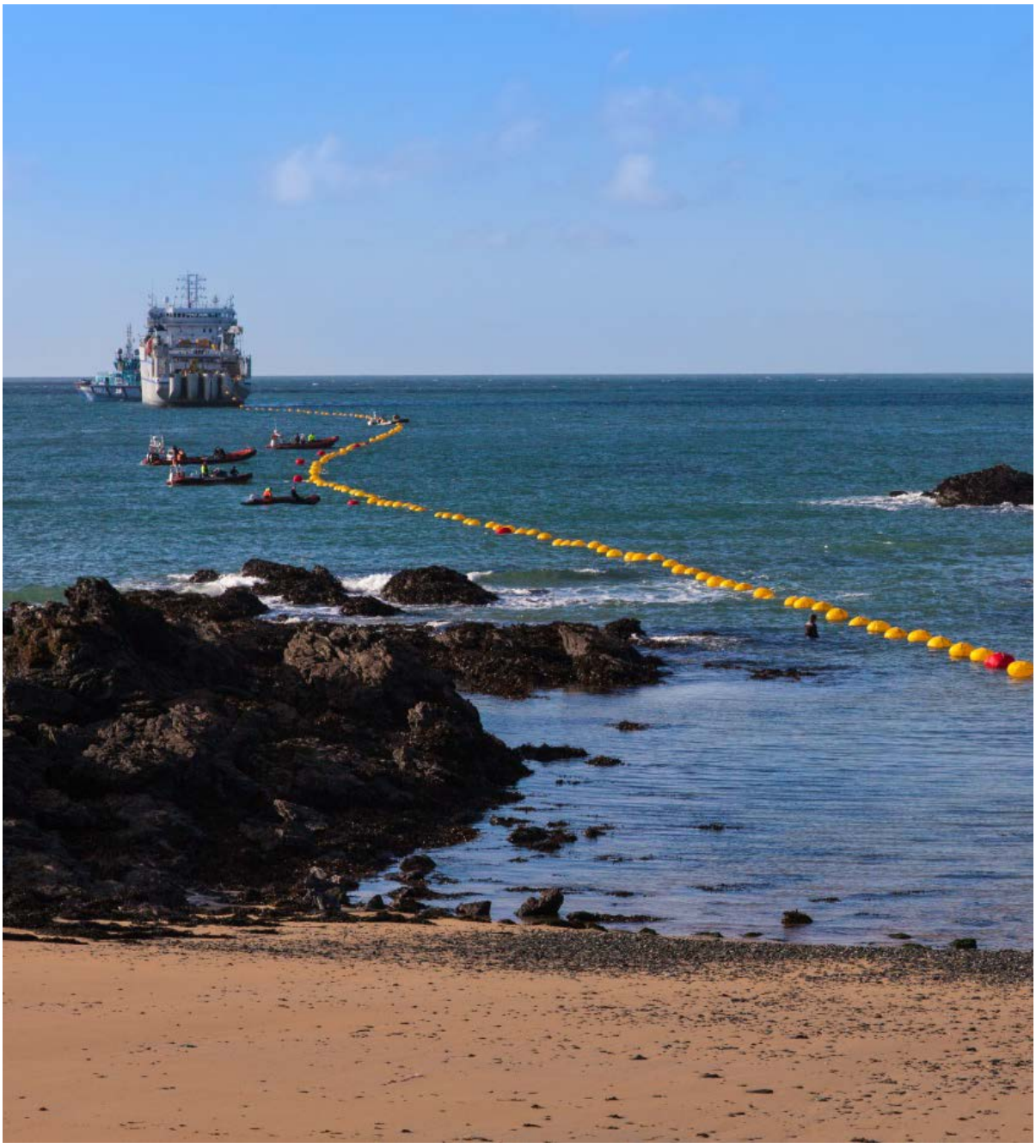
GREENLINK

FORESHORE LICENSE APPLICATION FOR MARINE SURVEY

SUPPORTING INFORMATION



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Foreshore License Application for Marine Survey

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Intertek Energy & Water Consultancy Services is the trading name of Metoc Ltd, a member of the Intertek group of companies.

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GLOSSARY

AA
Appropriate Assessment

CEF
Connecting Europe Facility

Cefas
The Centre for Environment, Fisheries and Aquaculture

CPT
Cone penetrometer testing

DAHG
Department of Arts, Heritage and the Gaeltacht

DEHLG
Department of Environment, Heritage and Local Government

EEZ
Exclusive Economic Zone

EPS
European Protected Species

EUNIS
European Nature Information System

HDD
Horizontal directional drilling

HWM
High water mark

IMO
International Maritime Organisation

INNS
Invasive non-native species

JUB
Jack-up barge

km
Kilometre

LAT
Lowest astronomical tide

LWM
Low water mark

m
Metre

MARPOL
International Convention for the Prevention of Pollution from Ships

MBES
Multi-beam echo sounder

MESH
Marine European Seabed Habitat

mm
Millimetre

MMO
Marine mammal observer

NIS
Natura Impact Statement

nm
Nautical mile

NMFS
National Marine Fisheries Service

NPWS
National Parks & Wildlife Service

PCI
Project of Common Interest

pNHA
Proposed Natural Heritage Area

PTS
Permanent threshold shift

SAC
Special Area of Conservation

SBP
Sub-bottom profiler

SEL
Sound exposure level

SL
Source level

SPA
Special Protection Area

SPL
Sound pressure level

SSS
Side scan sonar

TEN-E Regulations
Trans-European Network for Energy Regulations

TTS
Temporary threshold shift

UAU
Underwater Archaeology Unit

UK
United Kingdom

VC
Vibrocore

1. INTRODUCTION

The foreshore licence application which this document supports, relates to the Greenlink proposed marine survey works, within the Irish foreshore waters (i.e., up to 12nm). In recognition that some of the consultees e.g. the Underwater Archaeology Unit, will also be interested in the survey route from 12nm to the Irish / UK median line, information about the entire route in Irish waters has been provided.

A separate foreshore licence application will be submitted at a later date for the installation of the subsea marine cables and potentially the deposition of cable protection material (e.g. rock or concrete mattresses).

1.1 PROJECT DESCRIPTION

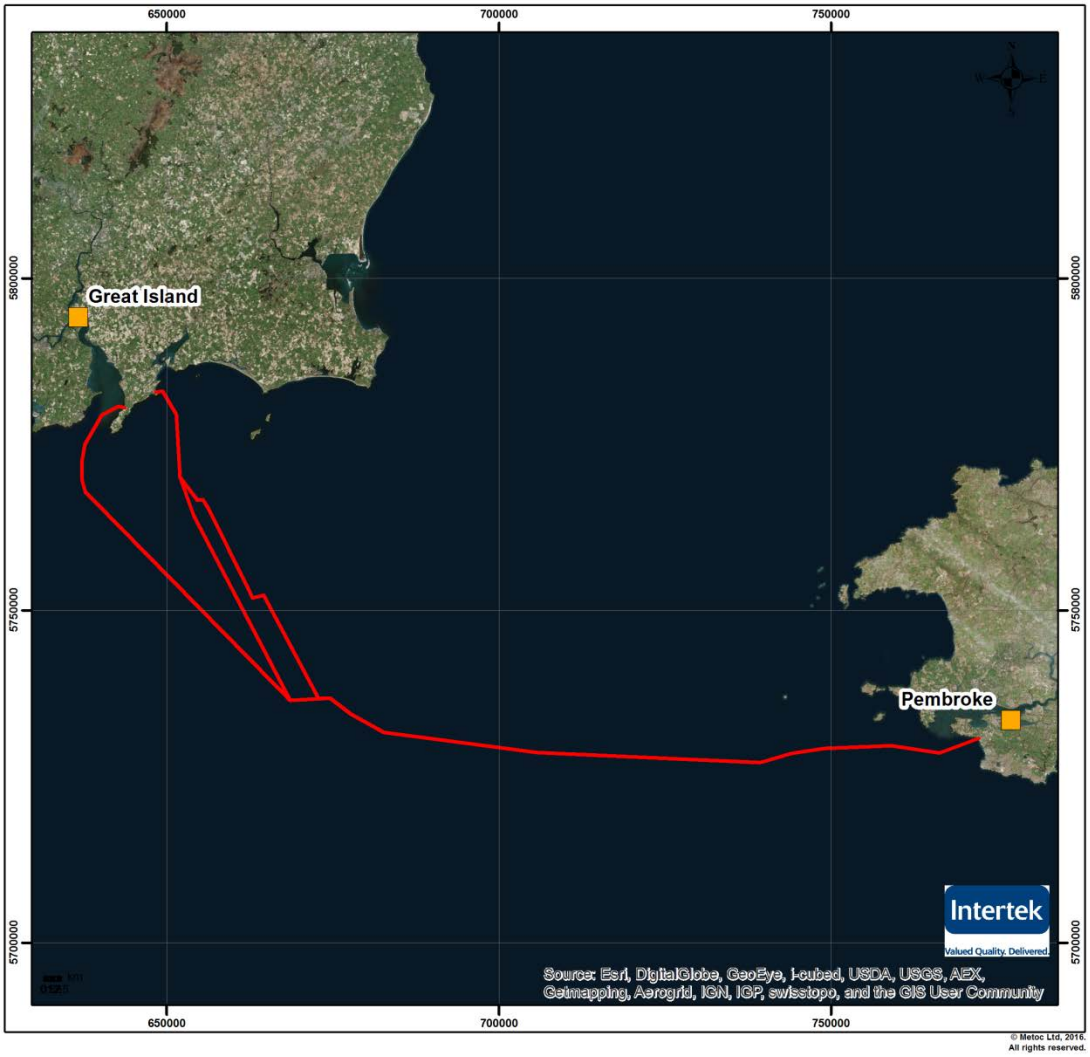
Greenlink Interconnector Limited, trading as 'Greenlink', is proposing to develop an electricity interconnector linking the existing electricity grids in Ireland and the UK. The 'Greenlink' project will consist of two converter stations, one close to the existing substation at Great Island in County Wexford (Ireland) and one close to the existing substation at Pembroke in Pembrokeshire (Wales). The converter stations will be connected by underground cables (onshore) and subsea cables (offshore).

Greenlink will have key strategic importance providing significant additional interconnection between Ireland, the UK and onwards to mainland Europe. It will provide additional transmission network capacities, reinforcing the existing electricity grids in south-east Ireland and south Wales and contributing to each country's strategic interconnection objectives. The development and construction of Greenlink will deliver increased security of supply, fuel diversity, greater competition, and ultimately provide significant benefits to consumers in Ireland, Wales, Great Britain as a whole and mainland Europe.

Greenlink is designated as a European Union Project of Common Interest (PCI project number 1.9.1) under the provisions of European Union Regulation No. 347/2013 on guidelines for Trans-European Network for Energy (TEN-E Regulations) and has successfully applied for funding under the Connecting Europe Facility (CEF).

The proposed marine cable would run from Freshwater West, Pembrokeshire, Wales to the Hook Head Peninsula in County Wexford. Greenlink commissioned Intertek Energy & Water Consultancy Services to develop the marine cable route through a desk based study. The most suitable route will be the shortest and least constrained route. However, there is a balance to be achieved between the length and environmental, technical and economic constraints. The desk based study undertaken made use of publically available survey data available from INFOMAR and involved consultation with the National Parks & Wildlife Service (NPWS) and the Port of Waterford. The outcome was the development of shortlisted marine routes to Baginbun Beach, on the east coast of the Hook Head Peninsula, and Boyce's Bay on the west coast of the Hook Head Peninsula (see Figure 1-1).

Figure 1-1 Greenlink overview (shortlisted routes)



1.2 MARINE SURVEY

Greenlink intend to carry out geophysical, geotechnical and environmental marine surveys of the shortlisted marine cable routes. The objective of the survey campaign is to acquire all appropriate data for the confirmation of a preferred offshore route. This includes: detailed mapping of nearshore shallow geological and seabed character; reconnaissance level mapping of seabed relief and features along offshore sections; and baseline environmental mapping along the entire route corridor. The data would also be used to inform an Environmental Appraisal in support of the cable installation application 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 at a later date to provide a baseline against which to monitor post construction effects of construction/operation/decommissioning.

Data acquisition and coverage requirements are split according to the following survey areas:

- **Nearshore application area**
  - ***Intertidal survey***: from high water mark (HWM) to the charted low water mark (LWM) of each shore landing.
  - ***Shallow water survey:*** from LWM seawards to the first 10m lowest astronomical tide (LAT) water depth.
- **Offshore application area**
  - ***Offshore survey***: Seawards of the first 10m LAT water depth to 12nm limit and onwards to median line.

At each of the shortlisted landfalls i.e. Boyce's Bay and Baginbun Beach, there is the option to install the cable using horizontal directional drilling (HDD). In order to confirm the suitability of the geology for this technique geotechnical boreholes are required within the first 1km of the proposed cable route from the beach. It is likely that boreholes will only be acquired, at the final selected landfall. Landfall selection will partly depend on the results of the geophysical survey and therefore borehole acquisition will be scheduled to take place after geophysical data has been acquired in the nearshore application area.

1.3 SCHEDULE

It is proposed that the marine survey works will be split into five components during the period 01 May 2018 to 31 December 2019.

1. Shallow & offshore geophysical survey – will take 1 month within this period and will start at the earliest on 01 May 2018.
2. Shallow & offshore geotechnical and environmental survey – will take approximately 1 month and will start at the earliest on 01 June 2018.
3. Geotechnical borehole – will take approximately 1 week (per landfall) and will start at the earliest on 01 June 2018.
4. Land/intertidal geophysical survey – walkover survey will take up to one month (maximum two weeks at each landfall) and will start at the earliest on 01 June 2018.
5. Land/intertidal habitat survey – walkover survey will take 1 to 2 days at each landfall and will start at earliest on 01 May 2018.

It is anticipated that all works will be completed within four months during this period, but a contingency until the end of December 2019 has been applied for to account for operational downtime e.g. due to weather, and uncertainty regarding the timing of the project and individual phases.

1.4 FORESHORE APPLICATION AREA

An overview of the entire survey area from landfall out to the Irish / UK median line is presented in Appendix A (Figure A-1: Foreshore Licence Application Area Overview Map). Figure A-2 Foreshore Licence shows the application area within the foreshore. Detailed co-ordinates are also provided in Appendix A.

The actual survey corridors will be approximately 250m wide for the nearshore survey works (approximately the first 4.77km from Boyce's Bay, and 2.4km) and 500m wide for the offshore survey works. The application area is wider than the proposed survey corridor to allow for flexibility in the position of the final survey corridor centre line.

The application (up to the 12nm limit) covers an area of 87.8 km^2; 4.4 km^2 of nearshore and 83.4 km^2 of offshore.

The maximum area of the potential survey corridor from the 12nm to the median line is 95.5 km^2

2. DESCRIPTION OF THE PROPOSED SURVEY WORKS

2.1 SURVEY VESSELS

Dedicated survey vessels will be used which are appropriate to the water depth of the survey area; a vessel with a shallow draft will be utilised for the intertidal and shallow water survey area. The exact equipment to be used will be confirmed following a tender process to procure the survey contractor.

A jack-up barge (JUB) will be used to acquire geotechnical boreholes in the nearshore application area. Exact details of the vessel to be used will not be confirmed until April 2018 (at the earliest). As a worst case it has been assumed that a JUB similar to a Wave Walker, pictured in Figure 2-1, will be used. This is a specially designed JUB for work in intertidal areas. It can use up to eight legs to support the platform, each with a footprint of 2.54m^2. Positioning at the site will be conducted using the on-board positioning aid (e.g. thruster) and is not expected to require the use of a tug vessel; although it is possible that a tug will remain on standby for the duration of the coring operations.

Figure 2-1 *Wave Walker 1 Jack-up barge*

2.2 GEOPHYSICAL SURVEY

2.2.1 SCOPE OF WORK

The geophysical survey will consist of topographic measurements, multi-beam bathymetry, seabed mapping (side-scan sonar), land-based geophysical methods, sub-bottom profiling, and magnetometry.

To ensure full data coverage and overlap with future land survey, it is necessary for the marine geophysical survey to extend above the HWM. Therefore, the intertidal sections of the two landfall

areas require the use of topographic survey with land-based geophysics to continue geophysical interpretation up to 50m landwards of the HWM.

The objectives of the geophysical survey are to:

- Map the seabed and sub-surface to optimise cable routing within the survey corridor and to enable assessment of cable target burial depth along the route(s);
- Plan the scope and positioning of the geotechnical sampling programme in the nearshore area and along the 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 sea bed bathymetry, surface morphology and identify the nature of the seabed sediments - in particular the height, length and slopes of sand waves (topography, bathymetry, side scan sonar);
- Identify the distribution and thickness of superficial sediments and rock head where possible (sub bottom profiling, seismic refraction);
- Identify the distribution of subsea geological features such as areas of exposed bedrock (bathymetry, side scan sonar);
- Identify the location, extent and nature of any impediments to the laying or burial of the cable such as wrecks, debris on seafloor, rock outcrop, other cables, pipelines etc. (magnetometer, bathymetry, side scan sonar); and
- Identify the seabed and sub-seabed conditions along the proposed route(s).

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

The geophysical survey requirements are summarised below:

Table 2-1 Geophysical survey requirements

Zone	Survey Operation	Requirements
Intertidal survey area : HWM to LWM	Land Topographic Survey	10m line interval with in-line measurement distance less than 5 metres.
	Land Refraction Seismic / Sediment Profiling	Three lines; centre line and two equidistant across data corridor. Sediment profiling in-line interval of 5 m.

Zone	Survey Operation	Requirements
	Magnetometer	Hand held metal detector run along all lines of topographic survey along data corridor.
Shallow water survey: LWM to 10m LAT water depth	Multi-beam bathymetry	250m data corridor providing full seabed coverage. Cross lines of 500m length, run at 1km interval. Feature resolution as per IHO S-44 Special Order survey. Vertical corrections to enable soundings transfer to within IHO S-44 Special Order limits.
	Side scan sonar	250m data corridor providing full seabed coverage. Cross lines of 500m length, run at 1km interval. Line spacing to be no more than 50m. Resultant coverage is minimum of 100% insonification of the seabed.
	Sub-bottom profiler	At least one source acquired along all side scan sonar lines.
	Magnetometer	To be used in tandem with and acquired along all side scan sonar lines.
Offshore survey: >10m water depth	Multi-beam bathymetry	500m data corridor providing full seabed coverage. Cross lines of 1000m length, run at 2km interval. Feature resolution as per IHO S-44 Order 1A survey. Vertical corrections to enable soundings transfer to within IHO S-44 Order 1A limits.
	Side scan sonar	500m data corridor providing full seabed coverage. Cross lines of 1000m length, run at 2km interval. Line spacing to be no more than 50m. Magnetometer to be used in tandem with side scan sonar.
	Sub-bottom profiler	At least one source acquired along all side scan sonar lines.
	Magnetometer / gradiometer	To be used in tandem with and acquired along all side scan sonar lines.

2.2.2 TECHNICAL SPECIFICATIONS

The exact technical specifications of equipment to be used will not be known until the survey contract has been awarded in April 2018.

For the purposes of assessment, typical acoustic properties of equipment are provided. The acoustic frequencies given below are indicative. They may change on site if dictated by the ground conditions. However, with regard to noise output, the bathymetric, side scan and sub-bottom profiling systems proposed are characterised by a limited acoustic footprint with the high directional, high frequency, short duration output attenuated within a few hundred metres of the survey vessel.

2.2.2.1 LAND/INTERTIDAL TOPOGRAPHIC SURVEY

A topographic survey will be undertaken to ensure that there is continuous height measurements along the cable route and to delineate hard features that will present an obstacle to cable installation.

The spacing of the topographic lines will be no greater than 25m across the width of the shallow water survey corridor. The in-line spacing of elevation points will be at least such that features can be clearly resolved but no greater than 5m in-line. Where there are hard structures such as seawall defences and exposed areas of bedrock then additional point measurements will be taken with annotation that differentiates these features from elevation points.

2.2.2.2 LAND GEOPHYSICAL SURVEY

The methods required for geophysical investigations will be dependent upon the conditions at landfall locations. Where seismic refraction is not a suitable method, then alternative methods may be used to enable a continuation of the geological interpretation along the intertidal area to a depth of at least 5m below mapped surface.

A geophysical survey (seismic refraction) will be performed along the cable route and on two offset lines spaced equidistant across the data corridor, to provide information on subsurface sediment layers and thicknesses to a depth of 10m.

Seismic refraction may not be suitable if there are areas of exposed bedrock or thin sediment cover along the intertidal area and shore landing. An alternative method for determining sediment thickness is through the use of sediment probing.

2.2.2.3 BATHYMETRY

A hull or tow-fish mounted swathe or multi-beam echo sounder (MBES) system shall be used to provide coherent data across the full width of the survey corridors. The equipment will have the following acoustic properties:

- Frequency range 300-500 kHz with sound pressure levels in the range 200-220dB re 1µPa at 1m.

2.2.2.4 SIDE SCAN SONAR (SSS)

The side scan sonar will be dual frequency hydrographic sonar with a lowest operating frequency of not less than 100 kHz. Due to consent conditions in Irish waters, the higher frequency of the side scan sonar must be between 410 and 500 kHz. Therefore the equipment will have the following acoustic properties:

- Frequency range 100 to 500kHz with sound pressure levels of 228dB re 1µPa at 1m.

