraging during this time and while the migration path would likely include some of the area where the proposed survey work is due to be carried out, it is highly unlikely that adult (returning) salmon will be impacted by the proposed acoustic survey work due to limited spatial and temporal overlap considering both the modelled zone of influence for all acoustic devices together with the present level of knowledge in relation to salmon migration paths.

With respect to outbound salmon smolts, the same logic is applied – Irish salmon are known to swim generally northwards once they have entered the sea as Atlantic salmon feeding grounds are known to be located along oceanic polar fronts close to Greenland, Iceland and the Faeroe Islands. For outward migrating fish from Irish Sea rivers, studies (Rikardsen, *et al*. 2021) have shown movements to be most likely in a northerly direction through the Irish Sea. However, it is likely that fish from Irish south coast rivers, as well as possibly out migrating smolts from UK/French/Spanish catchments, may pass through the area of the proposed surveys. However, spatial and temporal overlap between proposed survey work and smolt migration are considered highly unlikely to impact Atlantic salmon smolts due to limited spatial and temporal overlap, taking account of the modelled zone of influence for all acoustic devices and available (published) knowledge in relation to salmon migration paths.

Impacts on the conservation objectives of Atlantic salmon and Twite Shad in any European site are not considered possible.

Sea lamprey possess neither swim bladders nor lateral lines and functional hearing in sea lamprey is poorly understood. However, one available published study in the literature suggests that sea lamprey can detect frequencies in the range of 50–300 Hz (Mickle *et al*, 2018). In this study, sea lamprey detected tones of 50–300 Hz with equal sensitivity but did not detect sounds above 300 Hz.

Sea lamprey at sea are highly mobile, spending their adult life attached to a host species as a parasitic organism. They are known to prefer shallow coastal waters, where they may attach to host fish species. They are a common and frequently recorded ecto-parasite on basking shark *Cetorhinus maximus*.

The Slaney River Valley SAC, The River Barrow and River Nore SAC and the Blackwater River (Cork/ Waterford) SAC are all designated for lamprey and within the ZoI of the proposed project. Some spatial and/or temporal overlap between migrating sea lamprey and the proposed survey may occur. However, considering the lack of a swim bladder, available knowledge in relation to sound detection ability together with habitat preferences, life history and behaviour, risks to both lamprey species (sea and river) are highly unlikely to be significant for these species, particularly factoring in the limited spatial and temporal aspects of the survey.

Impacts on the conservation objectives of Lamprey in any European site are not considered possible

Otters

Otter hearing is not adapted for life underwater; however, one study did record behavioural responses in otters in experimental trails. While otters utilise the marine environment for foraging, they would not be impacted by the proposed project as they are known to forage close inshore, generally less than 100m. Although records for otter 2-300m from shore have been recorded in the UK this is considered to be an unusual occurrence. East of Knockadoon Head the proposed project area is between 6 and 30 km from the shore. West of Knockadoon Head to Oyster Haven it is closer to the shore and within approximately 80 to 100 meters at some locations. However, there are no Otter commuting habitats, associated with SACs, mapped for this area and thus no potential for impact on the conservation objectives of any SAC designated for otter.

Impacts on the conservation objectives of otter in any European site are not considered possible

Birds

It is recognised in the literature that the impact of underwater noise on diving seabirds is poorly known. Therefore, it is not possible to estimate underwater noise disturbance or injury to diving seabirds. However, it is considered that any seabirds present in the area would be temporarily displaced by the presence of the vessel, and the effects, therefore, would be the same as vessel displacement i.e. as few seabirds would be present, impacts on their fitness will not lead to any population-level effects at the SPAs or other adjacent colonies.

Impacts on the conservation objectives of birds which form a SCI for any European site are considered highly unlikely. However, with due regard to the precautionary principle, LSEs on diving seabirds within Seas off Wexford SPA, Saltee Islands SPA, Mid-Waterford Coast SPA, Helvick Head to Ballyquin SPA and Cork Harbour SPA are considered possible.

8.2.5 Benthic habitats

All of the proposed site investigations, will be carried out in the exposed sediment community which constitutes the entire area of the MUL. CPT will lead to temporary seabed disturbance of a very small area (less than 10 m^2), surrounding each of the potential sampling locations, and no sediment will be removed. The disturbance caused would likely be undetectable within a short period of time (days). Vibrocore sampling is designed to take small sediment samples. The sediment within the area effected will fill in naturally over a short period of time (hours-days) with no significant disturbance to benthic communities. The habitat in this area is considered to represent an exposed environment and any disturbance caused by all of the above operations cumulatively would be undetectable within days.

Up to 45 vibrocores/boreholes are proposed within the MUL area. Boreholes typically create a 2-3m^2 disturbance area which will fill in naturally on completed of sampling. The habitat type at the borehole locations is comprised of sandy or coarse sediment. Effects are considered to be insignificant given the scale of the habitat at this location and localised sampling area.

Sampling for ecological assessment of benthic habitats with the use of a Day grab or Hammon grab will be limited to soft sediments (day grab) and coarse sediments (Hamon grab). A maximum of 250 grabs are proposed. The footprint of both grabs is extremely small (0.5m^2) and the penetration depth very low (approx. 20cm).

Therefore, the potential for sediment disturbance is considered to be minimal and any sediment would settle out or disperse within a very short time period (days). Similarly, holes created by these activities would fill in naturally and not be detectable within a short duration (hours-days). Sediment mobilisation on this scale does not have the potential to impact the benthic fauna present either at the site or within the adjacent area.

