MARESCONNECT

MaresConnect Electricity Interconnector

Survey Method Statement

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MaresConnect

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Survey Method Statement

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	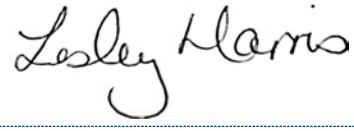
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1. INTRODUCTION

1.1 Project Overview

MaresConnect is a proposed 750-megawatt (MW) High Voltage Direct Current (HVDC) electricity interconnector linking the power markets of Ireland and Great Britain (GB). The construction of the Interconnector is scheduled to commence in 2025, with testing and full operation from 2028. MaresConnect Limited (MCL) are investigating the feasibility of coming ashore along the north Wales coast between Colwyn Bay and Abergele.

The MaresConnect Interconnector project is being developed by MCL, an Irish project specific company established to develop, construct and operate the interconnector. MCL is a subsidiary of Mares Interconnector Holdings Limited, an Irish limited company, funded by private capital.

The United Kingdom (UK) grid connection point will be established at the Bodelwyddan substation in North Wales. The Irish grid connection point is anticipated to be at an existing substation (Woodland, Belcamp or Maynooth) in the vicinity of Co. Dublin. The converter stations will be connected by underground cables (onshore) and subsea cables (offshore).

MCL intend to carry out geophysical, geotechnical and environmental marine surveys of the proposed marine cable route. The objective of the survey campaign is to acquire all appropriate data for the confirmation of a preferred marine route. This includes detailed mapping of nearshore shallow geological and seabed character; reconnaissance level mapping of seabed relief and features along marine sections; and baseline environmental mapping along the entire marine cable corridor. At present, there are a total of 15 core route options and three potential landfall zone options, however, these will be reduced and only one route (or a combination of sections of several route options) and a maximum of two landfall zones will be selected for survey. There is the possibility that small sections of other routes presented could be surveyed if sensitive habitats are identified, in order to provide alternative options to routeing in these areas. The final selections will be communicated to Natural Resources Wales (NRW) once a decision has been made. The potential routes are shown in Figure 1-1 (Drawing Reference: P2578-LOC-008).

The data would also be used to inform route design and support the environmental licence applications by providing information on the current situation and allowing impacts to be predicted, and subsequently appropriate mitigation to be developed. It may also be used later to provide a baseline against which to monitor post construction effects of construction, operation and decommissioning.

The intention is to commence the proposed site investigation activities as soon as feasible following the award of all necessary consents and licences in both the Irish and Welsh jurisdictions. The marine survey is expected to be completed within approximately five months for the entire route between the UK and Ireland. This is, however, dependant on external influences such as survey contractor availability and weather. MCL has applied for a Marine Licence from Natural Resources Wales for the intrusive seabed works to be valid for the period March 2024 to December 2025, to allow for programme contingency. The survey could be completed at any time of year, however, due to weather conditions the works are more likely to be undertaken in the spring and summer months.

The survey will consist of geophysical, geotechnical and environmental data acquisition as described in Section 2 below.

1.2 Project Schedule

The indicative timescales for the key stages of the project are outlined below in Table 1-1. These are subject to change based on project requirements.

Table 1-1 Indicative Project Schedule

Stage of development	Time period
Screening Request	May/June 2023
Scoping Report	July 2023
Consultation on Scoping Report	August - October 2023
Marine survey works	March 2023 – December 2024
Preparation of voluntary Environmental Impact Assessment	Q3 2023 – Q4 2024
Submission of installation licence applications with ES	Q4 2024
Regulator consultation on licence applications	Q4 2024 - 2025
Determination of licence applications	2025
Cable installation	2025 - 2027
Operation	2028

ENVIRONMENTAL SCOPING REPORT – WELSH MARINE ROUTE

LOCATION OVERVIEW

MaresConnect Interconnector Route Options

Drawing No: P2578-LOC-008 | B

380000

440000

5960000

5900000

Legend

- 12nm Territorial Sea Limit
- Economic Exclusive Zone (EEZ) Boundary

Cable Routes

- W1I1
- W1I2
- W1I3
- W1I4
- W1I5
- W2I1
- W2I2
- W2I3
- W2I4
- W2I5
- W3I1
- W3I2
- W3I3
- W3I4
- W3I5

NOT TO BE USED FOR NAVIGATION

Date	2023-03-06 11:17:45
Coordinate System	WGS 84 / UTM zone 30N
WKID	EPSG:32630
Scale @A3	1:450,000
Data Sources	GEBCO; MarineRegions; MarineFind; MaresConnect
File Reference	J:\P2578\Mxd_QGZ\01_LOC \P2578-LOC-008.qgz
Created By	Oliver Bula
Reviewed By	Lewis Castle
Approved By	Stephane Theurich