2.2.2.5 SUB-BOTTOM PROFILING (SBP)

Two high resolution seismic systems will be used. The high resolution profiler will emphasise the top 3 to 5m of sediment with a resolution of 0.25m or better in a variety of geological conditions. Increased penetration through sand waves of amplitude of up to eight metres is also required. The appropriate systems comprise pinger (either hull or tow-fish mounted), sub-bottom profiler and chirp systems.

Two systems will be made available so that the most appropriate system can be chosen dependent on the seabed conditions. The pinger system will deliver 2 kW output or more and frequency in the range 3.5kHz to 12 kHz. Sound pressure level generated will be 200dB re 1µPa at 1m.

2.2.2.6 MAGNETOMETER

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±0.1nT.

2.3 GEOTECHNICAL SURVEY

2.3.1 SCOPE OF WORK

The purpose of the geotechnical survey is to evaluate the nature and mechanical properties of the superficial seabed sediments and intertidal sediments along the survey corridors.

The exact location and spacing of the geotechnical sampling, within the survey corridor will be determined following interpretation of the geophysical data. Boreholes and trial pits will be used to determine soil conditions in the intertidal zone. Vibrocores (VC) and cone penetrometer testing (CPTs) will be used in the shallow water and offshore survey. VC and CPTs will be acquired at the same or separate locations as determined by review of sub-bottom profile data interpretation.

- Intertidal area (HWM to LWM) – Will require approximately four bore holes (within the first 1km of the route) and three trial pits at each of the two landfalls with a nominal 100m spacing between trial pit sites, and 250m spacing between each borehole. The target depth of boreholes will be up to 25m. Thermal resistivity samples will be taken in the borehole and trial pits.
- Shallow water (LWM – 10m LAT) – A nominal distance of 1000m between each sample is given resulting in a maximum of 6 VCs and 6 CPTs if all routes were surveyed. Target depths for VCs and CPTs will be 3-6 m (some of each).
- Offshore survey (10m LAT – 12nm Limit) – A nominal distance of 1500m between each sample is given resulting in maximum of 48 VCs and 48 CPTs in the application area. As with the shallow water geotechnical scope of work, the target penetration depth for VCs and CPTs will be 3-6 m and will aim to achieve some of each depth.

2.3.2 TECHNICAL SPECIFICATIONS

2.3.2.1 LAND / NEARSHORE GEOTECHNICAL

Depending upon the requirement identified from interpretation of the geophysical data, approximately four boreholes and three trial pits will be required at each of the landfall sites; 4-8 boreholes and 6 trial pits in total. The maximum depth below surface for trial pits will be 5 metres.

Thermal resistivity tests will be performed at each of the locations where boreholes are drilled.

Boreholes will be drilled using cable percussion and a rotary corer. Each borehole will have a seabed footprint of approximately 0.5m^2 and risings of approximately 11m^3 (assuming a borehole depth of

up to 25m) will be dispersed around the drill site as a cuttings pile. 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 28m^2. The borehole will be left to collapse naturally following completion of drilling where the cuttings are likely to fall back down the hole.

Boreholes will be drilled from a JUB as described in Section 2.1. The number of legs used for the operations is dependent on seabed conditions, current strength and wave action. For the application area, four legs are the most likely scenario; however this may be variable with weather conditions.

The total expected seabed footprint of the geotechnical borehole sampling is shown in Table 2-2 below.

Table 2-2 Calculated geotechnical borehole survey footprint

Activity	Seabed footprint (m^2)	
	Per borehole	8 boreholes
Jack-up barge legs (worst case assumes 8 legs deployed)	20.32m^2	162.56m^2
Borehole extraction	0.49m^2	3.92m^2
Drill cuttings	28m^2	224m^2
Total	**48.81m^2**	**390.48m^2**

2.3.2.2 MARINE GEOTECHNICAL

The standard VC shall have a 6m depth capability and a 75 mm nominal core diameter. VC sampling will consist of a sample barrel being vibrated into the ground to recover a sample. A motor sits on top of the barrel which generates a centrifugal force to vibrate the barrel.

The Piezocone penetrometer for CPT shall have a minimum 10 tonne capability and a maximum depth penetration of 6m below seabed. The CPT is undertaken 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.

2.4 ENVIRONMENTAL SURVEY

2.4.1 SCOPE OF WORK

The aim of the environmental survey is to map the distribution and extent of marine benthic habitats in the vicinity of the proposed cable route corridor. In the shallow water and offshore survey areas 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.

Additional sediment samples may be acquired for later chemical analysis to determine the concentration of potential pollutants.

The final scope of the environmental survey is dependent upon the diversity of benthic habitats. The programme and base scope is based upon site intervals given below.

- Shallow water: Use of grab sampling and still or video camera. Grab samples will be collected as required for aiding side scan sonar interpretation.
- Offshore: Sampling intervals will be nominally every 5km. Use of grab sampling and still or video camera.

For the land / 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.

2.4.2 TECHNICAL SPECIFICATIONS

2.4.2.1 SHALLOW WATER AND OFFSHORE SURVEY

The grab will be used for collection of sediment samples for analysis of benthic infauna, particle size, total organic carbon and anthropogenic contaminants.

At each station up to two grab samples (sample volume approximately $0.1m^3$) will be required.

- One sample will be used for faunal analysis (sample collected nominally every 5km).
  - Identification and quantitative analysis of benthic fauna – colonial and epifaunal species will be recorded qualitatively
- One sample will be used at locations where chemical and sediment analysis is required (sample collected nominally every 10km).
  - Particle size analysis and distribution
  - Sediment organic matter and carbon analysis
  - Major trace element analysis
  - Hydrocarbon analysis

Grabs are required to be more than 5cm in depth of sample and sampling to achieve this will be repeated for up to three attempts.

2.4.2.2 INTERTIDAL SURVEY

On areas with a predominantly sedimentary benthic habitat, a 50x50m grid of points will be overlaid on aerial imagery within the survey corridor. Each of these points is a target for taking notes on the predominant habitat and visible flora and fauna. Biotope identification will be supported by sieving a small amount of sediment in situ to examine infauna.

Where rock is the predominant habitat, and aerial photography is sufficient to identify habitats, a wireframe map will be created alongside the target points. This digital map will be taken into the

field and polygons annotated with biotope classifications. Features of interest (e.g. rock pools) will be waymarked on a hand-held GPS, the biota described and photographs taken.

Surveys are typically carried out two hours either side of low water, on a spring tide to maximise the area that can be surveyed.

2.5 NOISE SOURCES FROM PROPOSED SURVEY

A survey contractor has yet to be appointed, however survey equipment typically operates within the ranges outlined in Table 2-3.

Table 2-3 Survey sound pressure levels

Source of noise	Frequency (kHz)	Sound Pressure Level (dB re 1µPa @ 1m)
Swathe or Multi-beam echo sounder	300 – 500, **300**	200 – 220, **220**
Side scan sonar	100 – 500, **100**	228
Pinger or Chirp system	3.5 – 12, **3.5**	200
Geotechnical borehole (rotary corer)	1 – 200*, **100**	90*
	1 – 600**, **300**	191**

*Data sources: * ICOE (2010), ** DAHG (2014), **Bold** = worst case*

*Where a range of values is provided, the value modelled for the marine mammal risk assessment (see Section 4.5.1) is the worst case (indicated in **Bold**).*

2.6 ADDITIONAL ASSESSMENT TO INFORM SELECTION OF SAMPLE LOCATIONS

Early consultation with NPWS and DAHG - Underwater Archaeology Unit has identified two areas of sensitivity that the intrusive survey works programme must consider: areas of stony and biogenic reef and archaeological sensitive features. We are also aware that the Geological Survey of Ireland are conducting assessment of the region and may identify areas of sensitive geology.

Biogenic reef

Prior to any intrusive survey works the geophysical data will be used to identify any potential areas of biogenic or stony reef. Intrusive sampling of this habitat will be avoided, with drop down cameras being used to assess extent of coverage if necessary.

Archaeology

A desk top study will be carried out by a suitably qualified archaeologist to determine the location of all known archaeological features in advance of the intrusive geotechnical and environmental survey. It is also proposed that the archaeologists will carry out walk over surveys at each landfall.

The results of the geophysical survey, archaeology desk top study and site walkover will be interpreted to inform the location of geotechnical and environmental grab samples. The results of

these assessments will be used to ensure that sampling and positioning of the jack-up barge for geotechnical borehole acquisition avoids the following:

- Archaeological sensitive features or artefacts
- EC Habitats Directive Annex I reef features.

3. ENVIRONMENTAL CONSIDERATIONS

An understanding of the potential impacts from an operation on the environment requires a clear understanding of the present state of the environmental baseline. For the purposes of this report this section focuses on the environmental receptors which have the potential to be impacted by the planned survey.

3.1 INTERTIDAL AND BENTHIC COMMUNITIES

Intertidal and benthic ecology comprises the habitats and species (flora and fauna) present in, on or closely associated with the seabed. A high level assessment of the key sensitive intertidal and benthic habitats and species within the application area has been made by reviewing the following desk based data sources:

- European Nature Information System (EUNIS) Habitats 2012 – Compiled by JNCC on behalf of MESH using existing studies and survey data
- Marine European Seabed Habitat (MESH) Predicted EUNIS Habitats 2008 GIS Data – Modelled predicted habitats based on physical hydrographic information within different habitats areas and water depths.

The MESH project has collated studies and survey data to map EUNIS habitats present on the seabed of north-west Europe. This data is predictive rather than definitive however it does provide some indication to the types of benthic habitats that may be found within the application area. The EUNIS habitats identified within the survey corridor (including the EEZ to the UK /Irish median line) are listed in Table 3-1 below.

Table 3-1 EUNIS Habitats present within the proposed cable route

EUNIS Code	EUNIS Name	Biotope	Typical Fauna
A3.1	Atlantic and Mediterranean high energy infralittoral rock	IR.HIR	Typically the rock supports a community of kelp *Laminaria anaceaean* with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement. The sublittoral fringe is characterised by dabberlocks *Alaria esculenta*.
A4.1	Atlantic and Mediterranean high energy circalittoral rock	CR.HCR	Sponges such as *Pachymatisma johnstonia*, *Halichondria anacea*, *Esperiopsis fucorum* and *Myxilla incrustans* may all be recorded. Characteristic of this habitat complex is the dense 'carpet' of the hydroid *Tubularia indivisa*. The barnacle *Balanus crenatus* is recorded in high abundance on the rocky substrata. On rocky outcrops, *Alcyonium digitatum* is often present.
A5.13	Infralittoral coarse sediment	SS.SCS.ICS	Such habitats found on the open coast or in tide-swept marine inlets are characterised by a robust fauna of infaunal polychaetes such as *Chaetozone setosa* and *Lanice conchilega*, cumacean crustacea such as *Iphinoe trispinosa* and *Diastylis bradyi*, and

EUNIS Code	EUNIS Name	Biotope	Typical Fauna
			venerid bivalves. Habitats with the lancelet *Branchiostoma lanceolatum* may also occur.
A5.14	Circalittoral coarse sediment	SS.SCS.CCS	This habitat, as with shallower coarse sediments, may be characterised by robust infaunal polychaetes, mobile crustacea and bivalves. Certain species of sea cucumber (e.g. *Neopentadactyla*) may also be prevalent in these areas along with the lancelet *Branchiostoma lanceolatum*.
A5.23	Infralittoral fine sand	SS.SSa.IFiSa	The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (*Bathyporeia*) and robust polychaetes including *Nephtys cirrosa* and *Lanice conchilega*.
A5.25	Circalittoral fine sand	SS.SSa.CFiSa	The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the pea urchin *Echinocyamus pusillus*), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community.

Source: EUNIS (2012)

The inshore area around the Duncannon coast and Hook Head Peninsula is characterised by areas of rocky reef, shoals and sandbanks creating areas of varied depth and water patterns. This coast is subject to wave action and strong tidal streams. The Hook Head Special Area of Conservation (SAC) comprises marine subtidal reefs to the south and east of the Hook Head Peninsula and sea cliffs from Hook Head to Baginbun and Ingard Point. The substrate around the Hook Head Peninsula gives rise to a range of benthic fauna. This is partly due to the strong tides and water currents which bring new supplies of food and nutrients. Invertebrates living in or on the seabed include the pea urchin *Echinocyamus pusillus* and certain species of sea cucumber (e.g. *Neopentadactyla*).

An exposed to moderately exposed reef community complex occurs around Hook Head. Subtidally the reefs are aligned in a north-east/south-west orientation and are typically strewn with boulders, cobbles and patches of sand and gravel. There are also a number of isolated reefs that project from a sand plain. The reefs present a high species richness with *Laminaria* dominated communities in shallower waters. The deeper waters consist of Echinoderm and sponge dominated communities characterised by cushion sponges, branching sponges and the rose coral *Pentapora foliacea*. The rare red algae *Schizymenia dubyi* also occurs (NPWS 2016).

At Boyce's Bay, the seabed is generally described as gravelly sand; with muddy sandy gravel and rock at Baginbun. After approximately 60m depth, the seabed becomes mainly sand for the remainder of the application area.

Boyce's Bay lies on the eastern side of Waterford Harbour; with the River Barrow and River Nore SAC estuary lying upstream. Extensive areas of good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour extending for over 6km from north to south between Passage East and Creadaun Head. The SAC also consist of an extensive area of

Sabellaria alveolata adjacent to Duncannon, on the eastern shore of the estuary. This reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sands and grains, in tightly packed masses with a distinctive honeycomb-like appearance. These structures can be up to 25cm in height and can form sheets or massive formations. The reefs support a range of biodiversity and increase species richness within the area. Associated species include: *Enteromorpha* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Chondrus crispus*; *Polysiphonia* sp.; *Coralinus officialus*; *Nemertea* sp.; *Actinia equine*; *Patella vulgata*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis* (NPWS 2016).

Habitat maps of the Hook Head SAC were obtained from NPWS and used in the design of the cable route centre lines. The shortlisted marine routes have been routed to avoid areas of reef habitat as illustrated in Appendix B.

3.2 PROTECTED SITES

The application area is adjacent to a number of protected sites. These are summarised in Table 3-2 and their position relative to the application area illustrated in Appendix C.

Table 3-2 Protected sites within 10km of application area

Area Type	Site Code Name
SAC	**000764 Hook Head**
SAC	**002162 River Barrow and River Nore**
SAC	**000697 Bannow Bay**
SPA	**004033 Bannow Bay**
Ramsar	**000840 Bannow Bay**
SPA	**004118 Keeragh Islands**
SAC	**000707 Saltee Islands**
SAC	**000696 Ballyteige Burrow**
SPA	**004020 Ballyteige Burrow**
SAC	**000671 Tramore Dunes and Backstrand SAC**
SPA	**004027 Tramore Backstrand SPA**
NHA	000703 Keeragh Islands
pNHA	000787 Waterford Harbour
pNHA	000664 Dunmore East Cliffs
pNHA	000697 Bannow Bay
pNHA	000764 Hook Head
pNHA	000659 Belle Lake
pNHA	000671 Tramore Dunes and Backstrand
pNHA	000695 Ballyhack
pNHA	000711 Tintern Abbey

Area Type	Site Code Name
pNHA	000696 Ballyteige Burrow
pNHA	001738 Duncannon Sandhills

Natura 2000 sites i.e. Special Area of Conservation SAC and Special Protection Area SPA, highlighted in bold. pNHA: proposed Natural Heritage Area

In accordance with the provisions of Article 6(3) of the EC Habitats Directive (92/43/EEC), Screening for Appropriate Assessment (Stage 1) has been undertaken for Natura 2000 sites and a Stage 1 Report / Screening Determination is included as Appendix E.

3.3 FISH

The proposed survey is to be undertaken within the spawning and nursery grounds and spawning and nursery periods for fifteen species of fish, including an area defined by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) as where herring could be spawning. A summary of spawning and nursery periods for commercially important fish species that intersect with the application area is outlined below in Table 3-3. Appendix D illustrates the grounds in relation to the application area.

It should be noted that maps for horse mackerel and sole have not been included in Appendix D. The spawning grounds for sole are outside of the 12nm limit covered by the foreshore licence, but still within Irish waters.

The delineation of the horse mackerel nursery grounds in Ellis et al. (2012) appear to be limited by the extent of the survey used to inform the mapping. Catches of horse mackerel <8cm in total length in groundfish surveys are widespread and within the vicinity of the application area. Therefore, it has been assumed that juveniles of the species are likely to be present.

Table 3-3 Summary of spawning and nursery periods for commercially important fish species within the application area.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N				
Blue Whiting				N	N	N	N	N				
Cod	SN	SN*	SN*	SN	N	N						
European Hake	N	N	N	N	N	N	N	N				
Herring	S	S	S									
Ling		N	N	N	N	N	N					
Horse mackerel			N	N	N	N	N	N	N	N		
Mackerel			SN	SN	S*N	S*N	SN	N	N			
Nephrops	SN	SN	SN	SN*	SN*	SN*	SN	SN	SN	SN	SN	SN

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Plaice	S*	S*	S									S
Sandeel	N	N									N	N
Sole			S	S*	S							
Sprat					S*	S*	S	S				
Lemon Sole				SN	SN	SN	SN	SN	SN	N	N	
Whiting		N	N	N	N	N	N	N	N	N		

*S = Spawning, N = Nursery, SN = Spawning and Nursery, Blank = No Data, *peak spawning.*

Source: Coull et al. 1998; Ellis et al. 2012. Red text represents the survey period.

Sea lamprey, river lamprey, twaite shad and Atlantic salmon are listed as designated features of the River Barrow and River Nore SAC. All are migratory species that may be found in the application area at certain times of the year:

- Sea lamprey – late April to early June
- River lamprey – September to June
- Twaite shad – April onwards
- Atlantic salmon – May to June and autumn months.

The Boyce's Bay marine route lies within the Waterford Harbour Shellfish Waters and the Baginbun Beach marine route lies 3.5km to the south of the Bannow Bay Shellfish Water.

3.4 BIRDS

The coastal sea cliffs, estuaries and offshore islands of Ireland are host to a number of nationally and internationally important bird species, with many areas designated as Special Protection Areas (SPAs) or SACs. Coastal habitats provide important breeding sites for many species of seabirds, a number of which are protected under national and European legislation.

At least 45 species of seabird (including divers and grebes) have been recorded during at-sea surveys in Irish waters, of which 23 species regularly breed around Ireland (Pollock et al 2007, Mackey et al 2004). In addition, a further 59 species of waterfowl and wader regularly occur at coastal sites such as estuaries around Ireland; including 5 grebe species, 2 heron species, 26 species of wildfowl and 26 wader species (Crowe 2005). Some of these species are migratory, and are present only during migration periods in spring and autumn; others come to Ireland to breed or to spend the winter, while some are resident all year round.

The application area lies within the Hook Head SAC. The cliffs within this site are of ornithological interest for breeding red-billed chough (*Pyrrhocorax pyrrhocorax*), raven (*Corvus corax*) and peregrine (*Falco peregrinus)*, and there is a small seabird colony, mainly of guillemots, near Baginbun. The seacliffs from Creadan Head to Dunmore East within close proximity to Boyce's Bay hold breeding seabirds including razorbills (*Alca torda*) and kittiwakes (*Rissa tridactyla*). The kittiwake colonies around Dunmore East are present almost all year round.

The application area lies in close proximity to several protected sites important for seabirds:

- **Saltee Islands SAC/SPA** – The Saltee Islands are internationally important for holding an assemblage of over 20,000 breeding seabirds. The nationally important gannet colony on Great Saltee has been well documented since its establishment in the 1920s and 2,446 pairs were present in 2004. The following species have populations of national importance: fulmar, cormorant, shag, lesser black-backed gull, great black-backed gull, herring gull, kittiwake, guillemot, razorbill, manx shearwater, chough, and puffin.

  Keeragh Islands SPA/NHA – The islands have a nationally important breeding colony of cormorant, which is considered to be one of the largest in the country. In winter the islands are a refuge and night roost for flocks of brent goose and for ducks, notably mallard and wigeon with smaller numbers of teal and shoveler.

- **River Barrow and Nore SAC –** The site is of ornithological importance for a number of EU Birds Directive Annex I species, including Greenland white-fronted goose, whooper swan, Bewick's swan, bar-tailed godwit, peregrine and kingfisher. Nationally important numbers of golden plover and bar-tailed godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by swallows before they leave the country. The reedbed at Woodstown supports populations of typical waterbirds including mallard, snipe, sedge warbler and water rail.
- **Bannow Bay SAC/SPA/pNHA** – Most of the estuary has been designated a SPA because of its significant bird interest, particularly during the winter. Large numbers of wintering wildfowl and waders feed on the mudflats and sandflats, and use the fringing vegetation of reedbed and saltmarsh for roosting and feeding. Important species include: little tern, light-bellied brent goose, shelduck, pintail, golden plover, lapwing, knot, dunlin, black-tailed godwit, bar-tailed godwit, redshank and heron.
- **Ballyteige Burrow SAC/SPA** – It is a major site for wintering waterfowl, with an internationally important population of brent goose and a further six species with populations of national importance.

3.5 MARINE MAMMALS

Marine mammals present in the survey area are restricted to cetaceans (whales, dolphins and porpoises) and pinnipeds (seals). All cetaceans are European Protected Species (EPS) protected under Annex IV of the EC Habitats Directive (92/43/EEC), which lists species of Community Interest in need of strict protection. It is an offence to deliberately capture, kill, injure or disturb animals classed as EPS.