The subtidal sediment habitat within the area of the proposed survey area, where the grab samplers will be deployed, is comprised of sands, coarse sediments and mixed sediment. The habitat in this area is considered to represent an exposed environment comprised of robust specialists capable of withstanding disturbance and smothering. Any disturbance caused by grab sampling would be undetectable within days. Benthic species damage would be negligible due to the scale of sampling and would not have the potential to significantly impact the habitat present. There are no species communities recorded for this area that are known to be sensitive to physical damage/abrasion or disturbance.

Impacts on benthic habitats or species are not considered possible.

Table 13 presents a summary of the potential for impact on the QIs or SCIs of all European sites where a SPR link was identified.

Table 13. Summary of assessment of potential for impact.

Slaney River Valley SAC		
Attribute	**Potential for impact**	**Assessment**
Estuaries [1130]	Habitat outside of ZoI.	No likely significant effects
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat outside of ZoI	No likely significant effects
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	Habitat outside of ZoI	No likely significant effects
Mediterranean salt meadows (Juncetalia maritimi) [1410]	Habitat outside of ZoI	No likely significant effects
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	Habitat outside of ZoI	No likely significant effects
Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Habitat outside of ZoI	No likely significant effects
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Habitat outside of ZoI	No likely significant effects
Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	Species outside of ZoI	No likely significant effects
***Petromyzon marinus* (Sea Lamprey) [1095]. Species within ZoI**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups present	No project related activity has the potential to impact population structure.	No likely significant effects
Juvenile density in fine sediment: Juvenile density at least 1/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds. Improved dispersal of spawning beds into areas upstream of barriers	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects
***Lampetra fluviatilis* (River Lamprey) [1099]. Species within ZoI**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups of river lamprey present	No project related activity has the potential to impact population structure.	No likely significant effects

Juvenile density in fine sediment: Mean catchment juvenile density of river lamprey at least 2/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects
***Alosa fallax* (Twaite Shad) [1103]. Species within ZoI**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure- age classes: More than one age class present	No project related activity has the potential to impact population structure.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Water quality-oxygen levels: No lower than 5mg/l	No project related activity has the potential to impact water quality	No likely significant effects
Spawning habitat quality: Filamentous algae; macrophytes; sediment: Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	No project related activity has the potential to impact spawning habitat quality	No likely significant effects
***Salmo salar* (Atlantic Salmon). Only in freshwater. Species within ZoI**		
Distribution: extent of anadromy: 100% of river channels down to second order accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Adult spawning fish: Conservation Limit (CL) for each system consistently exceeded	No project related activity has the potential to impact conservation limits	No likely significant effects
Salmon fry abundance: Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	No project related activity has the potential to impact Salmon fry abundance	No likely significant effects
Out-migratory smolt abundance: No significant decline	No project related activity has the potential to impact out-migratory smolt abundance	No likely significant effects
Number and distribution of redds: No decline in number of spawning redds due to anthropogenic causes	No project related activity has the potential to impact redds number or distribution	No likely significant effects
Water quality: At least Q4 at all sites sampled by EPA	No project related activity has the potential to impact water quality	No likely significant effects
***Phoca vitulina* (Harbour Seal) [1365]. Species within ZoI NOTE: Conservation objectives apply only to this species within the site (Slaney River Valley SAC)**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	The ZoI caused by artificial barriers (acoustic noise) do not extend to this site. The source path receptor link is therefore too weak to cause impacts on the species range **within** the site.	No likely significant effects

Breeding behaviour: The breeding sites should be maintained in a natural condition	Distance to breeding sites **within** the site too distant from the proposed survey area for any impact to occur.	No likely significant effects
Moulting behaviour: The moult haul-out sites should be maintained in a natural condition	No project related activity has the potential to impact moult haul-outs sites due to the distance of the proposed project area to these sites.	No likely significant effects
Resting behaviour: The resting haul-out sites should be maintained in a natural condition	No project related activity has the potential to impact rest haul-outs sites due to the distance of the proposed project area to these sites.	No likely significant effects
Disturbance: Human activities should occur at levels that do not adversely affect the harbour seal population at the site	No project related activity has the potential to lead to disturbance of the harbour seal population at the site due to the distance of the proposed project area to the site.	No likely significant effects
***Lutra lutra* (Otter) 1355. Species within ZoI**		
Distribution: No significant decline	No project related activity has the potential to lead to a decline in otter distribution.	No likely significant effects
Extent of terrestrial habitat: No significant decline. Area mapped and calculated as 64.7ha above high water mark (HWM); 453.4ha along riverbanks/ around ponds	No project related activity has the potential to lead to impacts on the extent of terrestrial habitats.	No likely significant effects
Extent of marine habitat: No significant decline. Area mapped and calculated as 534.7ha	No project related activity has the potential to lead to impacts on the extent of marine habitats.	No likely significant effects
Extent of freshwater (river) habitat: No significant decline. Length mapped and calculated as 264.1km	No project related activity has the potential to lead to impacts on the extent of freshwater habitats.	No likely significant effects
Extent of freshwater (lake/lagoon) habitat: No significant decline. Area mapped and calculated as 0.4ha	No project related activity has the potential to lead to impacts on the extent of lake/lagoon habitats.	No likely significant effects
Couching sites and holts: No significant decline	No potential for impact. All project related activities fully marine.	No likely significant effects.
Fish biomass available: No significant decline	No impacts on fish biomass have been identified.	No likely significant effects
Barries to connectivity: No significant decline	No barriers to connectivity are possible.	No likely significant effects
Blackwater Bank SAC		
Sandbanks which are slightly covered by sea water all the time [1110]	Habitat outside of ZoI.	No likely significant effects
***Phocoena phocoena* (Harbour Porpoise) [1351]**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the proposed surveys do not have the potential to impact the range of harbour porpoise within this site. The range of any artificial barriers created is too far distant (at least 31 km) from the site for the potential for any impact on species range within the site.	No likely significant effects