0 5 10 15 20 km

2. METHODOLOGY

The following activities are proposed for the survey (note that all sample numbers are indicative, based on the longest potential survey route (125 km in Welsh waters) and include an extra 20% for a conservative estimate):

- **Geophysical survey:** The geophysical survey will comprise multibeam echosounder (MBES), sidescan sonar (SSS), sub-bottom profiler (SBP) and magnetometer surveys to determine seabed conditions along the proposed cable route. These surveys will be undertaken both offshore (>15 m water depth) and nearshore (0 m to 15 m water depth). Surveys can be undertaken at any time of the year (subject to weather conditions) and are likely to be carried out over a period of up to five months (including downtime).
- **Geotechnical**: Up to eight landfall boreholes (nearshore marine) two boreholes at each site (an extra two as contingency), 150 shallow-water CPTs and 150 shallow-water vibrocores (VCs) will be acquired to evaluate the nature and mechanical properties of the seabed sediments. Up to 35 boxcores may be used to characterise shallow soils if the sediment is found to be very soft. The geotechnical survey is likely to be carried out over multiple campaigns to determine site characteristics and cable positioning. Surveys will be undertaken at any time of the year (subject to weather conditions). Campaigns are likely to be within a two to four month period at any time of the year (subject to weather conditions). Positioning of samples will be informed by the geophysical survey but are estimated to be stationed approximately 1 km apart.
- **Environmental (benthic sampling)**: The benthic sampling campaign is likely to be conducted alongside the geophysical survey, however, if this is not possible the benthic sampling would be carried out separately. Up to 30 grab sample stations, and additional drop-down camera (DDC) and video transects, will be acquired to characterise seabed habitats and sensitive features. Up to 35 boxcores may be taken along the proposed cable route. At each geotechnical and environmental sampling station a DDC will be deployed to allow for further confirmation of sampling analysis.
- **Intertidal:** Intertidal surveys will be undertaken separately and will take less than 1 week at each landfall selected for survey (up to two chosen landfall sites). They will consist of up to four intertidal boreholes and one marine borehole per landfall site and a Phase 1 habitat survey to be completed potentially at a later date than the geotechnical works.
- **Topographic Landfall Surveys** - Terrestrial survey methods at the landfall (intertidal and terrestrial) may include a topographic survey of the ground elevations to ensure that there are continuous height measurements between the landfall and the cable route and to delineate hard features that will present an obstacle to cable installation. Terrestrial geophysical investigations may include seismic refraction of the cable route centreline and offset lines to provide information on sub-surface sediment layers and thicknesses using a ground penetrating radar survey, or similar. One of two techniques will be selected to acquire the data; either a traditional topographic survey using levels and reference points via RTK foot or vehicle traverses, laser-scanning and/or an aerial drone survey using photogrammetry techniques.
- **Birds and Marine Mammal Surveys -** Boat based and aerial/drone surveys will be conducted offshore and from landfall vantage points to determine usage of the survey area by birds, marine mammals and other megafauna. Species type and distribution along the cable route will be recorded.

2.1 Geophysical Survey

The geophysical acquisition methodologies will comprise MBES, SSS, magnetometry and SBP surveys.

The objectives of the proposed geophysical survey are to:

- Map the seabed and sub-surface to assist in optimising the routing of the interconnector cable and to enable assessment of cable burial depth;
- Plan the scope and positioning of the geotechnical sampling programme along the proposed cable route;
- Identify marine habitat areas from which the benthic survey can be undertaken;
- Identify sensitive marine habitats which will need to be avoided during geotechnical and environmental sampling and cable installation; and
- Provide the geophysical data from which a marine archaeological assessment can be undertaken as part of the consenting process.

To meet these objectives, the geophysical survey will undertake the following tasks:

- Measure intertidal topography and seabed bathymetry, surface morphology and identify the nature of the seabed sediments - in particular the height, length and slopes of sand waves (topography, MBES, SSS);
- Identify the distribution and thickness of superficial sediments and rock head where possible (SBP);
- Identify the distribution of subsea geological features such as areas of exposed bedrock (MBES, SSS); and
- Identify the location, extent and nature of any impediments to laying or burial of the cables such as wrecks, debris on seafloor, rock outcrop, other cables, pipelines etc. (magnetometer, MBES, SSS).

The interpretation of the geophysical survey for cable routing forms the basis of the scope of work for geotechnical and benthic surveys.