Harbour porpoise, bottlenose dolphin, grey seal and common/harbour seal are listed under Annex II of the Habitats Directive, which lists species whose conservation requires designation of SAC.

3.5.1 CETACEANS

Of the 24 species of cetacean recorded in Irish waters, approximately 11 of these have been recorded off the east coast and may be present in the offshore survey area at least on a seasonal

basis (Table 3-4). However, it is unlikely that deepwater species such as the blue whale, fin whale and long-finned pilot whale will be present.

Table 3-4 Cetacean species potentially in the application area

Species	Information	Frequency of sightings
Toothed whales (odontocetes)		
Harbour porpoise *Phocoena phocoena*	Common around the entire Irish coast and present year round. Known to breed in Irish waters.	Common from June through the autumn/winter. Peak period in August.
Bottlenose dolphin *Tursiops truncatus*	This species is often associated with coastal areas, but an offshore population is also considered to be continuously distributed along Ireland's Atlantic Margin. Known to breed in Irish waters.	Common year round but most frequent in summer.
Common dolphin *Delphinus delphis*	One of the most commonly recorded species of cetacean in Irish waters, and is found throughout the Irish Atlantic Margin. Known to breed in Irish waters.	Peak period is spring and summer and winter peak on the south coast associated with prey items.
Striped dolphin *Stenella coeruleoalba*	Not common in Irish waters, although a number of sightings occur each year, most notably in offshore waters off the southwest coast.	Most frequent in summer and early autumn months.
Risso's dolphin *Grampus griseus*	Found year round in Irish waters, perhaps moving inshore in the summer months. Prefer deep offshore waters, although they can be seen close inshore around the Irish coast. Known to breed in Irish waters.	Peak period in April - Sept
Atlantic white-sided dolphin *Lagenorhynchus acutus*	Predominantly recorded in waters overlying the continental slope, generally not recorded with regularity in coastal waters. Known to breed in Irish waters.	Summer months
White-beaked dolphin *Lagenorhynchus Albirostris*	Generally found in offshore waters off the Irish west coast along the shelf edge, and on the continental shelf, also on the southwest and south coast occasionally coming close to shore. Known to breed in Irish waters.	More regular in late summer – autumn
Long-finned pilot whale *Globicephala melas*	This species is often associated with offshore areas, and predominantly recorded in waters over 1000 m in depth. Known to breed in Irish waters.	Most frequent between April and September
Baleen whales (mysticetes)		
Minke whale Balaenoptera acutorostrata	Widely distributed around Ireland and throughout the Irish Atlantic Margin mainly on the shelf, from the shelf-edge to the coast. Commonly recorded.	Peak period May - September

Species	Information	Frequency of sightings
Blue whale Balaenoptera musculus	Few sightings, although acoustic monitoring has confirmed that blue whales are present in small numbers throughout the year. Migrate annually along the western seaboard.	Unclear, but thought that Nov – Dec might represent peak time.
Fin whale *Balaenoptera physalus*	The annual movements of fin whales are not well understood, although acoustic surveys show the species may be detected throughout the year. Annual migration along western seaboard.	Unclear, contradictory evidence with sightings during summer months, and acoustic monitoring data suggest a peak in November - December.

Source: Irish Whale and Dolphin Group (2014), Species Information Available at: http://www.iwdg.ie/index.php

There are no SACs designated for cetaceans within 50km of the application area. However there is a possibility that harbour porpoise from the West Wales Marine pSAC, which lies in UK waters, approximately 35km from the median line may be visitors to the survey area. The closest Irish SAC noted for cetacean is the West of Connacht SAC on the West coast of Ireland, approximately 500km west of the survey area (measured around the coast). As marine mammals are increasingly considered within their management units (NPWS 2009), which include shelf waters, it is possible that harbour porpoise from the West of Connacht SAC may be occasional visitors to the application area.

3.5.2 PINNIPEDS

Two species of seal are resident within Irish waters - grey seals (*Halichoerus grypus*) and harbour (or common) seals (*Phoca vitulina*).

Grey seals use the area of the Saltee Islands SAC (<10km east of the Baginbun marine route application area) as one of the very few breeding grounds in eastern Ireland. The breeding population was estimated at 571-744 individuals in 2005. A one-off moult count in 2007 gave a figure of 246 individuals. Pupping time occurs primarily from August through to December. After three weeks the pups moult with adults congregating in large numbers on beaches between December and February to moult. This species is a primary feature for the designation of the Saltee Island SAC (NPWS 2013).

The harbour seal is widespread around the shores of Ireland, but population density varies greatly from place to place with low numbers at many sites. Sightings of the harbour seal within the application area are thought to be infrequent.

4. POTENTIAL IMPACTS & MITIGATION

This section describes the potential impacts that the proposed survey could have on the environment. If necessary and appropriate, mitigation measures have been proposed to reduce the significance of potential impacts to a level that is as low as reasonably practicable.

4.1 INTERTIDAL AND BENTHIC COMMUNITIES

4.1.1 POTENTIAL IMPACTS

4.1.1.1 DIRECT LOSS OR DISTURBANCE OF BENTHIC HABITATS AND SPECIES

Temporary substratum loss and direct displacement of sediment is a direct impact during geotechnical survey. During the geotechnical, environmental and borehole survey, small areas of the seabed will be removed for investigation.

Geotechnical borehole sampling will involve the removal of up to four deep sediment and rock cores at each of the landfalls sites (8 in total); each with a surface footprint of approximately 0.5m^2. A small cuttings pile created from drill risings will form around the borehole which could cover an area of seabed approximately 32m^2 per sample location. Following completion of the drilling, the borehole will be left to naturally backfill with seabed sediments and cuttings material. Placement of the JUB legs on the seabed is expected to cover a maximum of 20.32m^2 per borehole.

As discussed in Section 3.1, an exposed to moderately exposed reef community complex occurs around the Hook Head peninsula supporting excellent examples of tide-swept communities with high species richness (NPWS 2016).

The survey corridor to Baginbun Beach will pass through the Hook Head SAC. The survey corridor to Boyce's Bay for the most part skirts the edge of the SAC but passes within its south-westerly corner for a short distance. The reefs, a designating feature of the site, are potentially vulnerable to the geotechnical operations. The application area in relation to the boundary of the SAC and the designated habitats is presented in Appendix B. The survey centre line has been designed to avoid the designated reef features as mapped by NWPS. The geotechnical boreholes will be acquired within the nearshore application area, which does not overlap with the reef features and therefore the boreholes will not impact on the reef features.

Within the nearshore application area, sediments are predominantly sandy. The geotechnical sampling programme will create small depressions (from the JUB legs) and mounds (from risings) on the seabed. Given the region is subject to strong tidal streams and swells, any mounds or depressions created during sampling are likely to be quickly dispersed and infilled following rig removal. All benthic communities in the footprint of sampling equipment, and in their immediate vicinity, will be impacted through substratum loss, direct displacement or smothering during sampling. However, softer sediments such as those found at the two landfall sites are highly recoverable to disturbance and typical species are able to recolonize rapidly.

The impact of geotechnical sampling on the sensitive reefs in the area will be minimal as effects from sampling will be extremely localised with disturbance not expected to have any significant impact to the wider population of benthic fauna or the protected site.

4.1.1.2 SMOTHERING OF SPECIES THROUGH SUSPENDED SEDIMENT DISPERSION AND DEPOSITION

As the borehole is drilled and the core extracted, a small amount of sediment is likely to be suspended. The resultant suspended sediment dispersion and deposition are unlikely to have any significant smothering effect on the surrounding marine environment due to the extremely small volume of material extracted and the localised footprint.

The geotechnical boreholes will be positioned close to shore (within a kilometre). This coast in this region is subject to wave action and strong tidal streams. The suspension and deposition levels resulting from the survey are likely to be within storm background levels for the area and will not have a significant impact to the conservation objectives of the habitats or species within the Hook Head SAC.

4.1.1.3 RISK TO HABITATS AND SPECIES FROM EXPOSURE TO NON-NATIVE SPECIES FROM BALLAST WATER DISCHARGE

Since the introduction of steel hulled vessels around 120 years ago, water has been used to stabilise vessels at sea. Ballast water is pumped in to a vessel to maintain safe operating conditions throughout a voyage (IMO 2011). The multitude of marine species carried in ships' ballast water may pose ecological problems as transferred species may survive a voyage and be discharged at a destination. They may establish a reproductive population in the host environment, and become invasive non-native species (INNS) and may out-compete native species.

The JUB may utilise ballast water to provide sufficient stabilisation in transit and while operating. All vessels used during the survey operate within the Northern European inshore area and will have been antifouled prior to mobilisation for these works and therefore do not pose a significant risk to introduction of INNS to the application area.

4.1.2 MITIGATION

Geotechnical boreholes will only be undertaken in the nearshore application area and therefore will not affect the reef habitats in the Hook Head SAC.

Biotope maps of the Hook Head SAC have been used in the design of the route to ensure, where possible, sensitive reef features are avoided.

To ensure any impacts on the designated features of the Hook Head SAC are reduced to as low as practicable, the geophysical data will be used to identify potential reef and priority habitats prior to locating offshore geotechnical (e.g. CPT and VC) and environmental sampling. Drop down camera will be used to visualise the seabed prior to environmental sampling to ground truth geophysical interpretation. Geotechnical and environmental sampling sites will not be positioned on reef features.

Deployment of equipment on the seabed will be kept to a minimum in order to minimise loss and disturbance of features of conservation interest.

JUB will follow IMO ballast water management guidelines and/or European interim strategies (prior to the entry into force of the International Convention for the Control and Management of Ships'

Ballast Water and Sediments (IMO 2004)), developed to reduce the risk of the introduction of non-native species into the marine environment.

4.2 PROTECTED SITES

4.2.1 POTENTIAL IMPACTS

4.2.1.1 POTENTIAL TO ADVERSELY AFFECT THE CONSERVATION OBJECTIVES OF THE SITE

The AA Screening, Appendix E, concluded that no Natura 2000 sites had the potential to be significantly affected by the survey activities once mitigation measures have been applied.

4.2.2 MITIGATION

The mitigation proposed for individual receptors e.g. benthic communities, fish and marine mammals is appropriate for managing potential impacts on the conservation features of protected sites in the area. No additional mitigation is proposed.

4.3 FISH

4.3.1 POTENTIAL IMPACTS

4.3.1.1 DISTURBANCE / INJURY FROM UNDERWATER NOISE

The survey operations will generate noise from a variety of sources, including: vessel activity; side scan sonar; multi-beam echosounder; sub bottom profiler; core sampling; and VC and CPT sampling.

Potential effects on fish from anthropogenic sounds ranges from: behavioural changes, such as moving towards or away from a sound source or leaving a feeding or breeding site and increased stress; through to temporary impacts such as temporary hearing loss and the masking of biologically relevant sounds; and in extreme cases (where intense sound sources are used such as explosives and 3D seismic surveys) injuries that might either directly result in death or make the fish vulnerable in the short term.

Longer lasting sounds, such as those associated with shipping noise, cause a general increase in low frequency background noise (<1kHz). Some marine fish can produce and detect noise, and while not fully understood, this is thought to be associated with alarm calls and social behaviour, and studies have found that an increase in background noise can cause an avoidance or attraction reaction in fish (Thomsen 2006).

Fish ability to hear noise is dependent on their hearing structures, which indicate their sensitivity to sound. High sensitivity hearing species (including herring and sprat) have specialisations of the auditory apparatus; medium sensitivity species (including salmon and cod) have a swim bladder; and low sensitivity species with no swim bladder include flat fish such as plaice and dab (Nedwell et al 2004). There is also potential for some fish and shellfish species to be vulnerable to acoustic survey activities during sensitive life stages, for example during the egg and larvae development stages.

All SAC's within 40km of the application area have been screened for the presence of Annex II migratory fish species as designating interest features, in recognition that as mobile species fish could potentially enter the application area during the proposed survey. It is possible that the following species are likely to be within or moving through the application area at certain times of the year:

- Sea lamprey – late April to early June
- River lamprey – September to June
- Twaite shad – April onwards
- Atlantic salmon – May to June and autumn months.

Of these four species, only Atlantic salmon have swim bladders which are connected to their auditory apparatus and are therefore sensitive to underwater noise. Consultation with NPWS (per coms David Lyons) confirmed that Twaite shad will be on the move up-estuary in April and that the survey would not present a barrier to migration

Most noise from the proposed geophysical survey is likely to be generated at frequencies above the auditory capacity of fish (generally between 0.2Hz to 1kHz). Sound pressure is detected by species in the high and medium sensitivity as a pulse of energy. In the relatively noisy coastal environment, fish are habituated to the predominant low frequency noises arise from sources such as wave action as well as certain anthropogenic inputs (moderate levels of vessel activity associated with ports within the Irish Sea, together with wider traffic throughout the Irish Sea). Impacts to fish are therefore only expected if they are within the immediate zone of ensonification.

It should be noted that the noise source and potential impact zone that is present during the proposed survey as well as being limited in range is also moving slowly in a constant direction (in the order of 1 m/s) along the principal survey line orientation. It is also expected that any fish species susceptible to stress and within range of the potential noise impact would be able to maintain adequate separation.

Any loss of individuals (adults or juveniles) within the immediate area of the survey vessel is considered to be unlikely, and given the wider geographic extent of the spawning and nursery areas, there is considered to be no significant impact to fish species.

Small scale geotechnical drilling activities have been found to operate approximately at 10dB above background noise (ICOE 2010). Fish species do not have set sound exposure level criteria for the measurement of hearing threshold shifts and the specific zone of impact is therefore difficult to define. Drilling operations are not continuous and studies indicate that if pelagic fish are within 7.5m of the geotechnical drill site (drilled through rock) when operations begin, may experience barotraumas to the swim bladder. This would reduce the fish's ability to survive in the environment (ICOE 2010). However, the likelihood of pelagic fish (including salmon) being within the shallow waters and zone of ensonification of the drill site (due to the increase in localised disturbance from support and survey vessels prior to drilling) is extremely low.

Fish will avoid the operational area once operations have started and are extremely unlikely to move towards the sound source. Therefore it is extremely unlikely that fish will experience significant impact other than temporary displacement from the immediate area surrounding the survey activity.

4.3.2 MITIGATION

The NPWS has confirmed that no specific mitigation would be necessary for the Annex II fish species in the SACs in the area (pers coms David Lyons).

4.4 BIRDS

4.4.1 POTENTIAL IMPACTS

4.4.1.1 DISTURBANCE FROM PHYSICAL PRESENCE OF JUB, SURVEY VESSELS, PERSONNEL AND EQUIPMENT.

The additional activity in the region during the proposed surveys (both at the beach and in the foreshore area) may disturb birds in the vicinity which use the area for feeding, loafing and breeding.

Disturbance can lead to a number of physiological and behavioural responses which can affect demographic characteristics of the population. Responses to disturbance can result in: loss of energy; impaired breeding; unrest through increased vigilance; and disruption to incubation leading to increased nest failures due to predation and nest abandonment (Valente et al. 2011).

The extent to which a seabird responds to disturbance is dependent upon a number of factors including: period of breeding cycle during which disturbance occurs; duration, type and intensity of the disturbance; presence of opportunistic predators; and the degree of habituation with the disturbance (Showler et al. 2010). Some seabirds are more resilient to disturbance than others.

Whilst birds present on the surface waters in the vicinity of the survey vessel could be temporarily displaced from their chosen feeding/resting location, they are likely to readily move to another nearby location. Given the short duration of the operations with the vessel moving steadily forward along the survey route, any disturbance at a given location is likely to be minimal and given shipping activity is moderate in the region, disturbance is unlikely to be felt against background levels. Therefore, most birds are unlikely to be significantly impacted by disturbance.

The birds most vulnerable to disturbance would be any nesting birds in the immediate vicinity of the survey works during the breeding season. Disturbance to nesting birds due to vessel presence, could have an impact on the success rate of the breeding population. The zone of impact of disturbance on nesting birds (notably guillemots, razorbills and kittiwake) is considered to be up to approximately 2km surrounding the application area (NE/JNCC 2012). Relevant Natura 2000 sites are considered to be SPAs which support breeding birds within approximately 2km of the survey corridor. Therefore, all SPAs within this distance were screened for nesting birds as part of the Appropriate Assessment Screening presented in Appendix E.

The licence application applies for consent to carry out the survey between May 2018 and December 2019. In reality, it is expected the survey will be complete by the end of August. The AA screening concluded that the likelihood of breeding birds being present in the area during the survey was very low as the closest designated site, Bannow Bay SPA (1.6 km from Baginbun Beach) is not designated for breeding birds.

4.4.2 MITIGATION

Disturbance from the marine survey will be transient and take place against a background of existing sources of disturbance such as other vessels/ recreational boating and fishing activities. No mitigation is proposed.

4.5 MARINE MAMMALS

4.5.1 POTENTIAL IMPACTS

4.5.1.1 DISTURBANCE / INJURY FROM UNDERWATER NOISE

The geophysical survey includes the use of multi-beam echo-sounders (MBES), side scan sonar (SSS) and sub bottom profilers (SBP). One of the most important environmental concerns related to the proposed activities is the potential effects of underwater sound on marine mammals. Both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication and hunting (Richardson et al, 1995). It is generally accepted that exposure to anthropogenic sound can induce a range of effects on marine mammals. These range from insignificant impacts to behavioural changes, and also include non-injurious type effects including masking of biologically relevant sound signals, such as communication signals. In very severe cases, underwater noise can cause physical injury or death of an animal.

NPWS has indicated that the intertidal and shallow water survey is within an embayment. This heightens the concern as animals are restricted by water depth and coastal geography and may not be able to avoid the proposed operations as they would do in open water.

In order to evaluate the potential of the proposed survey to cause harm to marine mammals, an assessment has been conducted using both the Southall et al. (2007) approach and the recently published NMFS (2016) approach. Both approaches separate marine mammals into five groups based on their functional hearing, namely: low frequency cetaceans; mid frequency cetaceans; high frequency cetaceans; pinnipeds in water; and pinnipeds in air. Table 4-1 identifies the auditory groups for the species likely to be present during the proposed survey.

Table 4-1 Marine mammal functional hearing categories

Group	Low frequency cetaceans	Mid frequency cetaceans	High frequency cetaceans	Pinnipeds in water	Pinnipeds in air
Auditory band width – Southall et al. (2008)	7 – 22,000Hz	150 – 160,000Hz	200 – 180,000Hz	75 – 75,000Hz	75 – 30Hz
Auditory band width – NMFS (2016)	7 – 35,000Hz	150 – 160,000Hz	275 – 160,000Hz	50 – 86,000Hz	75 – 30Hz
Species	Baleen whales	Most toothed whales, dolphins	Certain toothed whales, porpoises	All species (Phocid seals)	

Group	Low frequency cetaceans	Mid frequency cetaceans	High frequency cetaceans	Pinnipeds in water	Pinnipeds in air
Species present in survey area	Minke whale Blue whale Fin whale	Bottlenose dolphin Common dolphin Striped dolphin Risso's dolphin Atlantic white-sided dolphin White-beaked dolphin Long-finned pilot whale	Harbour porpoise	Grey seal Harbour seal	

Source: Southall et al (2007), NMFS (2016)

Southall et al. (2007) carried out an extensive review of the available literature and proposed quantitative thresholds for received sound pressure levels at which shifts in hearing could be expected to occur for each marine mammal functional group. This review has recently been updated by NMFS (2016).

Noise levels which may produce a temporary reduction in hearing sensitivity are referred to as a temporary threshold shift (TTS) which is reversible. Activities that generate very high sound pressure levels (SPL) can cause permanent auditory injuries and other types of physical injury and, in some circumstances, leading to the death of the receiver. Where the threshold of hearing is permanently damaged, social isolation and the ability to locate food may occur. These impacts are considered to be a permanent threshold shift (PTS); and are of particular concern.

The thresholds proposed by Southall et al (2007) and NMFS (2016) are presented in Table 4-2.

Table 4-2 Injury criteria for individual marine mammals exposed to discrete noise events

Marine mammal group	Single or multiple pulses (SPL dB re: 1µPa (peak))			
	Southall et al. (2007)		NMFS (2016)	
	PTS	TTS	PTS	TTS
Low frequency cetaceans (LFC)	230	224	219	213
Medium frequency cetaceans (MFC)	230	224	230	224
High frequency cetaceans (HFC)	230	224	202	196
Pinnipeds (in water)	218	212	218	212

In the past few years, relatively large amounts of research data have become available that can be used to derive threshold values for marine mammal avoidance. During the Underwater Sound Working Group on 7 November 2014 threshold levels for disturbance were agreed as a sound exposure level (SEL) equal to 140 dB re 1 µPa2s for harbour porpoise and 145 dB re 1 µPa2s for seal.

Sound attenuates as it propagates through water and the local oceanographic conditions will affect both the path of the sound into the water column and how much sound is transmitted. Attenuation can be calculated using the equation SPL = SL – 15 log (R). In this equation SPL = sound pressure level, R is the distance from a source level (SL) and 15 is an attenuation value associated with spreading (MMO 2015).