Disturbance: Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Due to the distance of the proposed surveys from the site there is no potential for any project related activities to lead to disturbance to harbour porpoise within the site.	No likely significant effects
Carnsore Point SAC		
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat outside of ZoI	No likely significant effects
Reefs [1170]	Habitat outside of ZoI	No likely significant effects
***Phocoena phocoena* (Harbour Porpoise) [1351]**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the proposed surveys may have the potential to impact the range of harbour porpoise within this site.	**Potential for LSEs**
Disturbance: Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Due to the distance of the proposed surveys from the site there is no potential for any project related activities to lead to disturbance to harbour porpoise within the site.	No likely significant effects
Hook Head SAC		
Large shallow inlets and bays [1160]	Habitat outside of ZoI	No likely significant effects
Reefs [1170]	Habitat outside of ZoI	No likely significant effects
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Habitat outside of ZoI	No likely significant effects
***Tursiops truncatus* (Common Bottlenose Dolphin) [1349]**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the proposed surveys may have the potential to impact the range of harbour porpoise within this site.	**Potential for LSEs**
Disturbance: Human activities should occur at levels that do not adversely affect the Bottlenose Dolphin population at the site	Due to the proximity of the close proposed surveys to the site, there is potential for human related disturbance to the Bottlenose Dolphin at the site.	No likely significant effects
***Phocoena phocoena* (Harbour Porpoise) [1351]**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the proposed surveys may have the potential to impact the range of harbour porpoise within this site.	**Potential for LSEs**
Disturbance: Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Due to the distance of the proposed surveys from the site there is no potential for any project related activities to lead to disturbance to harbour porpoise within the site.	No likely significant effects
Saltee Islands SAC		
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat outside of ZoI	No likely significant effects
Large shallow inlets and bays [1160]	Habitat outside of ZoI	No likely significant effects
Reefs [1170]	Habitat outside of ZoI	No likely significant effects

Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Habitat outside of ZoI	No likely significant effects
Submerged or partially submerged sea caves [8330]	Habitat outside of ZoI	No likely significant effects
***Halichoerus grypus* (Grey Seal) [1364]. Species within ZoI. NOTE: Conservation objectives apply only to this species within the site (Saltee Islands SAC)**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the use of acoustic equipment including a mini air gun are not considered possible due to the distance of the proposed project to Saltee Islands SAC (15km minimum distance) short term duration of these surveys (52 days for entire survey but considerably less for the use of the mini-air gun should it be required) and limited range (2.9km for TTS).	**Potential for LSEs based on precautionary principle.**
Breeding behaviour: The breeding sites should be maintained in a natural condition	The use of acoustic survey equipment does not have the potential to effect breeding sites and hence breeding behaviour due to the distance of the breeding sites to the proposed project area.	No likely significant effects
Moulting behaviour: The moult haul-out sites should be maintained in a natural condition	The proposed project does not have the potential to impact moult haul-out sites. No survey activity will take place close to moult haul-out sites. The minimum distance to moult haul-out sites is 19km within the Saltee Islands SAC which has its site boundary 15km north of the proposed survey area.	No likely significant effects
Resting behaviour: The resting haul-out sites should be maintained in a natural condition	The proposed project does not have the potential to impact the rest haul-out sites. No rest haul-out sites within 19km of the proposed project area.	No likely significant effects
Population composition: The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually	N/A. The proposed project does not have the potential to impact population structure.	No likely significant effects
Disturbance: Human activities should occur at levels that do not adversely affect the grey seal population at the site	The survey vessel and associated acoustic surveys may have the potential to temporarily cause disturbance to foraging grey seals. However the temporary nature and distance to Saltee Islands SAC (15km) would result in too weak a SPR link to lead to significant disturbance.	No likely significant effects
River Barrow and River Nore SAC		
Estuaries [1130]	Habitat outside of ZoI	No likely significant effects
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat outside of ZoI	No likely significant effects
Reefs [1170]	Habitat outside of ZoI	No likely significant effects
Salicornia and other annuals colonising mud and sand [1310]	Habitat outside of ZoI	No likely significant effects
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	Habitat outside of ZoI	No likely significant effects