The bathymetric, SSS and SBP systems proposed are characterised by a limited acoustic footprint with the directional, high-frequency, short-duration output attenuated within a few hundred metres of the survey vessel.

2.1.1 Equipment

Specific equipment to be used during the geophysical survey have not yet been specified as the contractor has not been appointed. Examples of industry standard equipment for the purpose of geophysical and geotechnical survey have been used in this assessment. Frequencies and decibels used to obtain the data will be within similar ranges for all equipment used.

2.1.1.1 Landfall/Intertidal topographic survey

Terrestrial survey methods at the landfall (intertidal and terrestrial) may include a topographic survey of the ground elevations using real-time kinematic (RTK) foot or vehicle traverses, laser-scanning and/or an aerial drone survey using photogrammetry techniques. Terrestrial geophysical investigations may include seismic refraction of the cable route centreline and offset lines to provide information on sub-surface sediment layers and thicknesses using a ground penetrating radar survey, or similar.

2.1.1.2 Multibeam echo sounder (MBES)

An MBES is a remote sensing acoustic device typically attached to a vessel's hull. The purpose of this equipment will be to map the water depth to seabed (bathymetry) from a single transducer array that uses a fan of acoustic energy known as a swathe. MBES systems can be either hull-mounted or towed behind the vessel. MBES frequencies typically range from 12 kilohertz (kHz) to 500 kHz.

2.1.1.3 Side scan sonar (SSS)

SSS is a method of underwater imaging that uses acoustic energy to detect objects (e.g. pipelines and shipwrecks) and enable classification of surficial marine geology (e.g. sediment type, rock outcrop, sand ripples/waves). SSS instruments are often towed behind ships using a 'tow-fish' or mounted to a remotely operated vehicle (ROV). The instrument sends out acoustic energy in pulses perpendicular to the tow fish heading, looking sideways and down. Some of the sound sent out by the SSS reflects off the seabed and returns to the transducer with strong and weak echoes relative to the travel time. To obtain the best possible results most systems are dual frequency (dual channel high/low frequency). High-frequency systems up to 1600 kHz give excellent resolution but the acoustic energy only travels a short distance (used to identify small seabed objects). Lower frequencies such as 50 kHz or 100 kHz give lower resolution but the distance the acoustic energy travels is greatly improved (used to detect changes in seabed sediments). The SSS will be dual frequency hydrographic sonar with a minimum operating frequency of not less than 100 kHz.

2.1.1.4 Magnetometer

A magnetometer is a passive remote sensing device that detects ferrous objects, such as pipelines, cables, debris (wrecks) and potential unexploded ordnance (UXO), which may present an obstruction or risk to intrusive seabed works such as geotechnical surveys and construction activities. Magnetometers are towed either piggybacked from the side scan sonar or behind a survey vessel.

2.1.1.5 Sub-bottom profiler (SBP)

SBP systems are used to image geological layers and sediment thicknesses beneath the seabed and typically have two categories. The first type is the transducer array which combine the source and receiver (as with MBES and SSS systems) and is generally high frequency, identifying thin laminations of shallow geology. The second type has a separately towed source and receiver and is generally low frequency, identifying larger geological formations at lower depths. The source can be electrical or mechanical. The receiver is called a hydrophone which in most cases is physically separated from the source.

High frequency SBP's can either be either hull-mounted or towed from the survey vessel using a tow-fish or attached to a ROV. Low frequency SBP's require towed sources and receivers. The instrument sends out a pulse of acoustic energy which when recorded is known as a seismic profile. The acoustic penetration and resolution of a SBP system mainly depends on the shape and frequency of the acoustic pulse. High penetration of the seabed is only possible with low frequencies. High resolution data can be obtained with higher frequencies. SBP systems use frequencies of approximately 1 kHz up to 200 kHz. High frequency systems (e.g. chirp, a parametric echo sounder) can image approximately 5 m to 30 m below the seabed, with lower frequency systems (e.g. single channel sparker/boomer) imaging approximately 80 m to 100 m below the seabed. Examples of high frequency SBP systems include the Innomar SES 2000 and Edgetech 3100. Examples of low frequency SBP include Ultra High Resolution Seismic (UHRS) equipment (sparker/boomer).

It is likely that two different systems will be used; a high-resolution profiler that will emphasise the top 3 - 5 m of sediment with a resolution of 0.25 m or better in a variety of geological conditions; and a system that provides increased penetration of up to 20 m. Three systems (pinger, boomer and chirp) will be made available so that the most appropriate system can be chosen dependent on the seabed conditions.

2.2 Geotechnical Survey

The purpose of the proposed geotechnical survey is to evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments along the proposed cable route. The data will be used to inform future design studies, such as the determination of cable burial depth and methods.