The assessment considers the likely noise levels associated with the proposed project (see Section 2.5) and using the equation above calculates the distance from the source that noise levels will diminish to below the NMFS (2016) injury criteria thresholds. The criteria as defined by NFMS (2016) have been used as they either match or are a lower threshold than the Southall et al (2007) criteria. The results are presented in Table 4-3 below and are discussed below.

Table 4-3 Summary of potential injury distances

Auditory group	Threshold SPL dB re: 1µPa (peak)		Distance from source (m), where threshold is exceeded				
			SSS	MBES	Pinger or Chirp	Rotary corer	Rotary corer
			SPL: 220 dB re: 1µPa (peak) Frequency: 300 kHz	SPL: 228 dB re: 1µPa (peak) Frequency: 100 kHz	SPL: 200 dB re: 1µPa (peak) Frequency: 3.5 kHz	SPL: 90 dB re: 1µPa (peak) Frequency: 100 kHz	SPL: 191 dB re: 1µPa (peak) Frequency: 300 kHz
Low frequency cetaceans	PTS	219	2	4	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	213	3	10	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
Medium frequency cetaceans	PTS	230	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	224	Threshold not exceeded	2	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
High frequency cetaceans	PTS	202	15	50	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	196	30	90	2	Threshold not exceeded	Threshold not exceeded
Pinnipeds in water	PTS	218	2	5	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded
	TTS	212	4	15	Threshold not exceeded	Threshold not exceeded	Threshold not exceeded

Marine mammal species are highly mobile and have the potential to be within the survey area year round and may be present during the survey period, particularly grey seal from the Saltee Island SAC. However, the survey period is not within a sensitive period for seal (e.g. breeding season).

Section 3.4 identified eleven species of cetacean that have been observed in waters off the east coast of Ireland. Of these species it is likely that eight will be present in the survey area during the period under assessment: harbour porpoise; bottlenose dolphin; common dolphin; striped dolphin; Risso's dolphin; Atlantic white-sided dolphin; white-beaked dolphin; and minke whale. The remaining three (blue whale, fin whale and long-finned pilot whale) are unlikely to be present due to the season and water depth.

The survey area is not currently believed to contain key functional areas for cetacean species. Displacement is therefore considered unlikely and if it does occur will be temporary.

The majority of cetacean species which could be present in the survey area (bottlenose dolphin, common dolphin, striped dolphin, Risso's dolphin, Atlantic white-sided dolphin, white-beaked dolphin, long-finned pilot whale) fall within the auditory bandwidth of mid frequency cetaceans. None of the survey equipment has the potential to generate SPL capable of causing noise-related injury to these species beyond 3m radius of the source.

Harbour porpoise is classified as a high frequency cetacean. The MBES and SSS both have the capacity to produce noise, capable of causing PTS, at 50m and 15m from the source respectively, while TTS may occur within 90m and 30m respectively.

Seals in water may be potentially vulnerable to noise generated by the MBES and SSS within 5m and 2m for PTS and 15m and 4m for TTS (respectively). Seal from the Saltee Island SAC are likely to be in the water between January and August and therefore could be present in the vicinity of the survey operations. However, as discussed in Section 4.5.1.3 below, seal are likely to flee if vessels approach within 900m; suggesting that they will avoid the area before they encounter sound levels that will harm them.

It should be noted that the calculation for TTS and PTS does not account for the directional quality of the noise source, seabed interactions, seabed type, change in salinity, bathymetry, temperature or density, which would reduce the zone of ensonifcation. In addition to cylindrical spreading loss for acoustic propagation in the water column, higher frequency acoustic energies are more quickly absorbed through the water column than sounds with lower frequencies. Due to these factors, the distances for TTS and PTS are conservative and worst case.

The southern coast of Ireland has been identified as an area of high numbers of sightings of fin whale (DAHG, 2014) and it is therefore possible that this species may be present during the geophysical survey. Sighting data for the proposed survey area is limited. Therefore the number of animals which could be potentially impacted during the proposed survey cannot be estimated from available data.

In conclusion the most sensitive species to the proposed survey are harbour porpoise with other species unlikely to experience any effects from the survey equipment. Mitigation measures have been proposed (Section 4.5.2) to reduce the significance of the impact on harbour porpoise. With these measures in place, the survey will not have a significant effect on marine mammals.

4.5.1.2 RISK OF INJURY FROM COLLISION

There is the risk that animals could collide with machinery and vessels present during cable installation, repair and maintenance activities. Shipping collision is a recognised cause of marine mammal mortality worldwide, the key factor influencing the injury or mortality caused by collisions being ship size and speed. Ships travelling at 14 knots or faster are most likely to cause lethal or serious injuries.

Vessels involved in survey are likely to be either stationary or travelling considerably slower than this and therefore the collision risk is likely to be lower than that posed by commercial shipping activity.

4.5.1.3 PHYSICAL DISTURBANCE

Seals hauled out on land could react to the presence of vessels. In general, ships more than 1,500m away from hauled out grey or common seals are unlikely to evoke any reactions, between 900 and 1,500m seals could be expected to detect the presence of vessels and at closer than 900m a flight reaction could be expected (Brasseur & Reijnders,1994). This impact would be most significant for breeding and moulting seals, hauled out on the coast and on intertidal banks. The outer boundary of the Saltee Islands SAC lies 9km from the edge of the application area. It is unlikely that seals hauled out on land will react to the presence of the survey vessels.

4.5.2 MITIGATION

The Department of Arts Heritage and the Gaeltacht (DAHG) have issued 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014). Greenlink are committed to following the technical guidance provided in Section 4.3.4 (ii) applicable to MBES, SSS and SBP surveys within an embayment as follows:

- Survey activity in coastal waters will be planned to commence at the innermost part of any bay, inlet or estuary to be surveyed and thereafter work outwards, to ensure that marine mammals are not driven into or artificially confined within an enclosed comparatively shallow area.
- A qualified and experienced marine mammal observer (MMO) will be appointed for survey activities within the embayment.
- Sound-producing activities shall only commence during daylight hours where effective visual monitoring by the MMO, has been achieved. Where effective visual monitoring, as determined by the MMO, is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.
- Agreed and clear on-site communication signal must be used between the MMO and the Works Superintendent as to whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.
- Survey activities must not commence is marine mammals are detected within a 500m radius of the sound source.
- In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within 500m radius by the MMO.

- A ramp-up procedure (i.e. soft start) will be used.
  a. Where it is possible according to the operational parameters of the equipment concerned, the device's acoustic energy output shall commence from a lower energy start-up (i.e., a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.
  b. This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.
  c. Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched "on" and "off" in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.
- Once the ramp-up procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source.
- If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all pre-start monitoring and a subsequent ramp-up procedure must be undertaken.

4.6 ARCHAEOLOGY

4.6.1 POTENTIAL IMPACTS

4.6.1.1 DIRECT OR INDIRECT DAMAGE TO ARCHAEOLOGICAL ASSET

The geophysical survey is non-intrusive and therefore it is not anticipated it will have any impact on archaeological features.

In addition, to obtaining the environmental conditions of the seabed, the geophysical survey is intended to determine the location of any unknown archaeology. The magnetometer data acquired during the geophysical survey is a key component of this. A detection device consent will be applied for ahead of the survey, and consultation undertaken with the DAHG – Underwater Archaeology Unit to ensure that all requirements are met during the application process.

All intrusive sample locations will avoid archaeological sensitive areas.

4.6.2 MITIGATION

Consultation with the DAHG – Underwater Archaeology Unit has identified that the following mitigation will be appropriate for the proposed works:

- An archaeology desk-based study will be undertaken and provided to DAHG – Underwater Archaeology Unit prior to geotechnical works commencing.
- An archaeologist will carry out a walkover inspection of the land/intertidal area prior to commencement of any intrusive survey works.
- The results of the geophysical survey will be interpreted by a licensed marine archaeologist to inform: the positioning of the intrusive features of the geotechnical and environmental surveys

4.7 MARINE ACTIVITY

4.7.1 POTENTIAL IMPACTS

4.7.1.1 DISPLACEMENT OF VESSELS AND FISHING ACTIVITY

The types of marine activity that will occur in the area of the offshore marine survey corridor are generally limited to those relating to shipping, fisheries and leisure/sports traffic category.

Fishermen may have reduced access to their fishing grounds whilst the survey vessel is in the vicinity due to the mobile safety exclusion zone around the survey spread. As the exclusion zone moves with the survey spread, potential impacts will be temporary and restricted to this relatively small zone. There is also the possibility that if fixed gear such as pots are within the application area they may need to be temporarily moved.

The execution of the proposed offshore surveys will increase the volume of shipping traffic by a negligible amount. Therefore there will be no additional navigational safety implications. However, established marine navigation practices will be adhered to and maintained by the survey vessels involved.

As the works are temporary there will be no effect on marine navigation once the survey has been completed.

4.7.1.2 LOSS OR DAMAGE TO FISHERIES HABITATS/FISH STOCKS

Borehole drilling may increase the amount of suspended sediments in the water column in turn affecting water clarity. In the east of the Hook Head Peninsula and the Waterford Harbour, shellfish industries include the blue mussel *Mytilus edulis*, the surf clam *Spinsula* sp. and the oyster *Crassostrea gigas*. The likelihood of borehole drilling activities affecting these three bivalve species will be minimal as evidence suggests that these species commonly occur in naturally turbid environments and have the ability to recover from environmental disturbance. Furthermore, the re-suspension of sediments from this activity is likely to be localised.

4.7.1.3 DAMAGE TO OR INTERFERENCE OF AN EXTERNAL CABLE ASSET

The application area crosses a number of existing subsea cables. There is the potential that intrusive survey works such as geotechnical sampling could damage the asset.

4.7.2 MITIGATION

Consultation with representative bodies and advice notices issued will ensure minimum effect on all parties. Well established marine survey activity procedures will be followed for the survey works. These will include:

- Liaison with the Port of Waterford regarding survey vessel movements;
- Notice to Mariners will be issued; and
- A Fisheries Liaison Officer will appointed.

The geotechnical and environmental sampling locations will be positioned to avoid all existing cables by a minimum of 250m. Cable position will be confirmed through geophysical and magnetometer data interpretation.

4.8 RECREATIONAL RESOURCE

4.8.1 POTENTIAL IMPACTS

4.8.1.1 RESTRICTED ACCESS

The key recreational activity relating to the offshore area is likely to be restricted to sailing and possibly diving.

The main concern for recreational activity is that the survey will restrict access to the beach during the works. Any restrictions on the beach will be limited in duration (i.e. couple of days) and the beach will be left in a pre-impact condition. Disturbance to recreational users will be short-term and temporary.

4.8.2 MITIGATION

Prior to the offshore works Notifications to Mariners will be issued and local sailing clubs informed of the offshore survey works programme.

4.9 WASTE MANAGEMENT

The survey vessel will operate under international standards (MARPOL) with respect to black and grey waste water and food waste discharges, which are designed to eliminate impacts to coastal waters, and reduce the levels of discharge in offshore waters.

5. CONSULTATION WITH THIRD PARTIES

Greenlink is in the process of carrying out consultation with third parties on the proposed project. To date the following consultation has been undertaken with respect to the proposed marine survey:

Table 5-1 Summary of consultation

Stakeholder	Date	Type	Objective
National Parks & Wildlife Service (NPWS)	09 Dec 2015	Meeting	Discussed onshore and offshore aspects of project, focusing on choice of landfall sites. Requested advice regarding Hook Head SAC. Minutes attached as Appendix F.
	04 July 2016	Email correspondence	Provided habitat data for Hook Head SAC
Department of Arts, Heritage and the Gaeltacht (DAHG) – Underwater Archaeology Unit (UAU)	15 Feb 2016	Email correspondence	Discussed archaeological requirements that may be a condition of the foreshore licence for geotechnical aspects of marine survey programme.
Port of Waterford Harbour Authority	09 Mar 2016	Meeting	Meeting - Provided project information and discussed feasibility of landfalls with Waterford estuary.
	Jul – Aug 2016	Telephone & email correspondence	Discussions regarding feasibility and potential route to Boyce's Bay.

While we believe that no private land will be needed for the landfall, consultation with third-party landowners commenced in January 2016 to provide more flexibility for landfall design.

6. CONCLUSIONS

To determine whether the proposed marine survey is likely to have a significant effect on the surrounding environment and Natura 2000 sites, either individually or in-combination with other plans or projects, a number of assessments were carried out, including AA screening and marine mammal risk assessment.

The survey activities will cause short term, temporary and localised disturbance to other users of the application area e.g. fisheries, shipping and recreational users.

The activities will generate underwater noise which has the potential to cause disturbance effects to fish and marine mammals. Disturbance will be temporary, only affecting individual animals and as such will not affect population viability. Mitigation has been proposed to reduce the significance of the impact on marine mammals including following the Department of Arts, Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); in particular Section 4.3.4 (ii) applicable to MBES, SSS and SBP surveys within an embayment.

There is the possibility that geotechnical and environmental sampling within the Hook Head SAC has the potential to adversely affect the integrity of the designated reef feature. However, mitigation incorporated into survey design will ensure that the reef is not impacted and that there are no likely significant effects on the conservation objectives of the Natura 2000 site.

No significant impacts are expected from the proposed survey or in-combination with other plans or projects on any other Natura 2000 sites in the vicinity of the application area.

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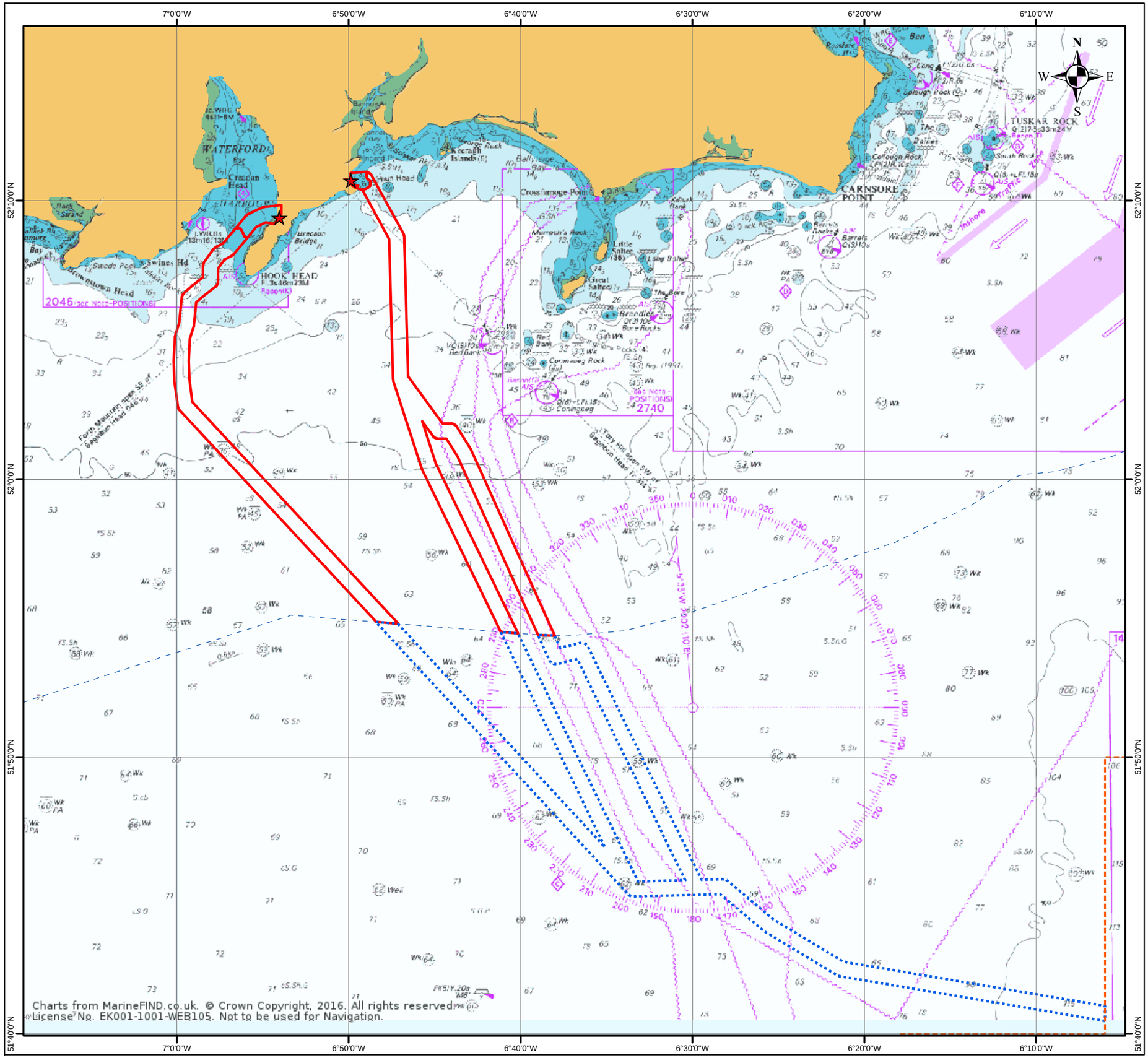
APPENDIX A- FORESHORE LICENCE APPLICATION AREA – OVERVIEW MAPS AND COORDINATES

Greenlink Interconnector

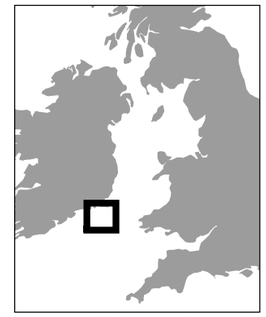
Foreshore Application

Appendix A - Foreshore Licence Application Area Overview Map



Legend

- Landfall Option
- Foreshore Licence Application Area
- Survey Corridor in Irish EEZ
- 12nm - Territorial Sea Limit
- Median Line



NOTE: Not to be used for Navigation

Date	Wednesday, October 12, 2016 11:20:55
Projection	WGS_1984_World_Mercator
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	MarineFIND, GEBCO, UKDEAL
File Reference	J:\P1975\Mxd\NEW Foreshore Licence 2016\ Appendix_A_Overview_rev1.mxd
Created By	Ian Charlton
Reviewed By	Emma Langley
Approved By	Anna Farley

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0 5 10 15 20 km

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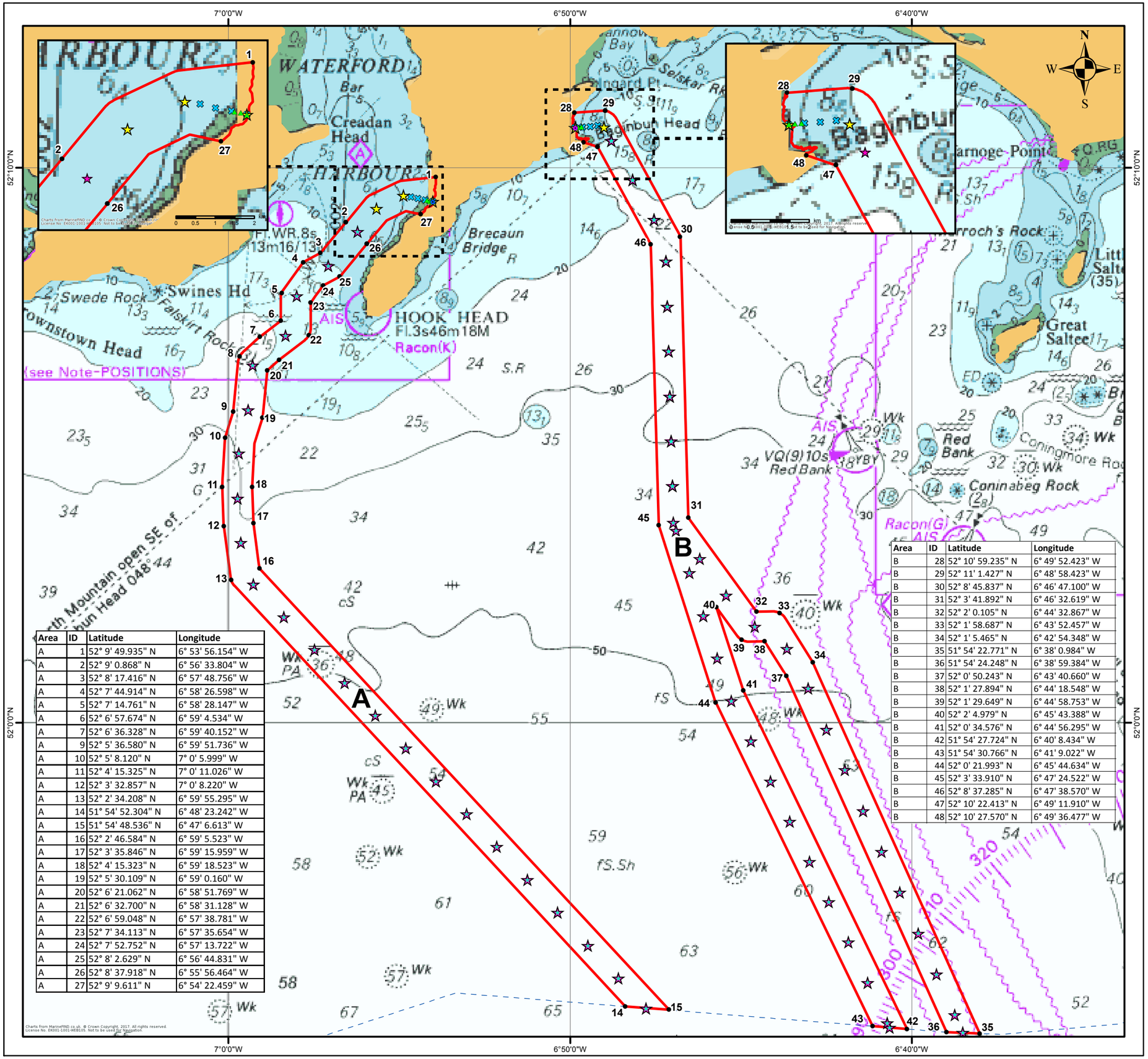