Mediterranean salt meadows (Juncetalia maritimi) [1410]	Habitat outside of ZoI	No likely significant effects
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	Habitat outside of ZoI	No likely significant effects
European dry heaths [4030]	Habitat outside of ZoI	No likely significant effects
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Habitat outside of ZoI	No likely significant effects
Petrifying springs with tufa formation (Cratoneurion) [7220]	Habitat outside of ZoI	No likely significant effects
Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Habitat outside of ZoI	No likely significant effects
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Habitat outside of ZoI	No likely significant effects
Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]	Species outside of ZoI	No likely significant effects
Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	Species outside of ZoI	No likely significant effects
Austropotamobius pallipes (White-clawed Crayfish) [1092]	Species outside of ZoI	No likely significant effects
Lampetra planeri (Brook Lamprey) [1096]	Species outside of ZoI	No likely significant effects
***Petromyzon marinus* (Sea Lamprey) [1095]. Species within ZoI.**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups present	No project related activity has the potential to impact population structure.	No likely significant effects
Juvenile density in fine sediment: Juvenile density at least 1/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects
***Lampetra fluviatilis* (River Lamprey) [1099]. Species within ZoI.**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups of river lamprey present	No project related activity has the potential to impact population structure.	No likely significant effects
Juvenile density in fine sediment: Mean catchment juvenile density of river lamprey at least 2/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects

Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects
***Alosa fallax* (Twaite Shad) [1103]. Species within ZoI.**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure- age classes: More than one age class present	No project related activity has the potential to impact population structure.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Water quality-oxygen levels: No lower than 5mg/l	No project related activity has the potential to impact water quality	No likely significant effects
Spawning habitat quality: Filamentous algae; macrophytes; sediment: Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	No project related activity has the potential to impact spawning habitat quality	No likely significant effects
***Salmo salar* (Atlantic Salmon). Only in freshwater. Species within ZoI.**		
Distribution: extent of anadromy: 100% of river channels down to second order accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Adult spawning fish: Conservation Limit (CL) for each system consistently exceeded	No project related activity has the potential to impact conservation limits	No likely significant effects
Salmon fry abundance: Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	No project related activity has the potential to impact Salmon fry abundance	No likely significant effects
Out-migratory smolt abundance: No significant decline	No project related activity has the potential to impact out-migratory smolt abundance	No likely significant effects
Number and distribution of redds: No decline in number of spawning redds due to anthropogenic causes	No project related activity has the potential to impact redds number or distribution	No likely significant effects
Water quality: At least Q4 at all sites sampled by EPA	No project related activity has the potential to impact water quality	No likely significant effects
***Lutra lutra* (Otter) 1355. Species within ZoI.**		
Distribution: No significant decline	No project related activity has the potential to lead to a decline in otter distribution.	No likely significant effects
Extent of terrestrial habitat: No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around pond	No project related activity has the potential to lead to impacts on the extent of terrestrial habitats.	No likely significant effects
Extent of marine habitat: No significant decline. Area mapped and calculated as 857.7ha	No project related activity has the potential to lead to impacts on the extent of marine habitats.	No likely significant effects

Extent of freshwater (river) habitat: No significant decline. Length mapped and calculated as 616.6km	No project related activity has the potential to lead to impacts on the extent of freshwater habitats.	No likely significant effects
Extent of freshwater (lake) habitat: No significant decline. Area mapped and calculated as 2.6ha	No project related activity has the potential to lead to impacts on the extent of lake habitats.	No likely significant effects
Couching sites and holts: No significant decline	No potential for impact. All project related activities fully marine.	No likely significant effects
Fish biomass available: No significant decline	No impacts on fish biomass have been identified.	No likely significant effects
Barries to connectivity: No significant decline	No barriers to connectivity are possible.	No likely significant effects
Blackwater River (Cork/Waterford SAC)		
Estuaries [1130]	Habitat outside of ZoI	No likely significant effects
Mudflats and sandflats not covered by seawater at low tide [1140]	Habitat outside of ZoI	No likely significant effects
Perennial vegetation of stony banks [1220]	Habitat outside of ZoI	No likely significant effects
Salicornia and other annuals colonising mud and sand [1310]	Habitat outside of ZoI	No likely significant effects
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	Habitat outside of ZoI	No likely significant effects
Mediterranean salt meadows (Juncetalia maritimi) [1410]	Habitat outside of ZoI	No likely significant effects
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]	Habitat outside of ZoI	No likely significant effects
Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Habitat outside of ZoI	No likely significant effects
Alluvial forests with *Alnus glutinosa and Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Habitat outside of ZoI	No likely significant effects
Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	Species outside of ZoI	No likely significant effects
Austropotamobius pallipes (White-clawed Crayfish) [1092]	Species outside of ZoI	No likely significant effects
***Petromyzon marinus* (Sea Lamprey) [1095]. Species within ZoI.**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups present	No project related activity has the potential to impact population structure.	No likely significant effects
Juvenile density in fine sediment: Juvenile density at least 1/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects

***Lampetra fluviatilis* (River Lamprey) [1099]. Species within ZoI.**		
Distribution: Access to all watercourses down to second order streams.	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure of juveniles: At least three age/size groups of river lamprey present	No project related activity has the potential to impact population structure.	No likely significant effects
Juvenile density in fine sediment: Mean catchment juvenile density of river lamprey at least 2/m²	No project related activity has the potential to impact juvenile density.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Availability of juvenile habitat: More than 50% of sample sites positive	No project related activity has the potential to impact juvenile habitat.	No likely significant effects
***Alosa fallax* (Twaite Shad) [1103]. Species within ZoI.**		
Distribution: extent of anadromy: Greater than 75% of main stem length of rivers accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Population structure- age classes: More than one age class present	No project related activity has the potential to impact population structure.	No likely significant effects
Extent and distribution of spawning habitat: No decline in extent and distribution of spawning beds.	No project related activity has the potential to impact spawning habitat.	No likely significant effects
Water quality-oxygen levels: No lower than 5mg/l	No project related activity has the potential to impact water quality	No likely significant effects
Spawning habitat quality: Filamentous algae; macrophytes; sediment: Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	No project related activity has the potential to impact spawning habitat quality	No likely significant effects
***Salmo salar* (Atlantic Salmon). Only in freshwater. Species within ZoI.**		
Distribution: extent of anadromy: 100% of river channels down to second order accessible from estuary	No project related activity has the potential to impact accessibility to rivers.	No likely significant effects
Adult spawning fish: Conservation Limit (CL) for each system consistently exceeded	No project related activity has the potential to impact conservation limits	No likely significant effects
Salmon fry abundance: Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	No project related activity has the potential to impact Salmon fry abundance	No likely significant effects
Out-migratory smolt abundance: No significant decline	No project related activity has the potential to impact out-migratory smolt abundance	No likely significant effects
Number and distribution of redds: No decline in number of spawning redds due to anthropogenic causes	No project related activity has the potential to impact redds number or distribution	No likely significant effects