The geotechnical survey techniques that may be used during the proposed marine survey include grab sampling, seabed cone penetrometer tests (CPTs), vibrocores (VCs), and boreholes. Boreholes will be used to determine deeper soil conditions at the export cable landfall to a depth of up to 25 m below ground level. VC and CPTs will be used across the entire application area. VCs and CPTs will be acquired at the same or separate locations as determined by review and interpretation of SBP data.

2.2.1 Location and survey spacing

As discussed previously, there are currently 15 potential marine survey routes in Welsh waters for the MaresConnect interconnector. Based on further route selection and contractor award, the below indicative sample numbers will be refined but have been based currently on the longest potential route option.

The exact location, quantity, type, penetration and spacing of the geotechnical samples will be determined following interpretation of geophysical data. The geotechnical sampling will be undertaken along the potential cable routes. Following review of geophysical data, only one cable route and up to two landfalls of the proposed options will be selected for geotechnical sampling.

The positioning of stations needs to take into consideration environmental constraints such as the position of sensitive habitats. The geophysical data will be used to confirm the presence and positions of potential sensitive habitats prior to locating geotechnical and environmental sampling stations. Sampling stations will be positioned to avoid these. If geophysical interpretation is not conclusive, DDC will be used to visualise the seabed prior to intrusive sampling to ensure sensitive features are avoided.

In order to avoid interaction with the existing pipelines in the area, geotechnical and environmental sampling stations will be positioned a minimum of 250 m from the assets marked positions. The asset owners will be contacted prior to the survey to determine if a proximity agreement is required.

During survey activities the deployment of equipment on the seabed will be kept to a minimum in order to minimise seabed disturbance.

2.2.2 Equipment

2.2.2.1 Vibrocore (VC)

A VC will be used to retrieve a soil sample by the lowering of a sample tube that is vibrated into the seabed. The VC will be launched from a vessel crane or A-frame. Samples will be taken at representative locations along the selected cable route and nominally will be located every 1 km.

- Shallow water VCs (up to 9 m): Approximately 150 samples will be collected, inclusive of an extra 20% contingency to provide conservative estimate. The target depth for samples will be 6 m, however, VCs may penetrate up to 9 m into the seabed and have a diameter of 150 mm. Therefore, sample volumes will be up to 0.16 m^3. For 150 collected samples, the approximate volume of sediment removed based on the deepest VC depth will be 24 m^3. Indicative equipment to be used is a high-performance corer (HPC) or a modular vibrocorer.

2.2.2.2 Cone Penetrometer Test (CPT)

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.

- Shallow water CPT: Approximately 150 samples will be taken, including extra 20% contingency to provide conservative estimate. Samples will be taken at representative locations along the selected cable route and nominally will be every 1 km of survey. Shallow water CPTs are likely to achieve penetrations of up to 9 m. No sediment will be removed from the seabed.

2.2.2.3 Borehole

A borehole is a method of drilling into the seabed to recover samples and enable downhole geotechnical testing to be completed. A drilling head is lowered to the seabed via a drill string and stabilised using a seabed frame. The drill string is then rotated to commence boring. Tools are lowered into the drill string to recover samples or conduct in-situ soil testing. The drilling flush and drill cuttings are largely returned to the vessel and re-used, however some loss of flush and cutting should be expected. All drilling fluids will be in compliance with environmental requirements. It is noted that borehole drilling is used to analyse and understand sediment stability and is not considered deep drilling, which would be subject to full Environmental Impact Assessment (EIA), under The Marine Works (EIA) Regulations 2007.

Up to four landfall boreholes (two planned and two contingency, either in the intertidal or terrestrial area) and one marine borehole (exact location will be determined by the geophysical survey, however the approximate location is at the 4 m depth contour) will be drilled per landfall (a maximum total of 10 boreholes if two landfalls are selected for survey). The necessary additional consents will be applied for if the borehole is required above Mean High Water Springs (MHWS).

The landfall boreholes will be drilled using a percussion and a rotary corer, and will likely be drilled from a jack-up barge (JUB), if undertaken in the intertidal or nearshore zone. If undertaken above mean high water, this would be undertaken from a tracked drilling machine on or near the shore. Alternative methods of drilling a borehole may also be considered, such as a remotely operated vehicle (ROV) drill.

The number of legs used by the JUB is dependent on seabed conditions, current strength and wave action. For the proposed survey route, four legs are the most likely scenario. Each leg has a seabed footprint of approximately 2.54 m^2.