Area	ID	Latitude	Longitude
A	1	52° 9' 49.935" N	6° 53' 56.154" W
A	2	52° 9' 0.868" N	6° 56' 33.804" W
A	3	52° 8' 17.416" N	6° 57' 48.756" W
A	4	52° 7' 44.914" N	6° 58' 26.598" W
A	5	52° 7' 14.761" N	6° 58' 28.147" W
A	6	52° 6' 57.674" N	6° 59' 4.534" W
A	7	52° 6' 36.328" N	6° 59' 40.152" W
A	9	52° 5' 36.580" N	6° 59' 51.736" W
A	10	52° 5' 8.120" N	7° 0' 5.999" W
A	11	52° 4' 15.325" N	7° 0' 11.026" W
A	12	52° 3' 32.857" N	7° 0' 8.220" W
A	13	52° 2' 34.208" N	6° 59' 55.295" W
A	14	51° 54' 52.304" N	6° 48' 23.242" W
A	15	51° 54' 48.536" N	6° 47' 6.613" W
A	16	52° 2' 46.584" N	6° 59' 5.523" W
A	17	52° 3' 35.846" N	6° 59' 15.959" W
A	18	52° 4' 15.323" N	6° 59' 18.523" W
A	19	52° 5' 30.109" N	6° 59' 0.160" W
A	20	52° 6' 21.062" N	6° 58' 51.769" W
A	21	52° 6' 32.700" N	6° 58' 31.128" W
A	22	52° 6' 59.048" N	6° 57' 38.781" W
A	23	52° 7' 34.113" N	6° 57' 35.654" W
A	24	52° 7' 52.752" N	6° 57' 13.722" W
A	25	52° 8' 2.629" N	6° 56' 44.831" W
A	26	52° 8' 37.918" N	6° 55' 56.464" W
A	27	52° 9' 9.611" N	6° 54' 22.459" W

Area	ID	Latitude	Longitude
B	28	52° 10' 59.235" N	6° 49' 52.423" W
B	29	52° 11' 1.427" N	6° 48' 58.423" W
B	30	52° 8' 45.837" N	6° 46' 47.100" W
B	31	52° 3' 41.892" N	6° 46' 32.619" W
B	32	52° 2' 0.105" N	6° 44' 32.867" W
B	33	52° 1' 58.687" N	6° 43' 52.457" W
B	34	52° 1' 5.465" N	6° 42' 54.348" W
B	35	51° 54' 22.771" N	6° 38' 0.984" W
B	36	51° 54' 24.248" N	6° 38' 59.384" W
B	37	52° 0' 50.243" N	6° 43' 40.660" W
B	38	52° 1' 27.894" N	6° 44' 18.548" W
B	39	52° 1' 29.649" N	6° 44' 58.753" W
B	40	52° 2' 4.979" N	6° 45' 43.388" W
B	41	52° 0' 34.576" N	6° 44' 56.295" W
B	42	51° 54' 27.724" N	6° 40' 8.434" W
B	43	51° 54' 30.766" N	6° 41' 9.022" W
B	44	52° 0' 21.993" N	6° 45' 44.634" W
B	45	52° 3' 33.910" N	6° 47' 24.522" W
B	46	52° 8' 37.285" N	6° 47' 38.570" W
B	47	52° 10' 22.413" N	6° 49' 11.910" W
B	48	52° 10' 27.570" N	6° 49' 36.477" W

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Greenlink Interconnector

Foreshore Application

Drawing Name: Foreshore Licence Map
Drawing Number: A2

Legend

- Route Position

Landfall Option

- Baginbun Beach (52° 10' 43.095" N, 6° 49' 50.777" W)
- Boyce's Bay (52° 9' 23.310" N, 6° 54' 0.978" W)
- Foreshore Licence Application Area

Proposed Survey Sampling Location (Indicative)

Intertidal Zone

- Borehole (100m Interval; 4 at each landfall)
- Trial Pit (100m Interval; 3 at each landfall)
- VC/CPT (1000m Interval; 6 at each landfall)

Offshore

- VC (1500m Interval; 48)
- CPT (1500m Interval; 48)

- - - 12nm Territorial Sea Limit

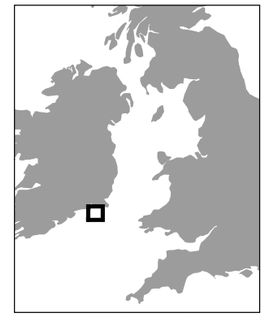
Area A: 35.92 km^2
Area B: 51.70 km^2
TOTAL: 87.62 km^2

Note: Coordinates listed in WGS 84. Proposed sampling locations are indicative only.

Map prepared by:

Jennifer Arthur
MSci (Hons) Geography

Intertek Energy and Water
Exchange House
Liphook
Hampshire
GU30 7DW



NOTE: Not to be used for Navigation

Date	Thursday, December 21, 2017 10:33:43
Projection	WGS_1984_World_Mercator
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	MarineFIND, GEBCO, UKHO
File Reference	J:\P1975\Mxd\NEW Foreshore Licence 2016\ Figure_A2_Overview_v2.mxd
Created By	Jennifer Arthur
Reviewed By	Emma Langley
Approved By	Anna Farley

Co-financed by the European Union
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Paper Size: A3

0 2.5 5 7.5 10 km

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679500 680000 680500 681000

604000 603500 603000

Legend

- Landfall Option
- Foreshore Licence Application Area
- Internal Boundary Between Inshore and Offshore Survey Area

N W E S

Baginbun Beach

0 100 200 300 400 500 m

Greenlink INTERCONNECTOR

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674500 675000 675500 676000

601500 601000

N W E S

Legend

- Landfall Option
- Foreshore Licence Application Area

HOUSELAND

Boyce's Bay

Waterford Harbour

PORTERSGATT

0 100 200 300 400 500 m

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Table A-1 Irish National Grid coordinates – Baginbun Beach nearshore application area

ID	Easting	Northing
1	281017.0	104153.7
2	281035.4	103936.0
3	281038.9	103804.3
4	281107.3	103678.8
5	281165.3	103631.5
6	281274.8	103569.9
7	281304.7	103423.6
8	281295.0	103246.3
9	281151.6	103108.5
10	281043.4	103040.9
11	280892.2	102978.6
12	280780.5	102943.7
13	280311.0	103095.5
14	280310.7	103105.0
15	280308.4	103120.0
16	280311.6	103127.3
17	280314.8	103129.1
18	280320.7	103130.1
19	280326.6	103129.1
20	280335.7	103130.1
21	280340.3	103133.2
22	280348.5	103136.4
23	280355.8	103141.9
24	280362.1	103142.8
25	280372.1	103146.4
26	280377.2	103147.8
27	280379.9	103146.4
28	280384.9	103147.8
29	280390.4	103150.1
30	280394.9	103155.5
31	280397.6	103157.8
32	280401.7	103160.1
33	280406.7	103163.7

ID	Easting	Northing
34	280415.4	103170.6
35	280417.7	103178.8
36	280423.1	103182.4
37	280427.2	103185.6
38	280431.8	103190.6
39	280439.5	103195.2
40	280446.8	103196.1
41	280450.0	103197.4
42	280456.4	103201.5
43	280462.7	103203.8
44	280466.8	103207.9
45	280471.4	103213.4
46	280474.1	103217.0
47	280473.2	103219.7
48	280469.6	103220.2
49	280462.3	103218.8
50	280457.3	103219.7
51	280450.5	103222.0
52	280443.6	103222.5
53	280438.6	103222.9
54	280431.3	103222.9
55	280423.1	103219.3
56	280417.7	103215.2
57	280409.5	103211.1
58	280395.8	103208.8
59	280387.2	103204.3
60	280375.8	103201.1
61	280371.2	103200.2
62	280367.1	103200.6
63	280365.3	103204.7
64	280372.1	103211.1
65	280372.1	103216.6
66	280372.6	103225.7

ID	Easting	Northing
67	280367.6	103227.0
68	280362.6	103223.8
69	280357.6	103219.3
70	280350.3	103218.4
71	280345.3	103218.4
72	280336.2	103214.7
73	280327.1	103210.6
74	280323.9	103209.3
75	280323.0	103204.3
76	280320.2	103200.6
77	280317.1	103196.1
78	280309.3	103193.8
79	280303.9	103195.2
80	280301.1	103202.0
81	280298.4	103207.9
82	280294.8	103207.9
83	280290.7	103206.1
84	280287.5	103202.9
85	280282.5	103196.5
86	280277.0	103191.1
87	280277.0	103185.1
88	280276.5	103182.4
89	280272.0	103180.1
90	280270.2	103185.1
91	280267.4	103188.8
92	280265.2	103186.0
93	280265.6	103181.5
94	280262.9	103180.1
95	280259.2	103182.4
96	280254.2	103185.1
97	280249.7	103186.5
98	280245.6	103190.1
99	280241.9	103192.9
100	280241.5	103197.9

ID	Easting	Northing
101	280243.8	103202.9
102	280247.4	103206.5
103	280244.7	103209.3
104	280239.2	103207.0
105	280235.1	103205.6
106	280231.5	103206.1
107	280230.6	103210.2
108	280234.2	103214.3
109	280235.6	103219.7
110	280231.5	103223.4
111	280226.5	103222.9
112	280221.9	103220.6
113	280219.2	103217.9
114	280219.6	103214.3
115	280216.9	103213.4
116	280212.8	103212.0
117	280211.0	103207.4
118	280208.3	103204.7
119	280205.1	103203.3
120	280196.9	103203.3
121	280189.6	103203.8
122	280183.2	103204.7
123	280180.0	103204.7
124	280177.3	103207.0
125	280180.9	103212.0
126	280180.5	103217.5
127	280180.5	103222.0
128	280173.2	103220.6
129	280170.0	103218.4
130	280166.4	103216.1
131	280163.6	103214.3
132	280158.6	103215.2
133	280154.5	103222.0
134	280151.8	103225.2

ID	Easting	Northing
135	280146.3	103225.7
136	280149.5	103227.5
137	280153.2	103229.8
138	280150.0	103233.9
139	280141.3	103229.3
140	280138.6	103226.1
141	280135.9	103223.8
142	280128.1	103223.4
143	280122.7	103226.1
144	280115.8	103235.2
145	280108.1	103242.5
146	280101.3	103255.2
147	280092.6	103271.6
148	280088.5	103276.6
149	280085.3	103279.4
150	280079.0	103281.7
151	280076.7	103284.8
152	280076.2	103289.4
153	280074.4	103295.8
154	280074.9	103301.2
155	280074.9	103315.8
156	280076.2	103327.6
157	280075.8	103342.2
158	280076.2	103356.3
159	280079.9	103370.0
160	280081.7	103387.7
161	280081.2	103412.8
162	280082.6	103432.8
163	280083.5	103458.3
164	280084.9	103472.4
165	280085.8	103487.0
166	280085.8	103497.9
167	280086.7	103509.7
168	280091.2	103516.1

ID	Easting	Northing
169	280094.9	103521.6
170	280095.3	103526.6
171	280098.5	103533.0
172	280104.0	103537.1
173	280111.3	103539.8
174	280117.2	103542.5
175	280118.6	103545.2
176	280113.6	103548.4
177	280108.1	103547.5
178	280105.8	103543.9
179	280098.5	103541.6
180	280092.2	103539.8
181	280087.2	103538.4
182	280083.5	103537.1
183	280079.4	103539.3
184	280086.2	103543.0
185	280092.2	103545.2
186	280097.2	103546.6
187	280098.1	103553.0
188	280095.8	103556.2
189	280089.4	103562.1
190	280083.1	103562.5
191	280075.3	103560.3
192	280071.2	103555.3
193	280067.1	103556.6
194	280066.7	103563.0
195	280068.0	103567.1
196	280069.4	103571.2
197	280071.7	103574.4
198	280072.1	103577.6
199	280066.7	103578.9
200	280060.3	103578.9
201	280055.7	103581.2
202	280054.8	103584.9

ID	Easting	Northing
203	280053.9	103591.2
204	280046.2	103596.2
205	280043.4	103600.3
206	280042.5	103605.3
207	280038.9	103607.6
208	280034.8	103602.6
209	280029.8	103602.2
210	280018.0	103604.0
211	280010.2	103605.8
212	280002.0	103609.4
213	279998.4	103614.4
214	279996.1	103619.5
215	279992.5	103622.2
216	279988.8	103617.2
217	279983.8	103614.9
218	279979.3	103614.4
219	279969.7	103621.3
220	279956.0	103632.2
221	279944.7	103650.0
222	279940.6	103672.3
223	279940.6	103682.3
224	279941.0	103693.7
225	279939.6	103704.1
226	279936.9	103717.8
227	279941.0	103743.7
228	279943.7	103755.6
229	279945.1	103764.7
230	279950.1	103769.2
231	279954.7	103776.1
232	279957.4	103779.3
233	279950.1	103782.9
234	279944.2	103783.3
235	279943.7	103792.9
236	279944.2	103816.6

ID	Easting	Northing
237	279946.0	103828.9
238	279947.8	103838.0
239	279951.9	103842.5
240	279957.4	103845.3
241	279958.3	103848.9
242	279958.3	103851.2
243	279951.0	103850.7
244	279947.8	103851.2
245	279941.9	103865.8
246	279939.2	103875.3
247	279934.2	103884.4
248	279932.4	103892.6
249	279934.6	103903.1
250	279939.2	103914.5
251	279941.9	103924.9
252	279946.5	103942.2
253	279950.1	103954.5
254	279951.5	103961.4
255	279956.0	103969.1
256	279959.2	103974.1
257	279960.1	103981.8
258	279962.4	103986.9
259	279970.6	103989.1
260	279975.6	103993.2
261	279972.4	103996.0
262	279967.9	104000.5
263	279962.9	104005.1
264	279961.0	104007.8
265	279966.5	104012.3
266	279972.9	104006.4
267	279980.2	104005.1
268	279988.4	104005.1
269	279994.3	104009.6
270	279990.2	104013.3

ID	Easting	Northing
271	279985.6	104015.5
272	279979.7	104020.1
273	279981.1	104025.5
274	279989.7	104023.7
275	279993.4	104026.0
276	279987.9	104031.5
277	279984.3	104033.7
278	279978.8	104037.4
279	279972.9	104036.9
280	279967.4	104038.8
281	279966.0	104046.0
282	279974.2	104051.0
283	279979.3	104055.6
284	279985.6	104059.7
285	279991.1	104063.3
286	279992.5	104068.8
287	279992.2	104069.3
288	280902.0	104156.0
289	280921.8	104157.5
290	280941.6	104158.2
291	280961.4	104158.2
292	280981.2	104157.3
293	281000.9	104155.7

ID	Easting	Northing

Table A-2 Irish National Grid coordinates - Boyce's Bay nearshore application area

ID	Easting	Northing
1	274912.9	100600.9
2	274419.4	100699.2
3	273778.3	100385.3
4	273211.8	99683.5
5	273140.1	99594.7
6	273112.8	99686.5
7	273049.1	99752.8
8	272980.8	99746.5
9	272957.1	99848.3
10	272917.9	99918.2
11	272868.0	100032.0
12	272799.9	100168.3
13	272690.7	100280.2
14	272637.9	100299.1
15	272545.0	100274.5
16	272419.7	100293.7
17	272434.1	100311.5
18	273070.1	101099.4
19	273082.8	101114.6
20	273096.2	101129.2
21	273110.1	101143.4
22	273124.6	101156.9
23	273139.6	101169.9
24	273155.1	101182.3
25	273171.0	101194.0
26	273187.5	101205.1
27	273204.3	101215.5
28	273221.6	101225.3
29	273239.2	101234.4
30	274131.6	101671.3
31	274149.0	101679.4
32	274166.6	101686.8
33	274184.6	101693.5

ID	Easting	Northing
34	274202.8	101699.6
35	274221.2	101704.9
36	274239.7	101709.6
37	275394.1	101854.8
38	275398.3	101825.0
39	275396.7	101798.7
40	275403.3	101770.6
41	275403.3	101750.8
42	275398.3	101734.3
43	275396.7	101714.5
44	275396.7	101694.8
45	275396.7	101681.6
46	275396.7	101658.5
47	275404.9	101632.1
48	275401.6	101605.7
49	275396.7	101589.2
50	275383.5	101567.8
51	275380.2	101533.1
52	275385.2	101508.4
53	275381.9	101480.4
54	275367.0	101458.9
55	275355.5	101434.2
56	275355.5	101411.1
57	275368.7	101386.4
58	275383.5	101368.2
59	275391.8	101333.6
60	275398.3	101285.8
61	275401.6	101233.0
62	275376.9	101206.6
63	275353.8	101176.9
64	275342.3	101137.3
65	275345.6	101097.7
66	275347.2	101069.7

ID	Easting	Northing
67	275339.0	101030.1
68	275322.5	100988.9
69	275312.6	100959.2
70	275302.7	100932.8
71	275282.9	100914.7
72	275253.2	100886.6
73	275235.1	100876.8
74	275218.6	100875.1
75	275198.8	100868.5
76	275182.3	100858.6
77	275170.8	100857.0
78	275152.6	100858.6
79	275139.4	100858.6
80	275118.0	100848.7
81	275103.1	100833.9
82	275075.1	100815.7
83	275063.6	100782.7
84	275055.3	100746.5
85	275038.8	100711.8
86	275000.9	100673.9
87	274948.1	100624.4

ID	Easting	Northing

Table A-3 WGS84 coordinates - Offshore application area

ID	Longitude	Latitude
1	6° 46' 32.619" W	52° 3' 41.892" N
2	6° 44' 32.867" W	52° 2' 0.105" N
3	6° 44' 4.501" W	52° 2' 0.370" N
4	6° 44' 3.462" W	52° 2' 0.367" N
5	6° 44' 2.424" W	52° 2' 0.338" N
6	6° 44' 1.389" W	52° 2' 0.284" N
7	6° 44' 0.358" W	52° 2' 0.205" N
8	6° 43' 59.334" W	52° 2' 0.101" N
9	6° 43' 58.316" W	52° 1' 59.972" N
10	6° 43' 57.308" W	52° 1' 59.818" N
11	6° 43' 56.310" W	52° 1' 59.640" N
12	6° 43' 55.324" W	52° 1' 59.437" N
13	6° 43' 54.353" W	52° 1' 59.211" N
14	6° 43' 53.396" W	52° 1' 58.961" N
15	6° 43' 52.457" W	52° 1' 58.687" N
16	6° 43' 51.536" W	52° 1' 58.391" N
17	6° 43' 50.634" W	52° 1' 58.073" N
18	6° 43' 49.754" W	52° 1' 57.733" N
19	6° 43' 48.896" W	52° 1' 57.372" N
20	6° 43' 48.062" W	52° 1' 56.990" N
21	6° 43' 47.253" W	52° 1' 56.588" N
22	6° 43' 46.471" W	52° 1' 56.166" N
23	6° 43' 45.716" W	52° 1' 55.726" N
24	6° 43' 44.991" W	52° 1' 55.267" N
25	6° 43' 44.295" W	52° 1' 54.792" N
26	6° 43' 43.630" W	52° 1' 54.299" N
27	6° 43' 42.998" W	52° 1' 53.791" N
28	6° 43' 42.398" W	52° 1' 53.268" N
29	6° 43' 41.833" W	52° 1' 52.730" N
30	6° 42' 55.210" W	52° 1' 6.390" N
31	6° 42' 54.767" W	52° 1' 5.932" N
32	6° 42' 54.348" W	52° 1' 5.465" N
33	6° 42' 53.954" W	52° 1' 4.990" N

ID	Longitude	Latitude
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37	6° 38' 59.384" W	51° 54' 24.248" N
38	6° 43' 40.660" W	52° 0' 50.243" N
39	6° 44' 18.548" W	52° 1' 27.894" N
40	6° 44' 45.694" W	52° 1' 27.640" N
41	6° 44' 46.741" W	52° 1' 27.643" N
42	6° 44' 47.787" W	52° 1' 27.672" N
43	6° 44' 48.830" W	52° 1' 27.726" N
44	6° 44' 49.869" W	52° 1' 27.807" N
45	6° 44' 50.902" W	52° 1' 27.913" N
46	6° 44' 51.927" W	52° 1' 28.044" N
47	6° 44' 52.943" W	52° 1' 28.200" N
48	6° 44' 53.948" W	52° 1' 28.381" N
49	6° 44' 54.940" W	52° 1' 28.587" N
50	6° 44' 55.918" W	52° 1' 28.817" N
51	6° 44' 56.881" W	52° 1' 29.071" N
52	6° 44' 57.826" W	52° 1' 29.348" N
53	6° 44' 58.753" W	52° 1' 29.649" N
54	6° 44' 59.660" W	52° 1' 29.972" N
55	6° 45' 0.544" W	52° 1' 30.317" N
56	6° 45' 1.406" W	52° 1' 30.684" N
57	6° 45' 2.244" W	52° 1' 31.072" N
58	6° 45' 3.055" W	52° 1' 31.480" N
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60	6° 45' 4.596" W	52° 1' 32.354" N
61	6° 45' 5.323" W	52° 1' 32.819" N
62	6° 45' 6.019" W	52° 1' 33.301" N
63	6° 45' 6.683" W	52° 1' 33.800" N
64	6° 45' 7.315" W	52° 1' 34.316" N
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67	6° 40' 8.434" W	51° 54' 27.724" N

ID	Longitude	Latitude
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70	6° 45' 44.634" W	52° 0' 21.993" N
71	6° 45' 44.992" W	52° 0' 22.517" N
72	6° 45' 45.321" W	52° 0' 23.049" N
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111	6° 48' 45.361" W	52° 10' 42.408" N
112	6° 48' 51.070" W	52° 10' 44.460" N
113	6° 48' 54.083" W	52° 10' 46.020" N
114	6° 48' 57.573" W	52° 10' 50.115" N
115	6° 48' 57.642" W	52° 10' 54.378" N
116	6° 48' 58.423" W	52° 11' 1.427" N
117	6° 48' 58.237" W	52° 11' 1.411" N
118	6° 48' 57.211" W	52° 11' 1.297" N
119	6° 48' 56.193" W	52° 11' 1.158" N
120	6° 48' 55.185" W	52° 11' 0.994" N
121	6° 48' 54.188" W	52° 11' 0.806" N
122	6° 48' 53.204" W	52° 11' 0.594" N
123	6° 48' 52.235" W	52° 11' 0.358" N
124	6° 48' 51.281" W	52° 11' 0.098" N
125	6° 48' 50.345" W	52° 10' 59.816" N
126	6° 48' 49.428" W	52° 10' 59.511" N
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128	6° 48' 47.657" W	52° 10' 58.835" N
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130	6° 48' 45.978" W	52° 10' 58.075" N
131	6° 48' 45.177" W	52° 10' 57.665" N
132	6° 48' 44.402" W	52° 10' 57.235" N
133	6° 48' 43.656" W	52° 10' 56.787" N
134	6° 48' 42.940" W	52° 10' 56.322" N
135	6° 48' 42.254" W	52° 10' 55.839" N
136	6° 48' 41.600" W	52° 10' 55.340" N
137	6° 48' 40.978" W	52° 10' 54.825" N
138	6° 48' 40.390" W	52° 10' 54.296" N

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140	6° 48' 39.319" W	52° 10' 53.196" N
141	6° 46' 49.402" W	52° 8' 49.366" N
142	6° 46' 48.925" W	52° 8' 48.803" N
144	6° 46' 48.082" W	52° 8' 47.643" N
145	6° 46' 47.716" W	52° 8' 47.049" N
146	6° 46' 47.389" W	52° 8' 46.447" N
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186	6° 57' 36.282" W	52° 7' 3.095" N
187	6° 57' 36.529" W	52° 7' 2.494" N
188	6° 57' 36.814" W	52° 7' 1.899" N
189	6° 57' 37.136" W	52° 7' 1.311" N
190	6° 57' 37.494" W	52° 7' 0.731" N
191	6° 57' 37.888" W	52° 7' 0.160" N
192	6° 57' 38.317" W	52° 6' 59.598" N
193	6° 57' 38.781" W	52° 6' 59.048" N
194	6° 57' 39.279" W	52° 6' 58.508" N
195	6° 57' 39.810" W	52° 6' 57.981" N
196	6° 57' 40.374" W	52° 6' 57.467" N
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198	6° 57' 41.595" W	52° 6' 56.480" N
199	6° 57' 42.251" W	52° 6' 56.009" N
200	6° 57' 42.935" W	52° 6' 55.554" N
201	6° 57' 43.648" W	52° 6' 55.115" N
202	6° 57' 44.387" W	52° 6' 54.693" N
203	6° 57' 45.152" W	52° 6' 54.289" N
204	6° 57' 45.942" W	52° 6' 53.904" N
205	6° 58' 31.128" W	52° 6' 32.700" N
206	6° 58' 51.769" W	52° 6' 21.062" N
207	6° 58' 59.760" W	52° 5' 31.732" N
208	6° 58' 59.864" W	52° 5' 31.188" N
209	6° 59' 0.000" W	52° 5' 30.647" N
210	6° 59' 0.160" W	52° 5' 30.109" N

ID	Longitude	Latitude
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212	6° 59' 0.573" W	52° 5' 29.043" N
213	6° 59' 0.824" W	52° 5' 28.518" N
214	6° 59' 14.241" W	52° 5' 2.048" N
215	6° 59' 18.523" W	52° 4' 15.323" N
216	6° 59' 15.959" W	52° 3' 35.846" N
217	6° 59' 5.523" W	52° 2' 46.584" N
218	6° 47' 6.613" W	51° 54' 48.536" N
219	6° 48' 23.242" W	51° 54' 52.304" N
220	6° 59' 49.618" W	52° 2' 28.329" N
258	6° 59' 42.326" W	52° 6' 32.859" N
259	6° 59' 42.055" W	52° 6' 33.457" N
260	6° 59' 41.746" W	52° 6' 34.049" N
261	6° 59' 41.402" W	52° 6' 34.632" N
262	6° 59' 41.020" W	52° 6' 35.208" N
263	6° 59' 40.604" W	52° 6' 35.773" N
264	6° 59' 40.152" W	52° 6' 36.328" N
265	6° 59' 39.666" W	52° 6' 36.873" N
266	6° 59' 39.147" W	52° 6' 37.405" N
267	6° 59' 38.595" W	52° 6' 37.925" N
268	6° 59' 38.010" W	52° 6' 38.431" N
269	6° 59' 37.395" W	52° 6' 38.923" N
270	6° 59' 36.749" W	52° 6' 39.400" N
271	6° 59' 36.074" W	52° 6' 39.862" N
272	6° 59' 35.371" W	52° 6' 40.307" N
273	6° 59' 34.640" W	52° 6' 40.735" N
274	6° 59' 5.729" W	52° 6' 57.040" N
275	6° 59' 5.139" W	52° 6' 57.363" N
276	6° 59' 4.534" W	52° 6' 57.674" N
277	6° 59' 3.914" W	52° 6' 57.974" N
278	6° 58' 28.147" W	52° 7' 14.761" N
279	6° 58' 28.207" W	52° 7' 39.319" N
280	6° 58' 28.188" W	52° 7' 39.954" N
281	6° 58' 28.129" W	52° 7' 40.587" N

ID	Longitude	Latitude
282	6° 58' 28.029" W	52° 7' 41.219" N
283	6° 58' 27.890" W	52° 7' 41.848" N
284	6° 58' 27.710" W	52° 7' 42.472" N
285	6° 58' 27.491" W	52° 7' 43.093" N
286	6° 58' 27.232" W	52° 7' 43.707" N
287	6° 58' 26.934" W	52° 7' 44.315" N
288	6° 58' 26.598" W	52° 7' 44.914" N
289	6° 58' 26.224" W	52° 7' 45.506" N
290	6° 58' 25.812" W	52° 7' 46.088" N
291	6° 58' 25.364" W	52° 7' 46.659" N
292	6° 58' 24.879" W	52° 7' 47.219" N
293	6° 58' 24.359" W	52° 7' 47.767" N
294	6° 58' 23.805" W	52° 7' 48.302" N
295	6° 58' 23.217" W	52° 7' 48.824" N
296	6° 57' 52.745" W	52° 8' 14.726" N
297	6° 57' 52.150" W	52° 8' 15.212" N
298	6° 57' 51.526" W	52° 8' 15.684" N
299	6° 57' 50.874" W	52° 8' 16.141" N
300	6° 57' 50.194" W	52° 8' 16.582" N
301	6° 57' 49.488" W	52° 8' 17.008" N
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303	6° 57' 47.999" W	52° 8' 17.808" N
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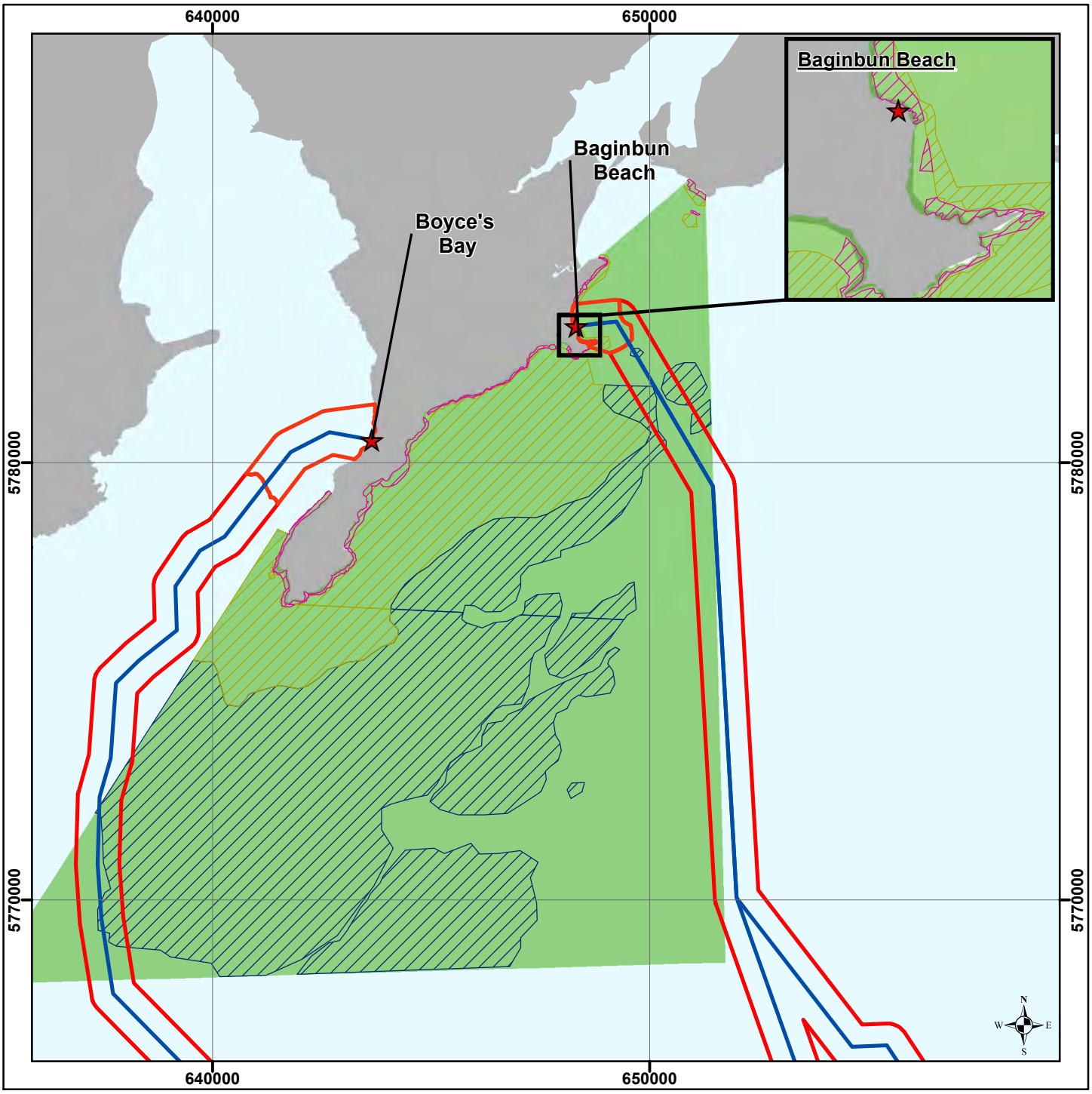
305	6° 57' 46.418" W	52° 8' 18.538" N
306	6° 57' 45.594" W	52° 8' 18.874" N
307	6° 57' 44.751" W	52° 8' 19.192" N
308	6° 57' 43.889" W	52° 8' 19.489" N
309	6° 57' 18.377" W	52° 8' 27.914" N

APPENDIX B – HOOK HEAD SAC BENTHIC HABITATS

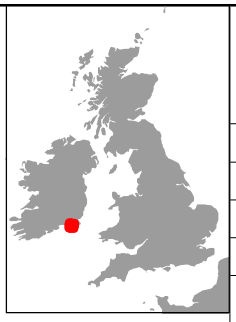


Legend

- Landfall Option
- Proposed Survey Centre Line
- Foreshore Licence Application Area
- SAC

Reef Type

- Echinoderm and Sponge Dominated Community
- Exposed to Moderately Exposed Intertidal Reef Community
- Laminaria Dominated Community



NOTE: Not to be used for Navigation

Greenlink Interconnector Foreshore Application

Appendix B – Hook Head SAC Benthic Habitats

Date	Wednesday, October 12, 2016 12:40:25
Projection	WGS_1984_UTM_Zone_29N
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	NPWS, OSI
File Reference	J:\P1975\Mxd\NEW Foreshore Licence 2016\Appendix_B_Hook_Head_Reef.mxd
Created By	Ian Charlton
Reviewed By	Emma Langley
Approved By	Jillian Hobbs

Greenlink INTERCONNECTOR

Intertek
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km
0 1 2 3 4 5

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APPENDIX C – PROTECTED SITES

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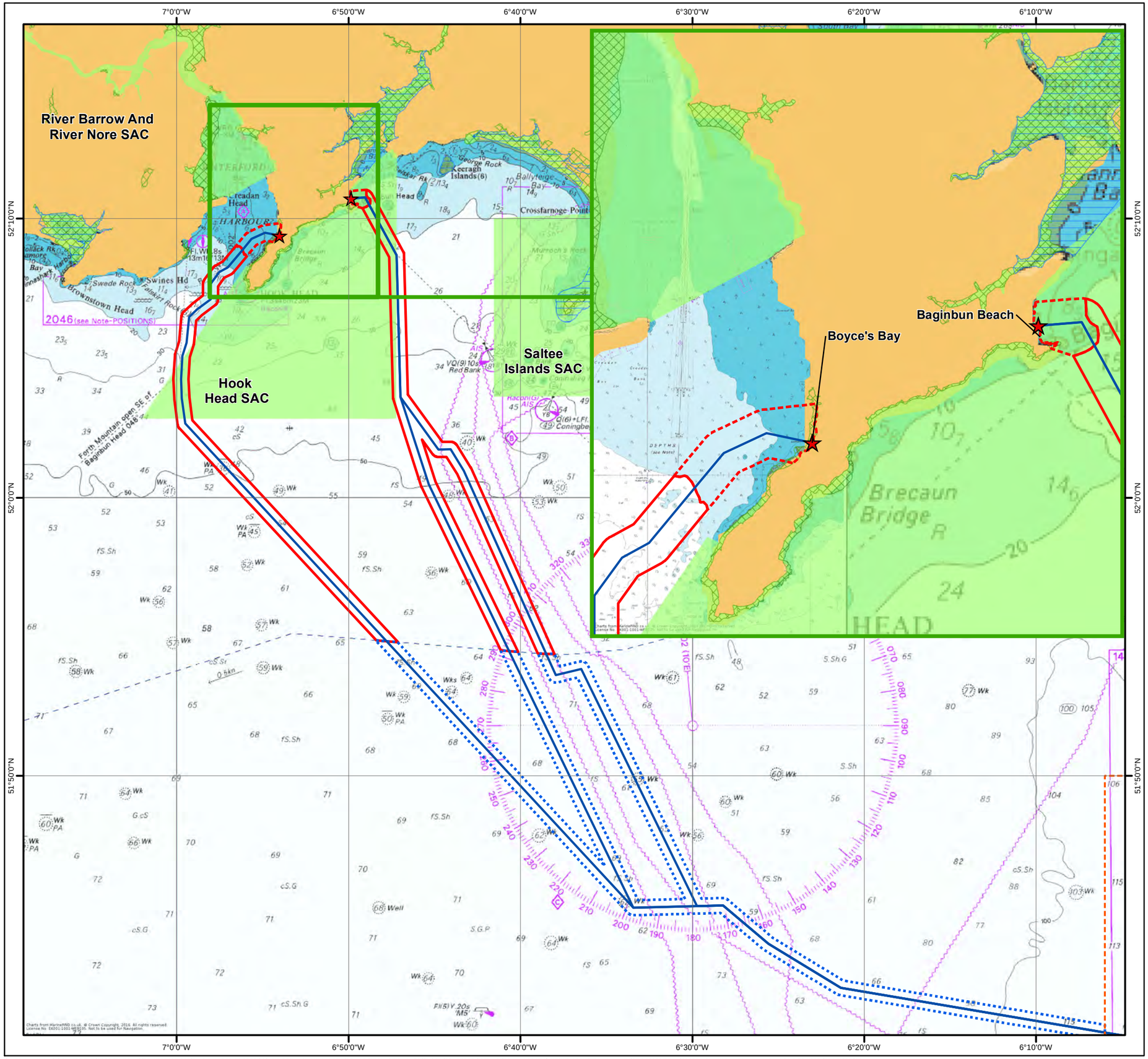
Foreshore Application

Appendix C – Protected Sites



Legend

- Landfall Option
- Proposed Survey Centre
- Foreshore Licence Application
- Survey Corridor in Irish
- SPA
- SAC
- NHA
- pNHA
- Median Line
- 12nm - Territorial Sea Limit

NOTE: Not to be used for Navigation

Date	Wednesday, October 12, 2016 12:51:42
Projection	WGS_1984_World_Mercator
Spheroid	WGS_1984
Datum	D_WGS_1984
Data Source	MarineFIND, GEBCO, UKDEAL, NPWS
File Reference	J:\P1975\Mxd\NEW Foreshore Licence 2016\ Appendix_C_Protected_Sites.mxd
Created By	Emma Langley
Reviewed By	Ian Charlton
Approved By	Anna Farley

Co-financed by the European Union Connecting Europe Facility

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0 2.5 5 10 15 20 km

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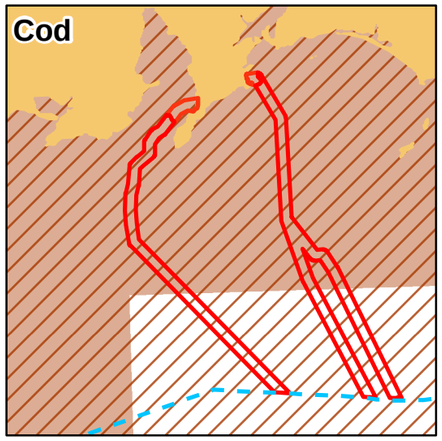
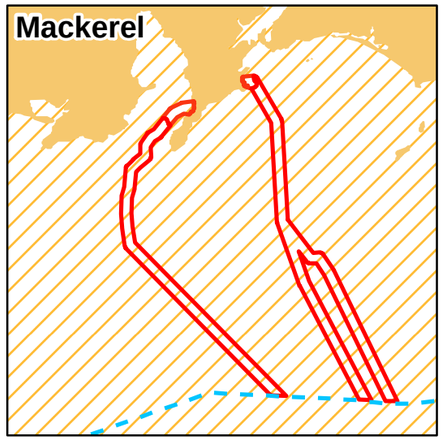
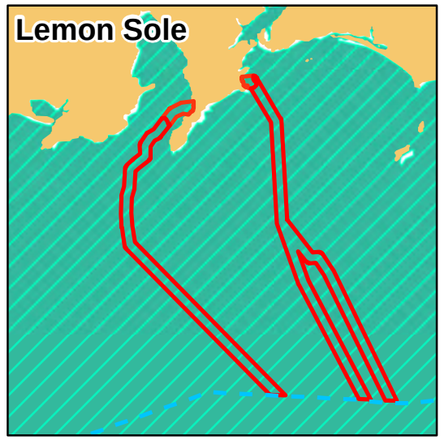
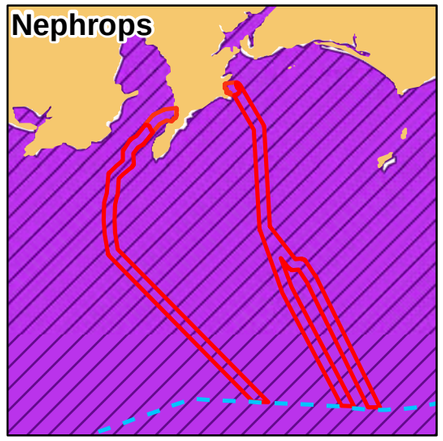
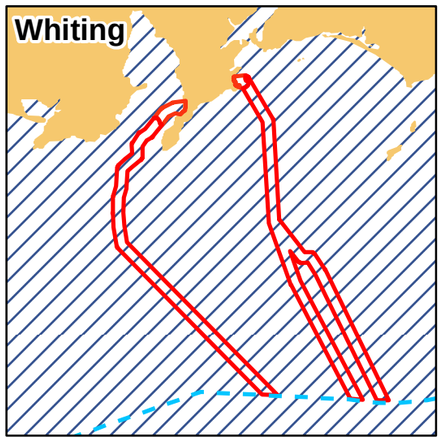
APPENDIX D – FISH SPAWNING AND NURSERY AREAS

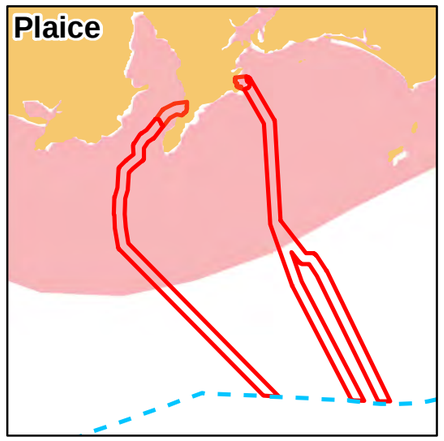


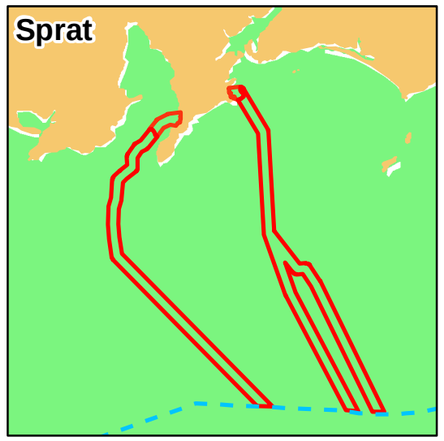


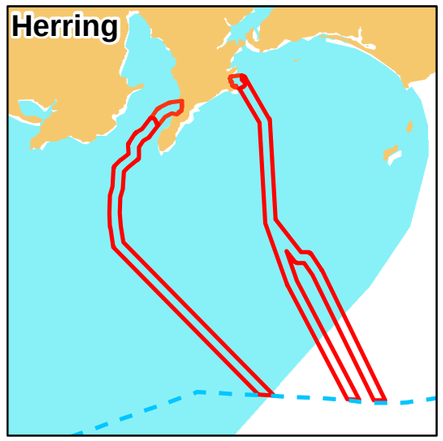


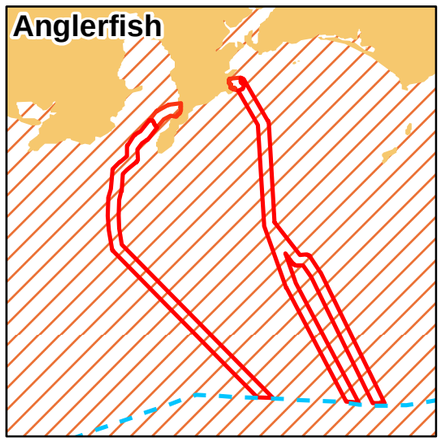


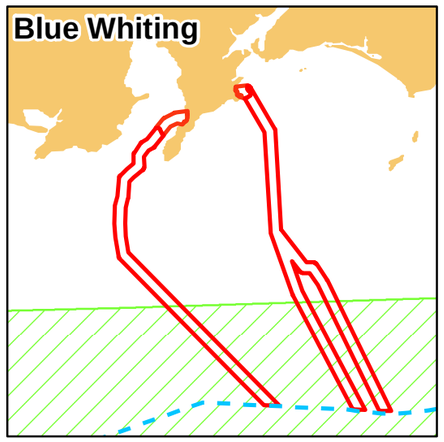


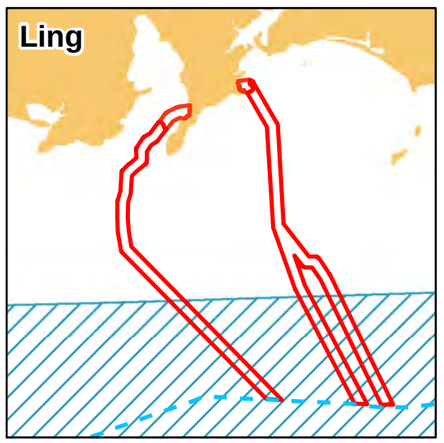


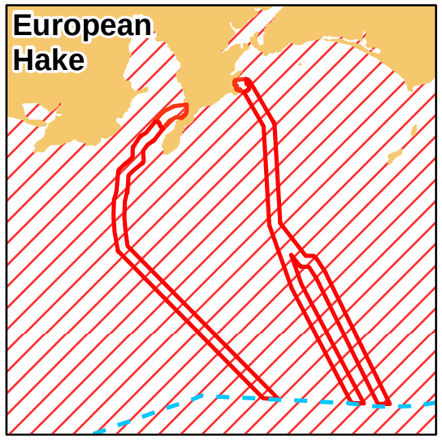


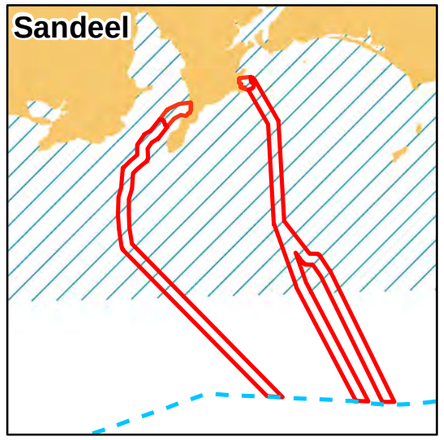












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Foreshore Application

Appendix D - Fish Spawning and Nursery Areas

Legend

- Foreshore Licence Application Area
- 12nm limit

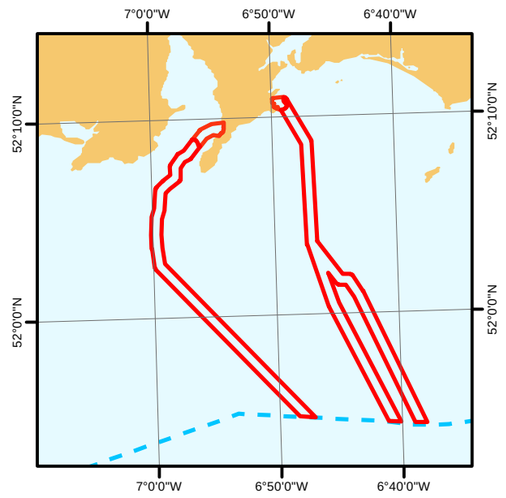
Spawning Areas

- Cod Spawning Area
- Lemon Sole Spawning Area
- Nephrops Spawning Area
- Plaice Spawning Area
- Sprat Spawning Area
- Herring Spawning Area
- Cod Nursery Area
- Mackerel Nursery Area
- Lemon Sole Nursery Area

Nursery Areas

- Nephrops Nursery Area
- Whiting Nursery Area
- Anglerfish Nursery Area
- Blue Whiting Nursery Area
- European Hake Nursery Area
- Ling Nursery Area
- Sandeel Nursery Area

Overview



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Datum	D_WGS_1984
Data Source	DECC, GEBCO, CEFAS,
File Reference	J:\P1975\Mxd\NEW Foreshore Licence 2016\ Appendix_D_Fish_Spawning.mxd
Created By	Ian Charlton
Reviewed By	Emma Langley
Approved By	Anna Farley

Co-financed by the European Union Connecting Europe Facility

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0 4 8 12 16 20 km

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APPENDIX E – APPROPRIATE ASSESSMENT (AA) SCREENING

E.1 INTRODUCTION

In accordance with the provisions of Article 6(3) of the EU Habitats Directive and the Irish Habitat Regulations (2011), an Appropriate Assessment (AA) Screening has been undertaken to consider the possible impacts of the proposed survey on relevant Natura 2000 sites.

This Appendix presents the findings of this AA assessment in support of the Foreshore Licence Application and has been based on the following guidance documents:

- The Department of Environment, Heritage and Local Government (DEHLG) Guidance "Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, 11 February 2010."
- The European Commission Guidance "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, November 2001".
- The Department of Arts, Heritage and the Gaeltacht "Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document, April 2012."

In accordance with the above guidance the sites considered in the AA screening are Natura 2000 sites which comprise Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

E.1.1 Legislative Background

The Habitats Directive (Council Directive 92/43/EC) and Birds Directive (Council Directive 2009/147/EC) enable European Union member states to work together within the same legislative framework to protect Europe's most valuable species and habitats, irrespective of political or administrative boundaries. At the heart of these Directives is the creation of a network of Europe's most valuable species and habitat sites known as Natura 2000.

Natura 2000 sites form an ecological network for the protection of sites that are of particular importance for rare, endangered or vulnerable habitats and species within the EU. The Natura 2000 network in Ireland is made up of SACs and SPAs.

In Ireland, the Habitats and Birds Directives are transposed into national legislation by the European Communities (Birds and Natural Habitats) Regulations 2011, SI 477/2011. SACs and SPAs are fully protected by law in the Ireland from when the Minister gives notice of the decision to designate the sites. Candidate, proposed and Sites of Community Importance (SCI) sites are also included as part of the Natura 2000 network.

The obligation to undertake appropriate assessment derives from Article 6(3) and 6(4) of the Habitats Directive. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances.

Both articles require a number of steps and tests to be applied in sequential order. Each step in the process precedes and provides a basis for other steps. The results of each step must be clearly documented for decision making.

To establish whether, in relation to the project activities, (a significant impact will occur to Nature 2000 sites, an Appropriate Assessment (AA) Screening is required. The purpose of AA Screening is to

determine, on the basis of a preliminary assessment and objective criteria, whether the project, alone and in combination with other plans and projects, could have any significant effect on a Natura 2000 site in view of the site's conservation objectives. A precautionary principle should be applied; therefore where significant effects are likely, uncertain or unknown at screening stage, AA will be required.

If significant impacts are considered likely then an AA would need to be undertaken by the competent authority to consider the impacts on the integrity of the Natura 2000 sites either alone or in combination with other projects in view of their conservation objectives. To support an AA, data and information on the site must be obtained and presented in a Natura Impact Statement (NIS).

E.1.2 Scope of the AA Screening

The foreshore licence application which this Appendix supports covers all proposed survey works planned for 2018/2019. A separate foreshore licence application, including a separate AA screening report, will be prepared for the installation of the marine cables should the project go ahead.

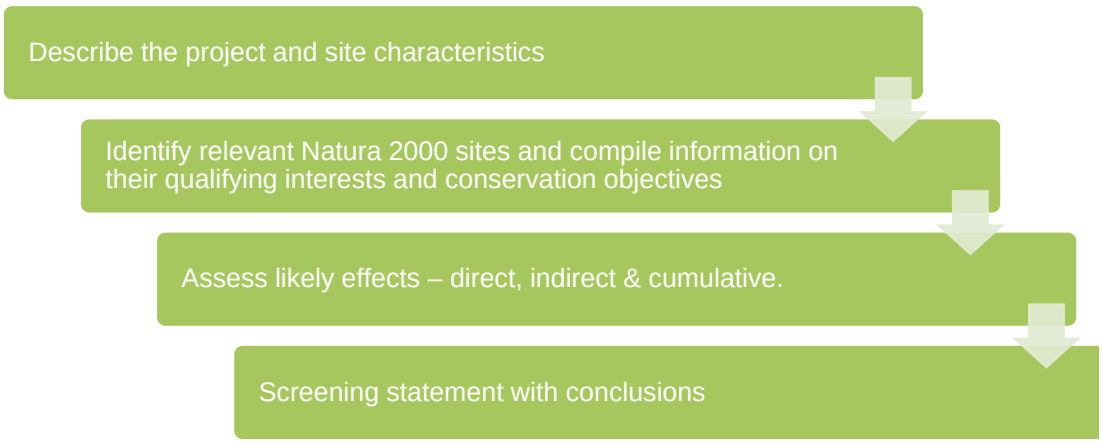
In recognition that some of the consultees will also be interested in the survey route from 12nm to the median line, the AA Screening has covered the entire route in Irish waters out to the median line. It is noted that although the Irish Natura 2000 sites in the region of the application area are all coastal there are a number of UK Natura 2000 sites designated for mobile species (e.g. marine mammals) and these have been included in the assessment as appropriate in recognition that the species may travel in to the application area.

E.2 APPROACH TO AA SCREENING

E.2.1 Overview

This AA screening has been undertaken according to the process set out in the NPWS and DEHLG (2010) Guidance; following the process illustrated in Figure E-1.

Figure E-1 AA screening process



The structure for the remainder of the appendix therefore reflects the key steps in this process.

E.3 DESCRIBE THE PROJECT

Full details of the scope of work are covered in the main document in Section 2. The site characteristics i.e. the baseline environment within the application area, are described in Section 3.

E.4 IDENTIFICATION OF RELEVANT NATURA 2000 SITES

This section has been split into two main parts:

- E.4.1 Screening of sites – this section provides information on how the relevant Natura 2000 sites were identified;
- E.4.2 Information on the relevant Natura 2000 sites – this section provides further details on the selected sites, including information on their conservation objectives to inform the assessment of likely affects in E.5.

E.4.1 Identifying Natura 2000 sites

The potential for a Natura 2000 site to be significantly impacted depends on whether receptors which are designating features of a Natura 2000 site:

a. Can come into contact with the surveys; and
b. Are sensitive to the survey activities to the extent that the activity is likely to have an adverse impact on the Natura 2000 site.

Identifying relevant Natura 2000 sites has therefore been achieved by applying the following steps:

1. Identify which receptors could be sensitive to the survey activities;
2. Identify potential impacts the surveys could have on these receptors and what the zone of impact for these receptors is, i.e. how far from the survey could a receptor be potentially impacted;
3. Screen SACs and SPAs within these zones of impact to identify designating features and assess whether interest features of the site could be significantly impacted by the proposed survey activities; and
4. Assess whether any SACs and SPAs further afield from the survey area have mobile qualifying species which may travel into the zone of impact and have the potential to be significantly impacted.

E.4.1.1 Identification of sensitive receptors

The receptors which could potentially be affected by the marine surveys and could be the designating interest features of Natura 2000 sites in the region are:

- Benthic habitats;
- Fish;
- Birds; and
- Marine mammals.

E.4.1.2 Identification of potential impacts and defined zones of impact

For each of the identified receptors, a description has been provided below to explain how these receptors could be impacted and what the zone of impact is likely to be.

The geographical extent of the likely zone of impact for non-mobile receptors such as benthic communities will represent the required search area for relevant Natura 2000 sites. For highly mobile species such as fish, birds and marine mammals the Natura 2000 sites which are most likely to be significantly impacted will be those within or in the vicinity of the zone of impact. However, in recognition that mobile species from SACs and SPAs further afield could travel into the area during the proposed surveys Natura 2000 sites within 40km of the application area where screened for sensitive mobile species.

Benthic habitats have the potential to be impacted in three ways:

- During the geotechnical and environmental surveys from the direct removal of substrate during sampling;
- Through smothering by the deposition of risings from the geotechnical boreholes; and
- Through smothering by the JUB legs.

The zone of impact on benthic communities will be restricted to the survey corridor (maximum 500m wide in the offshore area). As the survey corridor within the application area may be subject to change the entire application area was considered as the zone of influence for the purposes of the assessment. Relevant sites would include SACs designated for Annex I habitats which support benthic communities. Therefore all SACs which the application area passes directly through have been screened for Annex I habitats which could be affected.

Fish have the potential to be impacted by the geophysical survey from underwater noise within the immediate vicinity of the survey vessel. As discussed in Section 4.3.1.1, effects can either be direct e.g. causing behavioural changes or temporary hearing loss, or indirect e.g. noise acting as a barrier impeding migration pathways. Of the four migratory Annex II species known to be present in the vicinity of the application area, Atlantic salmon are the only species known to be sensitive to underwater noise and as such, Twaite shad, sea lamprey and river lamprey have been screened out of the assessment.

The zone of impact for direct impacts from underwater noise to Atlantic salmon would be the survey corridor within the application area. However, there is the potential that the noise could also impeded migration from rivers in the vicinity of the application area. Natura 2000 sites within 40km of the application area have therefore been screened for the presence of Atlantic salmon as a designating interest feature.

Marine birds – the physical presence of the survey vessels could cause a small degree of disturbance to birds in the vicinity of the works. Whilst birds present on the surface waters in the vicinity of the survey vessel could be temporarily displaced from their chosen feeding/resting location, they are likely to readily move to another nearby location. Given the short duration of the operations with the vessel moving steadily forward along the survey route any disturbance at a given location is likely to be minimal and given shipping activity is moderate in the region, disturbance is unlikely to be felt

against background levels. Therefore, most birds are unlikely to be significantly impacted by disturbance.

The most vulnerable birds to disturbance would be nesting birds in the breeding season in the immediate vicinity of the survey. Disturbance to nesting birds caused by the presence of the survey vessel could have an impact on the success rate of the breeding population. The zone of impact of disturbance on nesting birds is considered to be up to 2km from the application area (NE/JNCC 2012). Therefore, all SPAs within this distance will be screened for nesting birds during the proposed survey operations.

Marine mammals have the potential to be impacted by the generation of underwater noise. Annex II marine mammal species present in the application area include grey seal, bottlenose dolphin and harbour porpoise.

The zone of impact from underwater noise on marine mammals, according to the marine mammal risk assessment (Section 4.5.1.1), is likely to be within 90m of the sound source. Relevant sites would include SACs designated for marine mammals within the vicinity of the survey area. However, in recognition of the highly mobile nature of marine mammals, the importance of the survey area to Annex II marine mammal species which could use the area and be derived from a SAC further afield has also been assessed.

E.4.1.3 Screening of Natura 2000 sites

A geographic information system (GIS) was used to map the boundaries of SACs and SPAs in relation to the application area. All SACs and SPAs which are within the defined zones of impact for identified receptors have been listed along with their qualifying features.

A total of 30 sites were screened in this assessment and are shown in Table E-1.

For each site the potential impacts to the designating features where identified and it was determined whether there is the potential for an interaction between the proposed survey and the receptors i.e. whether there is an impact-receptor pathway. This is determined by comparing information such as the extent of the zone of influence with information regarding the conservation feature e.g. species foraging distances, spatial extent of habitats etc. The interactions were defined as follows:

- Possible: A pathway between the proposed survey and the conservation feature can be identified that is likely to result in an effect; or
- Unlikely: Either a pathway between the proposed survey and the conservation features cannot be identified or a pathway exists but there is no physical overlap of the impact and the conservation feature.

A likely effect is defined as one that cannot be ruled out on the basis of objective information. The test is a 'likelihood' of effects rather than a 'certainty' of effects. Where the proposed survey is likely to undermine the site's conservation objectives, it must be considered likely to have a significant effect on the site. The assessment of that risk must be made in the light, amongst other things, of the characteristics and specific environmental conditions of the site concerned. If an interaction between the project activities and the conservation features is possible, the potential significance of the effect will be considered.

Table E-1 Screening for relevant Natura 2000 sites

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
Hook Head SAC	Within	Within	**Annex I Habitats:** Large shallow inlets and bays, Reefs, Vegetated sea cliffs of the Atlantic and Baltic coasts	**Possible** Geotechnical sampling has the potential to disturb / damage sensitive reef habitats.
River Barrow and River Nore SAC	2.7km	6.3km	**Annex I Habitats:** Estuaries, Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean salt meadows (*Juncetalia maritimi*), Killarney fern *Trichomanes speciosum,* Nore freshwater pearl mussel *Margaritifera durrovensis,* Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation, European dry heaths, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels, Petrifying springs with tufa formation (*Cratoneurion*), Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior Alno-Padion*, *Alnion incanae*, *Salicion albae*. **Annex II Species:** Desmoulin's whorl snail *Vertigo moulinsiana,* Freshwater pearl mussel *Margaritifera margaritifera,* White-clawed crayfish *Austropotamobius pallipes,* Sea lamprey *Petromyzon marinus,* Brook lamprey *Lampetra planeri,* River lamprey *Lampetra fluviatilis,* Twaite shad *Alosa fallax,* Atlantic salmon (*Salmo salar*) (only in fresh water), Otter *Lutra lutra*	**Possible** Underwater noise from geophysical survey could disturb Atlantic salmon during migration. Sea lamprey, river lamprey and Twaite shad are not considered sensitive.

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
Saltee Islands SAC	14.6km	4km	**Annex I Habitats:** Tidal Mudflats and Sandflats, Large Shallow Inlets and Bays, Reefs, Vegetated Sea Cliffs, Sea Caves **Annex II Species:** Grey Seal (*Halichoerus grypus*)	**Possible** Underwater noise from the geophysical survey could impact grey seal from the site if they are in the application area.
Lower River Suir SAC	13.9km	16.1km	**Annex I Habitats:** Atlantic Salt Meadows, Mediterranean Salt Meadows, Floating River Vegetation, Hydrophilous Tall Herb Communities, Old Oak Woodlands, Alluvial Forests, Yew Woodlands **Annex II Species:** Freshwater Pearl Mussel (*Margaritifera margaritifera*), White-clawed Crayfish (*Austropotamobius pallipes*), Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Alosa fallax*), Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*)	**Possible** Underwater noise from geophysical survey could disturb Atlantic salmon during migration. Sea lamprey, river lamprey and Twaite shad are not considered sensitive.
Bannow Bay SAC	3.4km	1.6km	**Annex I Habitats**: Estuaries, Tidal Mudflats and Sandflats, Annual Vegetation of Drift Lines, Perennial Vegetation of Stony Banks, *Salicornia* Mud, Atlantic Salt Meadows, Mediterranean Salt Meadows, Halophilous Scrub, Embryonic Shifting Dunes, Marram Dunes (White Dunes), Fixed Dunes (Grey Dunes)	No impact-receptor pathway present. Site was scoped out of the assessment.
Tramore Dunes and Backstrand SAC	7.7km	17.1km	**Annex I Habitats:** Mudflats and sandflats not covered by seawater at low tide, Atlantic Salt Meadows, Mediterranean Salt Meadows, Embryonic Shifting Dunes, Marram Dunes (White Dunes), Fixed Dunes (Grey Dunes)	No impact-receptor pathway present. Site was scoped out of the assessment.