Water quality: At least Q4 at all sites sampled by EPA	No project related activity has the potential to impact water quality	No likely significant effects
***Lutra lutra* (Otter) 1355. Species within ZoI.**		
Distribution: No significant decline	No project related activity has the potential to lead to a decline in otter distribution.	No likely significant effects
Extent of terrestrial habitat: No significant decline. Area mapped and calculated as 103ha above high water mark (HWM); 1165.7ha along riverbanks/ around ponds	No project related activity has the potential to lead to impacts on the extent of terrestrial habitats.	No likely significant effects
Extent of marine habitat: No significant decline. Area mapped and calculated as 647.2ha	No project related activity has the potential to lead to impacts on the extent of marine habitats.	No likely significant effects
Extent of freshwater (river) habitat: No significant decline. Length mapped and calculated as 599.54km	No project related activity has the potential to lead to impacts on the extent of freshwater habitats.	No likely significant effects
Extent of freshwater (lake) habitat: No significant decline. Area mapped and calculated as 5.06ha	No project related activity has the potential to lead to impacts on the extent of lake habitats.	No likely significant effects
Couching sites and holts: No significant decline	No potential for impact. All project related activities fully marine.	No likely significant effects
Fish biomass available: No significant decline	No impacts on fish biomass have been identified.	No likely significant effects
Barries to connectivity: No significant decline	No barriers to connectivity are possible.	No likely significant effects
Lampetra planeri (Brook Lamprey) [1096]	Species outside of ZoI	No likely significant effects
Trichomanes speciosum (Killarney Fern) [1421]	Species outside of ZoI	No likely significant effects
Roaringwater Bay and Islands SAC		
Large shallow inlets and bays [1160]	Habitat outside of ZoI	No potential for impact
Reefs [1170]	Habitat outside of ZoI	No potential for impact
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Habitat outside of ZoI	No potential for impact
European dry heaths [4030]	Habitat outside of ZoI	No potential for impact
Submerged or partially submerged sea caves [8330]	Habitat outside of ZoI	No potential for impact
***Phocoena phocoena* (Harbour Porpoise) [1351]. Species within ZoI. NOTE: Conservation objectives apply only to this species within the site (Roaringwater Bay & Islands SAC)**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the proposed surveys do not have the potential to impact the range of harbour porpoise within this site. The range of any artificial barriers created is too far distant (at least 72 km) from the site for the potential for any impact on species range within the site.	No likely significant effects

Disturbance: Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Due to the distance of the proposed surveys from the site there is no potential for any project related activities to lead to disturbance to harbour porpoise within the site.	No likely significant effects
***Lutra lutra* (Otter) [1355]. Species within ZoI.**		
Distribution: No significant decline	No project related activity has the potential to lead to a decline in otter distribution.	No likely significant effects
Extent of terrestrial habitat: No significant decline. Area mapped and calculated as 171ha above high water mark (HWM); 3ha along river banks/ around ponds	No project related activity has the potential to lead to impacts on the extent of terrestrial habitats.	No likely significant effects
Extent of marine habitat: No significant decline. Area mapped and calculated as 1562ha	No project related activity has the potential to lead to impacts on the extent of marine habitats.	No likely significant effects
Extent of freshwater (river) habitat: No significant decline. Length mapped and calculated as 0.74km	No project related activity has the potential to lead to impacts on the extent of freshwater habitats.	No likely significant effects
Couching sites and holts: No significant decline	No potential for impact. All project related activities fully marine.	No likely significant effects
Fish biomass available: No significant decline	No impacts on fish biomass have been identified.	No likely significant effects
Barries to connectivity: No significant decline	No barriers to connectivity have been identified.	No likely significant effects
***Halichoerus grypus* (Grey Seal) [1364]. Species within ZoI. NOTE: Conservation objectives apply only to this species within the site (Roaringwater Bay & Islands SAC)**		
Access to suitable habitat: Species range within the site should not be restricted by artificial barriers to site use	Artificial barriers resulting from the use of acoustic equipment including a mini air gun are not considered possible due to the distance of the proposed project to Roaringwater Bay and Islands SAC (72 km minimum distance) short term duration of these surveys (52 days for entire survey but considerably less for the use of the mini-air gun should it be required) and limited range (2.9km for TTS).	No likely significant effects
Breeding behaviour: The breeding sites should be maintained in a natural condition	The proposed survey area is too far distant (at least 72km) to effect breeding sites within this SAC.	No likely significant effects
Moulting behaviour: The moult haul-out sites should be maintained in a natural condition	The proposed project does not have the potential to impact moult haul-out sites.	No likely significant effects
Resting behaviour: The resting haul-out sites should be maintained in a natural condition	The proposed project does not have the potential to impact the rest haul-out sites.	No likely significant effects
Population composition: The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually	The proposed project does not have the potential to impact population structure within this site.	No likely significant effects
Disturbance: Human activities should occur at levels that do not adversely affect the grey seal population at the site	Due to the distance of the proposed surveys from the site there is no potential for any project related activities to lead to disturbance to the grey seal population within the site.	No likely significant effects