The landfall boreholes will likely be drilled from a JUB. For the proposed landfall areas, four legs are the most likely scenario. Each leg has a footprint of approximately 2.54 m^2. Each borehole will have a footprint of approximately 0.02 m^2. Assuming a borehole depth of 25 m, the core sample removed will be approximately 0.25 m^3. Risings dispersed around the drill site will have a volume of approximately 0.15 m^3. Assuming cuttings will form a simple cone with an 18° slope angle around the drill head it has been estimated that they will cover an area of 1.82 m^2. The borehole will be left to collapse naturally following completion of drilling where the cuttings are likely to fall back down the hole. A maximum total of 2.5 m^3 of sediment will be removed if ten boreholes are drilled.

2.3 Landfall Topographic Survey

Terrestrial survey methods at the landfall may include a topographic survey of the ground elevations to ensure that there are continuous height measurements between the landfall and the cable route and to delineate hard features that will present an obstacle to cable installation. Terrestrial geophysical investigations may include seismic refraction of the cable route centreline and offset lines to provide information on sub-surface sediment layers and thicknesses using a ground penetrating radar survey, or similar. One of two techniques will be selected to acquire the data; either a traditional topographic survey using levels and reference points via RTK foot or vehicle traverses, laser-scanning and/or an aerial drone survey using photogrammetry techniques.

2.4 Environmental Survey

The aim of the proposed environmental survey is to map the distribution and extent of marine benthic habitats, presence and distribution of bats, presence of otters and otter holts, intertidal birds nesting and foraging locations along the proposed cable route. This will comprise a benthic sampling programme (using grab sampling) and video or still photographs. The sampling locations will be determined based upon interpretation of the geophysical data and selected to sample different habitats.

A grab sampler will be used to retrieve a soil sample of the seabed by the lowering of a mechanical grab. Each grab samples a volume of approximately 0.1 m^3. Grabs are required to obtain a sample greater than 5 cm in depth, to try and achieve this, samples will be repeated for up to three attempts. It is likely that three grab samples will be taken at each station; two for faunal analysis and one for sediment and chemical analysis. Each sampling station will therefore collect up to 0.3 m^3 of sediment. Approximately 30 sampling stations (this number includes an extra 20% as a conservative estimate) will be sited at representative locations along the preferred cable route (a total of 9 m^3 of sediment removed). Exact locations are subject to results of the geophysical and archaeological survey and are dependent on geology but nomically will be every 5 km or where there is a change in habitat type. Indicative equipment to be used will be a grab sampler e.g. Day or Hamond. The grab will be launched from a vessel crane or A-frame.

Boxcores may be used to characterise shallow soils if the sediment is found to be very soft. Up to 35 boxcores will be taken along the proposed cable route. Each boxcore will be taken at representative locations along the cable route (these numbers include an extra 20% as a conservative estimate). Each boxcore sample will remove 0.0072 m^3 of sediment, totalling approximately 0.252 m^3 of sediment removed along the survey corridor.

DDC and video transect: At each geotechnical and environmental sampling station a DDC will be deployed to allow for further confirmation of sampling analysis. Additional photographs or video footage will be acquired along transects to characterise sensitive habitats or features. This technique involves no intrusive seabed sampling. Transect locations will be determined following review of the geophysical data.

For the terrestrial and intertidal area, a Phase 1 intertidal habitat walkover survey will be carried out by an experienced ecologist. The aim of the survey will be to identify and map the extent and distribution of intertidal biotopes. Intertidal floral and faunal surveys and intertidal bird and bat surveys are planned at the proposed cable landfall zone which will include transects, quadrats and core sampling. The exact location/zone of the intertidal survey will not be known until the preferred cable route and landfall has been chosen. At this time, it is assumed that it could take place at any of the three landfall zones and up to two landfalls may be selected for survey.

2.5 Birds and Marine Mammals Survey

Boat based and aerial/drone surveys may be conducted offshore and from landfall vantage points to determine usage of the survey area by birds, marine mammals and other megafauna. Species type and distribution within the survey area will be recorded.

3. RISKS TO NAVIGATION AND PROPOSED MITIGATION

There is potential for temporary disruption to shipping activity during survey works. Survey vessels will comply with the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs) – as amended, particularly with respect to the display of lights, shapes and signals. All vessels will exhibit signals in accordance with the UK Standard Marking Schedule for Offshore Installations.

The survey contractor will be responsible for providing a Notice to Mariners to the UKHO and Kingfisher Information Services at least two weeks ahead of mobilisation.

The exact details of the survey vessels to be used are not currently known and more details will be provided once the survey contractor is engaged. However, it is anticipated that the survey vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards. Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements.