

CLARUS OFFSHORE WIND FARM LIMITED

Investigative Foreshore Licence Application: Reference FS006886

Schedule of Survey Works



P2399_R5197_Rev2 | November 2021

DOCUMENT RELEASE FORM

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1. SURVEY SCHEDULE

The intention is to commence the proposed site investigation activities as soon as feasible following award of Foreshore Licence, with a staged programme of the proposed site investigations to capitalise on suitable weather windows over this time period, likely during Spring and Summer. This phased approach will progress the overall development towards detailed design stage. The exact mobilisation dates for the site investigation activities will not be known until a Foreshore Licence has been secured and the process of procuring the contractor is complete.

While a multi-year licence is sought, most survey activities will only occur over a period of weeks, with the exception of the metocean devices (LiDAR, ADCPs and Wave Buoys) which may be deployed for longer. The time spent at each individual location will be a maximum of hours for other site investigation activities such as Boreholes, CPTs, Vibrocores, Gravity Coring, Grab Sampling etc.

2. GEOPHYSICAL SURVEYS

Objective: The purpose of the proposed geophysical surveys is to determine the geophysical characteristics of the Investigative Foreshore Licence Application Area. The geophysical surveys will involve:

- Mapping the water depth to the seabed (bathymetry) within the Investigative Foreshore Licence Application Area.
- Mapping the seabed and sub-surface to optimise cable routing within the Investigative Foreshore Licence Application Area. This will also enable assessment of cable burial depth;
- Planning the scope and positioning of the geotechnical sampling programme within the Investigative Foreshore Licence Application Area;
- Identifying marine habitat areas within which the benthic survey could be undertaken;
- Determining sensitive marine habitats that may need to be avoided during geotechnical and environmental sampling and potential infrastructure installation; and
- Providing the geophysical data from which a marine archaeological assessment can be undertaken to inform future Environmental Impact Assessment as part of any future consenting process.

Location: At present, it is not known where any potential export cable will be located. Therefore, for the purpose of this Investigative Foreshore Licence Application, it has been assumed that the geophysical surveys will be conducted across any part of the Investigative Foreshore Licence Application Area. However, it is possible that the geophysical surveys may be restricted to potential export cable routes.

Equipment: Indicative equipment for the geophysical surveys is set out below:

- a. Multibeam Echosounder (MBES) - MBES is a remote sensing acoustic device typically attached to a vessels hull. The purpose of an MBES is to map the water depth to seabed (bathymetry). Multibeam Echo Sounder Seafloor Backscatter will also be recorded. The exact equipment for use will be known following the appointment of survey contractor. The R2 Sonic 2024 or the Kongsberg EM2040 may be taken as typical examples of equipment that could be used.
- b. Side Scan Sonar - The side scan sonar will be a dual frequency hydrographic sonar with a lowest operating frequency of not less than 100 kHz. The higher frequency of the side scan sonar will be between 300 and 900 kHz.
- c. Sub-bottom Profiler – The Innomar parametric SES-2000 or similar will be used for the shallow investigation, in order to achieve appropriate resolution (1 to 5cm). For the deeper

penetration, a boomer sub bottom profiler or similar is to be used to achieve high quality data at the required depth. Additionally, for the deeper penetration, both single channel seismic and multi-channel seismic data is to be acquired.

- d. Magnetometry/Gradiometry - The marine magnetometer will be of the Caesium Vapour type and capable of recording variations in magnetic field strength during survey to an accuracy of $\pm 0.5\text{nT}$.

Survey points and spacing: The swathe width for each piece of equipment will vary depending on water depth. It is anticipated that the width of each swathe will allow for a 50% overlap between each swathe.

Vessel: Geophysical survey vessels are typically between 15m and 60m in length and typically have an endurance of approximately 14 days. These vessels are likely to use a local port for mobilisation and replenishment.

3. GEOTECHNICAL SURVEYS

Objective: The purpose of the proposed geotechnical survey is to evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments within the Investigative Foreshore Licence Application Area.

Overview: Geotechnical sampling will comprise of the following:

- a. Up to 130 no. Vibrocore Samples
- b. Up to 130 no. Cone Penetration Tests (CPT)
- c. Up to approximately 6 no. Boreholes

Location: At present, it is not known where the final export cable route will be located. Map 2 below, presents a high-level indication of potential geotechnical sample locations, noting that there are more sample positions indicated on Map 2 than have been indicated above (in 'Overview' portion of Section 3 Geotechnical Surveys) will be acquired. However, given that these sample locations are indicative, for assessment purposes, it is assumed that geotechnical samples could be undertaken anywhere within the Investigative Foreshore Licence Application Area.

Vessel: Geotechnical survey vessels are typically between 55m and 90m in length and typically have an endurance of approximately 28 days. The port of mobilisation for the geotechnical survey vessels will depend on where those vessels are deployed for preceding work packages. As such, the port of mobilisation may be Irish, UK, or another European location.

Survey points and spacing: The exact location, quantity, type, and penetration of the geotechnical samples will be determined following interpretation of geophysical survey data. This will be undertaken on board the survey vessel, if the geophysical and benthic surveys are undertaken as one campaign. Proposed geotechnical sample locations will be communicated to the Underwater Archaeology Unit in the Department of Housing, Local Government and Heritage for approval ahead of works commencing. Proposed locations will be accompanied by an assessment of the geophysical data by a qualified and experienced marine archaeologist.

Equipment: Geotechnical sampling will comprise:

- a. Up to 130 no. Vibrocore Samples

Method: A vibrocore will be used to retrieve a soil sample by penetrating the seabed with a tube using a vibration mechanism.

Location: To be determined following review of geophysical data but indicative locations are provided in Map 2 below. For assessment purposes, it has been assumed that a vibrocore will be deployed

every 1 km along a preferred cable route. As a preferred cable route is not yet known, the sampling locations presented in Figure 2-1, Map 2 are indicative only, noting that there are more sample positions on this figure than have been indicated above (130). The number of samples on the map do not represent the final number that will be acquired.

Dimensions: A vibrocore can penetrate up to 6m into the seabed and can have a diameter of 150mm. Therefore, sample volumes will be up to 0.11m^3 . For 130 collected samples, the worst-case volume of sediment removed will be approximately 14.3m^3 .

Equipment: Indicatively, a high-performance corer (HPC) or a modular vibrocorer is proposed to be used for this activity.

- a. Up to 130 no. Cone Penetration Tests (CPT)

Method: A CPT will be used to test the characteristics of the soil by pushing an instrumented cone into the ground at a constant speed, with continuous measurement of the cone end resistance, the friction along the sleeve of the cone and the pore water pressure.

Location: To be determined following review of geophysical data but indicative locations are provided in Map 2 below. For assessment purposes it is assumed that a CPT will be deployed every 1km, co-located with the vibrocore. As a preferred cable route is not yet known, the sampling locations presented in Figure 2-1, Map 2 are indicative only, noting that there are more sample positions on this figure than have been indicated above (130). The number of samples on the map do not represent the final number that will be acquired.

Dimensions: A CPT can achieve penetrations of up to 40m. No sediment will be removed from the seabed for CPT. SS

Equipment: The exact equipment for use will be known following the appointment of survey contractor. A deck mounted CPT is proposed to be used for this activity. A Seacalf seabed CPT system may be taken as a typical example of equipment that could be used. and

- a. Up to approximately 6 no. Boreholes

Method: A borehole is a method of drilling into the seabed to recover samples and to enable downhole geotechnical testing to be completed. A drilling head is lowered to the seabed via a drill string. The drill string is then rotated to commence boring. Tools are lowered into the drill string to recover samples or conduct in-situ soil and rock testing.

Location: It is assumed that a preferred cable route may not be known prior to undertaking survey works. Therefore, the borehole sample quantities have been calculated based on three potential cable routes likely to be under consideration at the time of survey works commencing. It is also assumed that the boreholes could be located anywhere within the Investigative Foreshore Licence Application Area.