In-combination impacts

8.3. Approach to identification of in-combination effects

While a single development may not in itself cause a significant impact on the conservation objectives of a site, a combination of projects within a localised area may cause a negative impact on a site. Therefore, the cumulative impacts of a project or plan in association with other projects and plans must be taken into consideration when assessing the possible impacts of a development.

Potential project related impacts were identified in section 6 (table 3) of this SISAA, and included potential pressures resulting from: vessel presence, acoustic surveys and benthic surveys. Additional projects identified as having potential to act in-combination with the proposed project are considered to be those projects most likely to contribute to these pressures and generate additional underwater noise, vessel disturbance and impacts on benthic habitats.

The following approach has been taken to the identification of cumulative impacts has been taken:

- The geographic boundaries of the proposed project as clearly set out in section 4 were reviewed.
- As the proposed project is solely marine based, a search for projects with a marine component or the ability to impact the marine environment through a SPR link were considered relative to the potential for cumulative effects. In this regard all additional projects within 100km of the proposed project area were considered in this review. This is considered to be reasonable and appropriate relative to the scale and scope of the proposed project.
- The search was focused on applications listed on the websites of the Maritime Area Regulatory Authority (MARA) for post 17th July 2023 applications and the Foreshore unit of the Department of Housing Local Government and Heritage for applications pre-17th July 2023. Further information available through the Department of Agriculture, Food and the Marine with regard to foreshore functions relating to fishery harbour centres, aquaculture and sea-fishing and the EPA regarding Dumping at Sea (DAS) permits were examined.
- Projects with the potential to impact the structure and function of all European sites within the ZoI of the proposed project were identified.
- An assessment of the magnitude and /or extent of the identified likely cumulative effects was carried out.
- The significance of any impact identified was determined

8.4. Assessment of In-Combination Effects

Table 14 presents a list of projects identified through searches of relevant consenting and planning portals/databases (including MARA applications/consents and other relevant sources) that occur within or adjacent to the ZoI and may share pressures with the proposed survey programme.

Table 14. Search of additional projects within or adjacent to ZoI. *Projects listed in bold have been identified as having the potential for LSEs.*

Project No.	Application licence no.	Applicant	Description	Location	Project scope	Potential for cumulative impact
1	FS007616	Ruby Offshore Energy Ltd	Site Investigation for Offshore Wind Farm, off the coast of Counties Wexford, Waterford and Cork	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	All of these projects (1 to 21) include elements with similar underwater noise, marine vessel disturbance and benthic sampling potential impacts. Due to the scale, magnitude and lack of any identified impacts on benthic habitats associated with the proposed project, it is considered that the there is no potential for combined impacts with any of these additional projects. It is intended that the proposed project will be conducted in advance of any further consent of permission that may be given to any currently submitted or future foreshore applications in the Celtic Sea. Therefore, there is no potential for temporal overlap. As such no potential for impact with project numbers 1 to 21 are considered possible.
2	FS007471	Floating Cork Offshore Wind Ltd	Site Investigations for proposed Offshore Wind Farm, off County Cork	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
3	FS007661	EirGrid	Offshore Renewable Grid Infrastructure – Waterford and Wexford	Spatial overlap	Export / grid corridor investigations and supporting surveys	
4	FS007660	EirGrid	Site Investigations to inform Offshore Renewable Grid Infrastructure, Co. Cork	Spatial overlap	Export / grid corridor investigations and supporting surveys	
5	FS007555	Sure Partners Ltd	Baseline site surveys for Arklow Bank Wind Park	>60 km north	Baseline surveys	
6	FS007318	RWE Renewables Ireland East Celtic Ltd	Site Investigations for East Celtic Offshore Wind Park	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
7	FS007445	Blackwater OWL Offshore Wind Ltd	Marine surveys off the coast of Wexford	Spatial overlap	Marine surveys supporting offshore wind development	
8	FS007074	Farraige Renewables Ltd	Site Investigations for offshore wind farm, off County Wexford	>20 km north	Site investigations (regional)	
9	FS007472	Mac Lir Offshore Wind Ltd	Site Investigations for Offshore Wind Farm, off Wexford, Wicklow and Dublin	>50 km north	Site investigations (regional)	

Project No.	Application licence no.	Applicant	Description	Location	Project scope	Potential for cumulative impact
10	FS006982	Energia	Site Investigation Licence for wind farm off Helvick Head	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
11	FS007384	Celtic Horizon Offshore Wind Farm Ltd	Site Investigations for Offshore Wind Farm, off Wexford and Waterford	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
12	FS007464	Bore Array Ltd	Site Investigation for Bore Array Offshore Wind Farm	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
13	FS007488	Celtic Offshore Renewable Energy	Site Investigations for Offshore Wind Farm, off Wexford and Waterford	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
14	FS007621	Perla Offshore Wind Ltd	Export cable corridor site investigations	Spatial overlap	Cable corridor investigations and supporting surveys	
15	FS007135	ESB Wind Development Ltd	Site investigations off the coast of Wexford	>44 km north	Site investigations (regional)	
16	FS007588	Wicklow Sea Wind Ltd	Cable route site investigations off County Wicklow	>90 km north	Cable route investigations (regional)	
17	FS007436	Voyage Offshore Array Ltd	Site Investigations for Offshore Wind Farm, off Waterford and Wexford	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	

Project No.	Application licence no.	Applicant	Description	Location	Project scope	Potential for cumulative impact
18	FS007431	Tulca Offshore Array Ltd	Site Investigations for Offshore Wind Farm, off County Cork	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
19	FS007575	Kinsale Offshore Wind Ltd	Export cable corridor investigations	Spatial overlap	Cable corridor investigations and supporting surveys	
20	FS007354	Kinsale Offshore Wind Ltd	Site Investigations for Kinsale offshore wind project	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
21	FS006983	Celtic Sea Array	Geophysical, geotechnical and environmental site investigation works	Spatial overlap	Site investigations (geophysical / geotechnical / metocean / ecology)	
22	LIC230013	Port of Waterford	Geotechnical investigation for 250 m ORE quay extension, River Suir	>27 km north	Localised geotechnical investigation	It is considered that the there is no potential for combined impacts with this project due to the weak SPR links upstream of a hydrological gradient, distance and likely magnitude of LIC230013.
23	LIC230019	Doyle Shipping Group	Site investigation to support port facility expansion for ORE	>8 km	Localised site investigation	It is considered that the there is no potential for combined impacts with this project due to the weak SPR links upstream of a hydrological gradient, distance and likely magnitude of IC230019.
24	LIC230017	Microsoft Ireland Operations Ltd	Subsea fibre optic cable investigations (Kilmore Quay–Wales)	Spatial overlap	Linear cable-route enabling surveys	Mapping indicates a limited scale of surveys will be required to lay a fibre optic cable. The scale of surveys required to determine ground conditions for laying fibre optic cables, which require a very narrow cable trench, is highly

Project No.	Application licence no.	Applicant	Description	Location	Project scope	Potential for cumulative impact
						unlikely to act in combination with the proposed project in any way.
25	FS007363	Uisce Éireann	ADCP surveys in Cork Harbour	Spatial overlap	ADCP deployments (metocean / tidal data)	ADCPs are placed on the seabed to gather tidal information in trawl resistant frames. Previous assessments of ADCP deployments around the coast of Ireland have not identified any potential for impact associated with such deployments on sediment habitats. As such no potential for in-combination effects is consider possible.
26	MUL240026	Uisce Éireann	Strategic modelling of currents and bathymetry (SE Coast)	> 5km north	Primarily modelling/analysis	Unlikely to contribute to cumulative pressures unless separate at-sea surveys occur with a temporal overlap. Cumulative effects possible if temporal overlap occurs.
27	MUL240036	EirGrid plc	Marine site investigations for OSS, cable corridors and landfall options (Tonn Nua)	Spatial overlap	SI works (geophysical / geotechnical / environmental)	Potential cumulative pathways if coincident in time/space with similar surveys. Cumulative effects possible if temporal overlap occurs.
28	MUL240003	Wexford County Council	Baseline marine environmental surveys	>25km	Baseline marine surveys	Generally low intensity: relevance depends on temporal/spatial overlap. Cumulative effects possible if temporal overlap occurs.
29	MAC20230018	Cork County Council	Facility centre for water sports activities	> 7 km	Tourism & recreation development	Narrow footprint; cumulative effects unlikely.
30	MAC20230004	Port of Cork Company	Capital dredging at Ringaskiddy East & West	4 km	Capital dredging	Potential cumulative effects are limited to localised dredging interactions.
31	MAC20230033	Cork County Council	Pedestrian and cycle bridge across Owenabue River	>10 km	State infrastructure	Localised works: no meaningful cumulative interaction anticipated.
32	MAC240059	Electricity Supply Board (ESB)	Aghada Power Station: Energy Park and associated renewable infrastructure	>6 km	Renewable energy (non-wind)	Broad development but spatially discrete; Cumulative effects possible if temporal overlap occurs.
33	MAC20230005	Iarnród Éireann / Irish Rail	ORE operation and maintenance facility at Rosslare Europort	> 38 km	ORE supporting infrastructure	Distance and port-specific footprint suggest no interaction.

Project No.	Application licence no.	Applicant	Description	Location	Project scope	Potential for cumulative impact
34	MUL250008	Port of Cork Company	Deposition of dredged sediments from Ringaskiddy Basin	Within	Offshore renewable-enabling dredging	Localised sediment deposition activity: no in-combination effects anticipated.
35	MUL240048	Uisce Éireann	Cork Harbour current modelling using ADCPs	Within	Metocean data collection	Localised, low-intensity deployments; negligible cumulative effect.
36	MUL230039	University College Cork	Passive acoustic monitoring for elasmobranchs	>10 km	Passive acoustic monitoring	Low-impact monitoring; unlikely to contribute to cumulative pressures.
37	MUL240035	Gas Networks Ireland	Marine surveys for Strategic Gas Emergency Reserve	200 m	SAM and ADCP surveys	Localised footprint: no in-combination effects anticipated.
38	MUL230031	Amazon MCS Ireland Ltd	Transatlantic subsea fibre optic cable investigations	63 km	Cable route investigations	Narrow corridor footprint; cumulative effects unlikely unless coincident.
39	PENDING MAC	ESB and Ørsted	Tonn Nua	Within MUL	900MW Offshore wind development	Potential for in-combination effects: No in-combination effects anticipated when there is no temporal overlap.
	Plans					
1	The Climate Action Plan 2023		These plans promote sustainable development in the maritime environment, particularly in line with Ireland's Climate Action Plan's renewable electricity target of 80% of energy generated from renewable sources by 2030.			No element of the proposed project has the potential to act in-combination with any of the 3 identified projects to result in any negative in-combination effects. Rather, the proposed project may contribute to positive, sustainable development in the maritime environment without the potential to cause negative impacts on any European site.
2	River Basin Management Plans (RBMP)					
3	Designated Maritime Area Plans (DMAPs)					

Additional activities with the potential for combination impacts

Vessel traffic is a constant feature of the area within and surrounding the proposed survey programme. During active survey periods, additional vessel movements associated with data acquisition, deployment/retrieval, and maintenance may temporarily increase the baseline of vessel activity and ambient noise. However, these effects are intermittent and localised in space and time relative to the prevailing baseline; significant cumulative effects from vessel noise or disturbance are not considered likely.

No SPR link, other than the production of wastewater, has been found to connect terrestrial projects to the ZoI of the survey area. It is considered that waste and storm water discharges from the emissions points identified on the EPA database would be well dispersed in the wider marine environment and would not have the potential to interact with the proposed project activities. Furthermore, no waste impacts are associated with the proposed project therefore no potential for cumulative effects is possible.

Given the scale of dredge spoil dumping, its strict regulation and distance from the proposed project, it is considered that the SPR link would be too weak for any possible interaction.

No other marine activities have been identified in the proposed project area that could lead to cumulative impacts.

Based on an assessment of the projects identified above, the potential for cumulative impacts is considered possible, relative to the introduction of underwater noise into the marine environment, where a temporal overlap occurs between the proposed project and any additional projects, as identified in Table 14.

Transboundary effect

Transboundary effects relate to the likelihood of significant effects on a site which is part of the Natura 2000 network but outside of Irelands national boundaries. Given the localised nature of physical disturbance, and the limited spatial extent of noise-related effect zones relative to international boundaries, transboundary likely significant effects are not predicted.

Since 1 January 2021 nature conservation areas in the UK (including Northern Ireland) are no longer part of the Natura 2000 network. On this basis, the nearest European sites outside of Ireland's national boundaries are in mainland Europe.

Conclusion

Following a review of the proposed project, information to support a screening assessment, the guidelines of *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 has been prepared.

The assessment concludes that, the proposed project, without mitigation, may give rise to significant effects on a number of European sites. Accordingly, it is concluded that an Appropriate Assessment of the proposed project is required.

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Appendices

8.5. Foraging ranges for breeding seabirds

**After Woodward et al. (2019).*

Species	Foraging Range - Mean Max (km)*	SPAs where species is qualifying feature
Kittiwake	156.1	Wicklow Head SPA
		Saltee Islands SPA
		Ireland's Eye SPA
		Howth Head Coast SPA
		Lambay Island SPA
		Helvick Head to Ballyquin SPA
Gannet	315.2	Saltee Islands SPA
		The Bull and The Cow Rocks SPA
		Skelligs SPA
Fulmar	542.3	Saltee Islands SPA
		Lambay Island SPA
		Puffin Island SPA
		Skelligs SPA
		Deenish Island and Scariff Island SPA
		Beara Peninsula SPA
		Blasket Islands SPA
		Iveragh Peninsula SPA
		Dingle Peninsula SPA
		Kerry Head SPA
		Cliffs of Moher SPA
Cormorant	25.6	The Raven SPA
		Wexford Harbour and Slobs
Shag	13.2	NA
Guillemot	73.2	Saltee Islands SPA
		Ireland's Eye SPA
Razorbill	88.7	Saltee Islands SPA
		Ireland's Eye SPA
		Lambay Island SPA
Puffin	137.1	Saltee Islands SPA
		Lambay Island SPA
Black-headed gull	18.5	Wexford Harbour and Slobs SPA
Roseate tern	12.6	NA
Common tern	18	NA
Arctic tern	25.7	Lady's Island Lake SPA
Sandwich tern	34.3	Lady's Island Lake SPA
Red-throated diver	9	The Raven SPA
Herring gull	58.8	Saltee Islands SPA
		The Murrough SPA
Little tern	5	NA
Lesser black-backed gull	127	Ballymacoda Bay SPA
		Lambay Island SPA
		Saltee Islands SPA
		Poulaphouca Reservoir SPA
		Wexford Harbour and Slobs SPA
Manx shearwater	1346.8	Deenish Island and Scariff Island SPA
		Skelligs SPA
		Puffin Island SPA

		Blasket Islands SPA
		Cruagh Island SPA
Storm petrel	336	The Bull and The Cow Rocks SPA
		Deenish Island and Scariff Island SPA
Great black-backed gull	73	NA
Common gull	50	NA
Med gull	20	NA
Great skua	443.3	NA
Arctic skua	NA	NA

8.6. Noise modelling and environmental risk assessment of a geophysical survey and its impact on herring and minke whales in Irish coastal waters

Provided as a separate document.