Dimensions: Each borehole will acquire a core sample up to 112mm in diameter, creating a hole (and therefore a seabed footprint) 143mm in diameter (0.016m^2). Assuming a borehole depth of 25m (the likely maximum depth), the core sample removed will have a volume of approximately 0.25m^3 . Risings dispersed around the drill site will have a volume of approximately 0.15m^3 . Assuming cuttings will form a simple cone with an 18° slope angle around the drill head, it has been estimated that cuttings will cover an area of 1.82m^2 . The borehole will be left to collapse naturally following completion of drilling where the cuttings are likely to fall back down the hole.

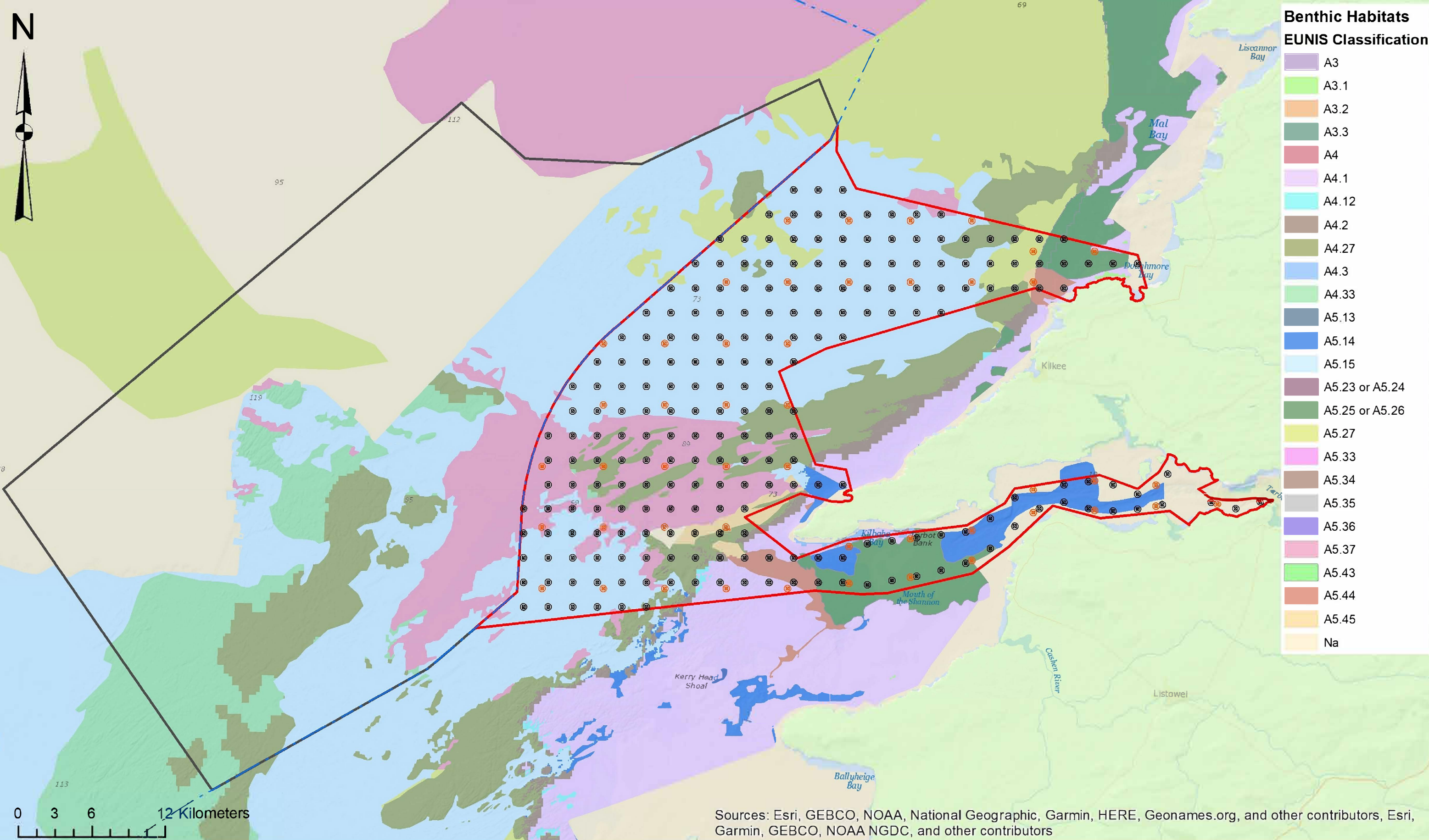
Equipment: The up to approximately six boreholes will be drilled from a jack-up barge (JUB) using a percussion and a rotary corer. The number of legs used by the JUB will be dependent on seabed conditions, current strength and wave action. Each leg has a seabed footprint of approximately 2.54m^2 .

The total expected seabed footprint of the geotechnical borehole sampling is set out in Table 3-1.

Table 3-1 **Calculated footprint for 6 boreholes**

Activity	Seabed footprint (m ²)
Jack-up barge legs (worst case assumes 4 legs deployed)	60.96
Borehole extraction*	0.096
Drill cuttings	10.92
Total	71.88m²

*Footprint from borehole extraction is not included within the total as it is assumed that this will be within the area of seabed disturbed by drill cuttings



Clarus Offshore Wind Farm

Map 2

Indicative Sampling Locations

Legend

- Foreshore Licence Application Area
- Contiguous Project Area
- Indicative Grab Sample Locations
- Indicative CPT/Borehole/Vibrocore Locations
- Irish Territorial Sea 12 nm Limit

Data source: EMODnet

Ver	Date	Drawn by	Checked	Approved
V1	13/10/2021			
Map prepared by: <div></div> MEngSc in Environmental Engineering, PGD in Sustainable Energy, HDGGIS				
Filename: C003IE_FIG_IndicativeSamplingLocations_V1.0_202110			Size A3	
Scale: 1:400,000		Printed @ A3		
Coordinate System: IRENET95 Irish Transverse Mercator Projection: Transverse Mercator				



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4. ECOLOGICAL SURVEY

Objective: The purpose of the proposed ecological surveys is to map the distribution and extent of marine benthic habitats, to identify the extent and distribution of intertidal biotopes, and to identify the distribution and abundance of birds, marine mammals and reptiles.

Location: Ecological sampling will be undertaken within the Investigative Foreshore Licence Application Area. At this time, it is not known where the potential export cable route will be located. Map 2 below assumes that the sample stations could be positioned anywhere within the Investigative Foreshore Licence Application Area. Positions are indicative only and include more than the 65 grab stations discussed below.

Survey points and spacing: The exact location and quantity of the stations will be determined following interpretation of geophysical survey data. This will be undertaken on board the survey vessel, if the geophysical and benthic surveys are undertaken as one campaign. For assessment purposes, it is assumed that an environmental station will be located every 2km along the preferred cable route or where there is a change in habitat type but could occur anywhere within the Investigative Foreshore Licence Application Area.

Equipment: Indicative equipment for the environmental surveys includes the following:

- a. 65 no. Grab stations (195 grab samples)

Method: A grab sampler will be used to retrieve a soil sample of the seabed by the lowering of a mechanical grab. The grab will be launched from a vessel crane or A-frame. It is likely that three grab samples will be taken at each station; two for faunal analysis and one for sediment and chemical analysis.

Dimensions: Each grab samples a volume of approximately 0.1m^3 . Grabs are required to obtain a sample greater than 5cm in depth, to try and achieve this, samples will be repeated for up to three attempts. If three samples are taken at each of 65 stations, then grab sampling will remove approximately 19.5m^3 of sediment.

Location: Yet to be determined but indicative locations (informed by EMODnet habitat data) are provided in Map 2 above.

Equipment: The exact equipment for use will be known following the appointment of survey contractor. A Day or Hamon Grab may be taken as typical examples of equipment that could be used.

- b. Drop-down camera and video transects

Method: Approximately four still photographs will be acquired at each environmental station. Additional photographs or video footage will be acquired along transects to characterise sensitive habitats and features.

Dimensions: This technique involves no intrusive seabed sampling.

Location: To be determined following review of geophysical data on board the survey vessel.

Equipment: The exact equipment for use will be known following the appointment of survey contractor. A SeaSpyder using Canon EOS 100D Digital Still Camera may be taken as a typical example of equipment that could be used for this activity, or similar with dedicated strobe and an integrated video system capable of performing full HD recordings.

c. Intertidal

Objective: The aim of the intertidal surveys will be to identify and map the extent and distribution of intertidal biotopes.

Method: Intertidal floral and faunal surveys at proposed cable landfall locations to include transects, quadrats and core sampling.

Location: The exact location of the intertidal surveys will not be known until a preferred export cable route and landfall have been identified. At this time, it is assumed that the cable landfall site could be located anywhere along the coast within the Investigative Foreshore Licence Application Area.

d. Bird, Marine Mammal and Reptile Survey

Objective: The purpose of the proposed bird, marine mammal and reptile survey is to record the species type, abundance and distribution of marine mammal, reptile and bird species observed in the Investigative Foreshore Licence Application Area.

Method: Boat-based bird and marine mammal surveys and/or acoustic monitoring may be used to complement aerial bird and marine mammal surveys currently underway. Boat based surveys may include towed hydrophonic acoustic array and static acoustic monitoring using C-PODS.

Location: To be determined based on the results of Year 1 of aerial bird and marine mammal surveys currently underway and based on engagement with statutory and non-statutory stakeholders on resultant Year 2 survey design.

5. WIND RESOURCE AND METOCEAN SURVEY:

Objective: The purpose of the proposed wind resource and metocean survey is to investigate wind, wave and tidal conditions within the Investigative Foreshore Licence Application Area.

Equipment: The exact equipment for use will be known following a procurement process. Up to two SEAWATCH Wind LiDAR Buoys or similar (with marker buoys next to each), up to five Acoustic Doppler Current Profilers (ADCP) and up to two Waverider Buoys are proposed to be used for this activity.

Method: The LiDAR buoys will be moored using a mooring chain and a concrete anchor (subject to the supplier's preferred methodology). The buoys will be moored to the seabed for a duration of approximately 12 to 36 months and will be powered by solar panels and micro wind turbine generators. The buoys are typically yellow in colour and will be clearly marked with two navigation lights (typically flashing amber, 5 flashes every 20 seconds, nominal range 3-6 nautical mile (NM) visibility and fitted with a Radar reflector). The ADCPs will be deployed via a vessel on-board crane and will sit on the seabed. Waverider buoys are weighted to the seafloor using a chain with a footprint of approximately 1.5m x 1.5m. The buoys are typically yellow in colour and include an amber LED with a programable ODAS flash sequence with three NM visibility.

Location: Exact details of the LiDAR buoys, Waverider buoys and ADCP deployment locations within the Investigative Foreshore Licence Application Area, associated mooring arrangement and installation vessel will not be available until a contract has been awarded.

6. GENERAL REQUIREMENTS

The survey contractor and vessels will comply with international and national statute as appropriate. In addition, the following standard environmental procedures/protocols will be followed during the survey campaign:

- All vessels will comply with the latest International Maritime Organization (IMO), Safety of Life at Sea (SOLAS) and environmental requirements for their classification and with any national requirement of the territorial or offshore waters to be operated in.
- The contractor will take particular care when handling or storing hazardous materials, radiation sources and chemicals.
- Liquid or non-liquid pollutants or waste material will not be dumped, thrown, or otherwise disposed of into the sea.
- All refuse and materials shall be kept onboard the vessel and safely disposed of onshore according to the MARPOL Convention.
- All substances handled and/or used whilst undertaking the works will be handled, used, stored, and documented in accordance with assessments and recommendations of the Control of Substances Hazardous to Health (COSHH) Regulations 1994.
- Where Fuels, Oils and Lubes are required to be stored on boats, suitable containers will be used and stowed to allow ventilation and safe dissipation of any accidental leaked gas and retention of any leaked liquid.
- No liquid will be discharged into the water at any stage of the work on site. No smoking will be permitted in the vicinity of fuel in storage or when in use.
- In line with ICPC Recommendations, geotechnical and environmental sampling locations will be positioned a minimum of 250m from third-party assets e.g. pipelines. All asset owners will be contacted prior to survey to determine if proximity agreements are required.
- Commissioners for Irish Lights (CIL) standard navigational safety requirements will be adhered to with regards to positioning, mooring, marking and lighting of all equipment deployed under the Foreshore Licence.
- Removal of all equipment deployed under the Foreshore Licence and return of the seabed to its original condition.