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
Ballyteige Burrow SAC	13.9km	7.1km	**Annex I Habitats** Estuaries, Mudflats and sandflats not covered by seawater at low tide, Coastal lagoons, Salicornia and other annuals colonising mud and sand, Atlantic Salt Meadows, Mediterranean Salt Meadows, Mediterranean and thermo-Atlantic halophilous scrubs, Embryonic Shifting Dunes, Marram Dunes (White Dunes), Fixed Dunes (Grey Dunes)	No impact-receptor pathway present. Site was scoped out of the assessment
Lady's Island Lake SAC	33.4km	25km	**Annex I Habitats:** Coastal lagoons, Reefs	No impact-receptor pathway present. Site was scoped out of the assessment
Tacumshin Lake SAC	26.7km	19.7km	**Annex I Habitats:** Coastal lagoons, Embryonic Shifting Dunes, Marram Dunes (White Dunes)	No impact-receptor pathway present. Site was scoped out of the assessment
Raven Point Nature Reserve SAC	42.2km	35.5km	**Annex I Habitats:** Mudflats and sandflats not covered by seawater at low tide, Atlantic Salt Meadows, Embryonic Shifting Dunes, Marram Dunes (White Dunes), Fixed Dunes (Grey Dunes), Dunes with Salix repens ssp. argentea (*Salicion arenariae*), Humid dune slacks	No impact-receptor pathway present. Site was scoped out of the assessment
Slaney River Valley SAC	36.6km	29.7km	**Annex I Habitats:** Estuaries, Mudflats and sandflats not covered by seawater at low tide, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), Mediterranean salt meadows (*Juncetalia maritimi*) **Annex II Species** Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Alosa fallax*), Atlantic Salmon (*Salmo salar*), Otter (*Lutra lutra*), Harbour seal (*Phoca vitulina*)	**Possible** Underwater noise from geophysical survey could disturb Atlantic salmon during migration. Sea lamprey, river lamprey and Twaite shad are not considered sensitive.

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
				Underwater noise from the geophysical survey could impact harbour seal from the site if they are in the application area
Carnsore Point SAC	31.6km	23km	**Annex I Habitats** Mudflats and sandflats not covered by seawater at low tide. Reefs.	No impact-receptor pathway present. Site was scoped out of the assessment
Blackwater Bank SAC	46km	38km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time.	No impact-receptor pathway present. Site was scoped out of the assessment
Long Bank SAC	42km	34.3km	**Annex I Habitats** Sandbanks which are slightly covered by sea water all the time.	No impact-receptor pathway present. Site was scoped out of the assessment
Helvick Head SAC	35.7km	50.5km	**Annex I Habitats** Vegetated sea cliffs of the Atlantic and Baltic coasts; European dry heaths	No impact-receptor pathway present. Site was scoped out of the assessment
Bannow Bay SPA	3.4km	1.6km	**Wintering birds:** Light-bellied Brent Goose (*Branta bernicla hrota);* Shelduck (*Tadorna tadorna));* Pintail (*Anas acuta);* Oystercatcher (*Haematopus ostralegus);* Golden Plover (*Pluvialis apricaria);* Grey Plover (*Pluvialis squatarola);* Lapwing (*Vanellus vanellus);* Knot (*Calidris canutus);* Dunlin (*Calidris alpina);* Black-tailed Godwit (*Limosa limosa);* Bar-tailed Godwit (*Limosa lapponica);* Curlew (*Numenius arquata);* Redshank (*Tringa totanus)* Wetlands	**Unlikely** Birds assessed as being sensitive to the proposed survey are nesting birds. This SPA is not designated for breeding birds; it is important for over wintering waterfowl.
Saltee Islands SPA	19.9km	10km	Fulmar (Fulmarus glacialis); Gannet (Morus bassanus); Cormorant (Phalacrocorax carbo); Shag (Phalacrocorax aristotelis); Lesser Black-backed	**Unlikely** The application area is within the foraging distances of all designated species.

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
			Gull (Larus fuscus); Herring Gull (Larus argentatus); Kittiwake (Rissa tridactyla); Guillemot (Uria aalge); Razorbill (Alca torda); Puffin (Fratercula arctica)	However, disturbance will be limited in extent and duration and there is sufficient space in the surrounding environment for birds to temporarily relocate.
Lady's Island Lake SPA	33.4km	27.5km	Gadwall (Anas strepera); Black-headed Gull (Chroicocephalus ridibundus); Sandwich Tern (Sterna sandvicensis); Roseate Tern (Sterna dougallii); Common Tern (Sterna hirundo); Arctic Tern (Sterna paradisaea); Wetland and Waterbirds	**Unlikely** The application area is within the foraging distances of Black-headed gulls, Sandwich terns, Roseate, Common and Arctic Terns and it possible that they use the application area for foraging. However, disturbance will be limited in extent and duration and there is sufficient space in the surrounding environment for birds to temporarily relocate .
The Raven SPA	42km	35km	Red-throated Diver (*Gavia stellata*); Cormorant (*Phalacrocorax carbo*); Common Scoter (*Melanitta nigra*); Grey Plover (*Pluvialis squatarola*); Sanderling (*Calidris alba*); Wetland and Waterbirds	**Unlikely** Cormorants have a maximum foraging range of 35km. The application area is at the furthest extent of their foraging range. There is sufficient space in the surrounding environment for birds to temporarily relocate without causing stress.
Ballyteige Burrow SPA	14.8km	8.1km	Shelduck (*Tadorna tadorna*); Black-tailed Godwit (*Limosa limosa*) Bar-tailed Godwit (*Limosa lapponica*) Wetland and Waterbirds	No impact-receptor pathway present. Site was scoped out of the assessment

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
Tramore Back Strand SPA	7.6km	17.1km	Black-tailed Godwit (*Limosa limosa*); Bar-tailed Godwit (*Limosa lapponica);* Curlew (*Numenius arquata);* Wetland and Waterbirds.	No impact-receptor pathway present. Site was scoped out of the assessment
Wexford Harbour and Slobs SPA	34.1km	27.5km	Cormorant (Phalacrocorax carbo); Light-bellied Brent Goose (*Branta bernicla hrota*); Shelduck (*Tadorna tadorna*); Wigeon (*Anas penelope*); Teal (*Anas crecca*); Pintail (*Anas acuta*); Scaup (*Aythya marila*); Red-breasted Merganser (*Mergus serrator*); Oystercatcher (*Haematopus ostralegus*); Knot (*Calidris canutus*); Sanderling (*Calidris alba*); Dunlin (*Calidris alpina*); Black-tailed Godwit (*Limosa limosa*); Bar-tailed Godwit (*Limosa lapponica*); Curlew (*Numenius arquata*); Redshank (*Tringa totanus*); Black-headed Gull (*Chroicocephalus ridibundus*); Lesser Black-backed Gull (*Larus fuscus*); Little Tern (*Sterna albifrons*); Greenland White-fronted Goose (*Anser albifrons flavirostris*); Wetland and Waterbirds	**Unlikely** The application area is within the foraging range of cormorant, black-headed gull and lesser black backed gull. However, birds will be able to forage over the wider area which will be unaffected.
Tacumshin Lake SPA	28.2km	21.4km	Wigeon (*Anas penelope*); Teal (*Anas crecca*); Pintail (*Anas acuta*); Black-tailed Godwit (*Limosa limosa*). Wetland and Waterbirds	No impact-receptor pathway present. Site was scoped out of the assessment
Keeragh Islands SPA	11.1km	4.5km	Cormorant (Phalacrocorax carbo)	**Unlikely** The application area is within the foraging range of cormorant. However, birds will be able to forage over the wider area which will be unaffected.
Helvick Head to Ballyquin SPA	35.7km	52.5km	Cormorant (Phalacrocorax carbo); Herring Gull (Larus argentatus); Chough (Pyrrhocorax pyrrhocorax); Kittiwake (Rissa tridactyla)	**Unlikely** The application area is within the foraging range of herring gull and kittiwake.

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
				However, birds will be able to forage over the wider area which will be unaffected.
Mid-Waterford Coast SPA	15.5km	23.4km	Cormorant (*Phalacrocorax carbo*); Herring Gull (*Larus argentatus*); Chough (*Pyrrhocorax pyrrhocorax*)	**Unlikely** The application area is within the foraging range of herring gull and cormorant. However, birds will be able to forage over the wider area which will be unaffected.
River Nore SPA	39.5km	35km	Kingfisher (*Alcedo atthis*)	No impact-receptor pathway present. Site was scoped out of the assessment
Dungarvan Harbour SPA	37.6km	52.5km	Great Crested Grebe (*Podiceps cristatus*); Light-bellied Brent Goose (*Branta bernicla hrota*); Shelduck (*Tadorna tadorna*); Red-breasted Merganser (*Mergus serrator*); Oystercatcher (*Haematopus ostralegus*); Golden Plover (*Pluvialis apricaria*); Grey Plover (*Pluvialis squatarola*); Knot (*Calidris canutus*); Black-tailed Godwit (*Limosa limosa*); Bar-tailed Godwit (*Limosa lapponica*); Curlew (*Numenius arquata*); Redshank (*Tringa totanus*); Turnstone (*Arenaria interpres*); Wetland and Waterbirds	No impact-receptor pathway present. Site was scoped out of the assessment
UK Waters				
Pembrokeshire Marine/ Sir Benfro Forol SAC	24.3km		**Annex I Habitats:** Estuaries, Large shallow inlets and bays, Reefs **Annex II species:** Grey seal (*Halichoerus grypus*), Shore dock (*Rumex rupestris*)	**Possible** Underwater noise from the geophysical survey could impact harbour seal from the site if they are in the application area

Site Name / Designation	Distance (direct) from the application area (km)		Designating Feature(s)	Likelihood of interaction between survey works and designating feature(s)
	Boyce's Bay route	Baginbun Beach route		
West Wales Marine / Gorllewin Cymru Forol pSAC	35km		Harbour Porpoise (*Phocoena phocoena*)	**Possible** Underwater noise from the geophysical survey could impact harbour porpoise from the site if they are in the application area.

E.5 ASSESSMENT OF LIKELY AFFECTS

Of the 30 Natura 2000 sites screened (Table E-1), it was identified that a receptor-impact pathway potentially existed for 15 sites. Of these 15, the screening concluded that 7 sites could possibly be affected by the proposed survey activities. For the remaining 8 it was unlikely that the proposed activities would affect the designating features.

This section describes the possible impacts, pathways and cumulative impacts on the seven screened sites. The significance of the impact on each of the screened sites was assessed against the conservation objectives of the site.

E.5.1 Identification of potential impacts

- Habitat loss during geotechnical and benthic sampling;
- Generation of underwater noise presenting a physical barrier to migratory fish; and
- Disturbance / injury from underwater noise during the geophysical survey.

E.5.2 Assessment of potential impact significance

The following assessment considers whether the potential impacts listed in E.5.1 have the potential to significantly impact the integrity of the Natura 2000 sites taken forward for further assessment.

E.5.2.1 Temporary habitat loss during intrusive sampling

Table E-1 identified that the designating reef features of the Hook Head SAC are potentially sensitive to intrusive sampling e.g. geotechnical and environmental survey. Temporary substratum loss and direct displacement of sediment is a direct impact during geotechnical and environmental survey as small areas of the seabed within the Hook Head SAC will be removed for investigation.

Geotechnical borehole at the Baginbun landfall will involve the removal of up to four deep sediment and rock cores; each with a surface footprint of approximately 0.5m^2. A small cuttings pile created from drill risings will form around the borehole which could cover an area of seabed approximately 32m2 per sample location. Following completion of the drilling, the borehole will be left to naturally backfill with seabed sediments and cuttings material. Placement of the JUB legs on the seabed is expected to cover a maximum of 20.32m^2 per borehole. All this activity is within the SAC.

The survey corridor to Boyce's Bay for the most part skirts the edge of the SAC but passes within its south-westerly corner for a short distance.

The reefs, a designating feature of the site, are potentially vulnerable to the geotechnical operations. The application area in relation to the boundary of the SAC and the designated habitats is presented in Appendix B. The survey centre line has been designed to avoid the designated reef features as mapped by NWPS. The geotechnical boreholes will be acquired within the nearshore application area, which does not overlap with the reef features and it is unlikely that the boreholes will impact on the reef features.

Within the Baginbun nearshore application area, sediments are predominantly sandy. The geotechnical sampling programme will create small depressions (from the JUB legs) and mounds (from risings) on the seabed. Given the region is subject to strong tidal streams and swells, any

mounds or depressions created during sampling are likely to be quickly dispersed and infilled following rig removal. All benthic communities in the footprint of sampling equipment, and in their immediate vicinity, will be impacted through substratum loss, direct displacement or smothering during sampling. However, softer sediments such as those found at the landfall site are highly recoverable to disturbance and typical species are able to recolonize rapidly.

The impact of geotechnical sampling on the sensitive reefs in the area will be minimal due to the mitigation incorporated into the design of the survey (described in E.5.4 below). Effects from sampling will be extremely localised with disturbance not expected to have any significant impact to the wider reef community. The conservation objectives of the Hook Head SAC will not be significantly affected.

E.5.2.2 Generation of underwater noise presenting a physical barrier to migratory fish

The screening exercise identified a number of Natura 2000 sites within 40km of the application area for which Annex II migratory fish species are listed as a designating feature, namely: River Barrow and River Nore SAC; Lower River Suir SAC; and Slaney River Valley SAC.

It is recognised that fish are mobile species and therefore migratory species from these SACs have the potential to cross the application area during the survey operations. As discussed in Section 4.3.1.1 of the Annex II species identified as present in these SACs, Atlantic salmon are sensitive to noise and therefore potentially vulnerable to the proposed survey operations. Twaite shad, river lamprey and sea lamprey are not known to be sensitive to noise. Consultation with NPWS confirmed that Twaite shad in particular will be moving up the estuaries in April and the survey would not present a barrier to this migration (pers comm David Lyons).

Atlantic salmon are thought to be present in the application area between May and June and during autumn months. Smolts leave rivers in cohorts in early spring/summer, usually between April and June (Holm et al, 2000; Hendry & Cragg-Hine, 2003). This is triggered by combinations of environmental stimuli such as water temperatures greater than 10°C and rates of high flow in river. When they have reached the estuary, they will generally enter the sea during ebb-tide and follow the direction of tidal streams (Hendry & Cragg-Hine, 2003; Malcolm et al, 2010), which for the application area is a general south westerly direction parallel to the coast.

Given the large open area of sea in the offshore region of the survey area, and the transient nature of the proposed survey Atlantic salmon are likely to be able to readily alter their course slightly to avoid the survey if necessary. It is considered unlikely that sufficient numbers of individuals will be affected by the proposed operations to significantly affect the conservation objectives of the sites.

The NPWS has confirmed that no particular mitigation would be necessary for the Annex II fish species in the SACs in the area (personal coms David Lyons).

E.5.2.3 Disturbance / injury from underwater noise during the geophysical survey

The geophysical survey includes the use of multi-beam echo-sounders, side scan sonars, sub bottom profilers and rotary coring. One of the most important environmental concerns related to the proposed activities is the potential effects of underwater sound on marine mammals. As discussed in Section 4.5.1.1, both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication and hunting (Richardson et al, 1995). It is generally accepted that exposure to anthropogenic sound can induce a range of effects on marine mammals. These range

from insignificant impacts to behavioural changes, non-injurious type effects including masking of biologically relevant sound signals, such as communication signals, and ultimately can lead to physical injury and death if the sound source is sufficiently intense.

NPWS has indicated that the intertidal and shallow water survey is within an embayment. This heightens the concern as animals are restricted by water depth and coastal geography and may not be able to avoid the proposed operations as they would do in open water.

The screening exercise identified that the following Natura 2000 sites list Annex II marine mammals as a designating feature and therefore could possibly be affected by the proposed operations: Saltee Islands SAC (grey seal); Slaney River SAC (harbour seal); Pembrokeshire Marine SAC (harbour seal); and West Wales SAC (harbour porpoise). It should be noted that the latter two sites (Pembrokeshire Marine SAC and West Wales SAC) are within UK waters but have been included in the assessment as the proposed survey continues from the application area across the Irish EEZ and onwards through UK waters. It is possible the animals from the two sites will be present within the survey area in the Irish EEZ.

In order to evaluate the potential of the proposed survey to cause harm to marine mammals, a marine mammal risk assessment has been conducted using both the Southall et al. (2007) approach and the recently published NMFS (2016) approach. The assessment, presented in Section 4.5.1.1 concluded that grey and harbour seal could experience a permanent threshold shift (PTS) in hearing if within 5m of the MBES and within 2m of the SSS. Harbour porpoise are also sensitive to the sound generated by the MBES and SSS, with PTS being experienced at 50m and 15m respectively.

The Saltee Islands SAC lies 4km from the application area and therefore it is possible that grey seal from the site will be present in the water, especially during the earlier months of the proposed survey window e.g. May to August. From August through to December animals are likely to be hauled up on beaches for pupping. As discussed in Section 4.5.1.3, seals are likely to flee if vessels approach within 900m; suggesting that they will avoid the area before they encounter sound levels that will harm them. Given the zone of influence (15m) and the distance to the site (4km) it is unlikely that animals will be affected by the proposed survey. However, in recognition of the potential sensitivity, mitigation measures to further reduce the risk have been proposed in E.5.4.

Given the distance to Slaney River SAC (29.7km) and the Pembrokeshire Marine SAC (24.3km from Irish median line), and the discussion above with respect animals fleeing from disturbance, it is highly unlikely that harbour seal will be affected by the proposed survey. However, the mitigation measures proposed to reduce the risk to grey seal from the Saltee Islands SAC will also be appropriate to harbour seal.

Harbour porpoise are not a designating feature of any of the Natura 2000 sites within the embayment. However, it is noted that they may be present in the offshore application area, possibly from the West Wales pSAC. Depending on the timing of the survey it may overlap with the peak period (August) for harbour porpoise sightings in Irish waters. Animals within the offshore application area will not be limited by the coastal geography and will be able to avoid the proposed survey. In addition the survey is transient in nature and will progress swiftly so will not act as a barrier to migration routes. It is unlikely that animals will be affected by the proposed survey.

Although it is considered unlikely that sufficient numbers of grey seal, harbour seal or harbour porpoise will be affected by the proposed operations to significantly affect the conservation

objectives of the sites identified, in recognition of the potential sensitivity of marine mammals, mitigation measures to further reduce the risk are required.

E.5.2.4 Cumulative Impacts

Potential cumulative impacts relate primarily to existing levels of disturbance at the landfall sites and from marine traffic. Currently the type of marine activity in the area of the nearshore survey falls into the leisure/sports traffic category. The coastline in the region of the application area has the potential for a number of recreational activities including sailing, sea angling and swimming. Given the limited scope and short-term nature of the proposed survey works and existing background levels of disturbance, no significant intensification of disturbance is predicted.

E.5.3 Mitigation measures

As identified in E.5.3 there are a number of potential effects which could possibly significantly affect the conservation objectives of a Natura 2000 site if mitigation measures are not implemented. Mitigation measures proposed are listed in Table E-2 below.

Table E-2 Proposed mitigation

Potential effect	ID	Mitigation measure
Temporary habitat loss during intrusive sampling	M1	Geotechnical boreholes will only be undertaken in the nearshore application area and therefore will not affect the reef habitats in the Hook Head SAC.
	M2	Biotope maps of the Hook Head SAC have been used in the design of the route to ensure, where possible, sensitive reef features are avoided.
	M3	To ensure any impacts on the designated features of the Hook Head SAC are reduced to as low as practicable, the geophysical data will be used to identify potential reef and priority habitats prior to locating offshore geotechnical (e.g. CPT and VC) and environmental sampling. Drop down camera will be used to visualise the seabed prior to environmental sampling to ground truth geophysical interpretation. Geotechnical and environmental sampling sites will not be positioned on reef features.
	M4	Deployment of equipment on the seabed will be kept to a minimum in order to minimise loss and disturbance of features of conservation interest.
Disturbance / injury from underwater noise during the geophysical survey	M5	Greenlink are committed to following the Department of Arts Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); in particular Section 4.3.4 (ii) applicable to MBES, SSS and SBP surveys within an embayment.

E.5.4 Screening determination

Having taken into account all mitigation measures in E.5.3, the seven sites considered to have the potential for a significant effect from the proposed survey works were re-screened. This assessment is presented in Table E-3.

Following the second screening process, the proposed survey is considered to have no significant effects on Natura 2000 sites.

The potential effects from survey operations have been minimised as a result of the implementation of mitigation measures.

Table E-3 Potential for significant effects

Site	Applicable conservation feature	Potential impact on site	Likely significant effect	Possible cumulative effect	Mitigation measure	Significant residual effect
Hook Head SAC	Reefs	Loss or disturbance of habitat	Geotechnical sampling has the potential to disturb/damage sensitive reef habitats. **Possible:** Geotechnical and environmental sampling will remove small areas of the seabed within the Hook Head SAC for investigation. However, the mitigation proposed will ensure that the designating reef features are not affected by the survey operation.	No	M1 – M4	No
River Barrow and River Nore SAC	Atlantic Salmon	Disturbance to features of conservation interest	Underwater noise from geophysical survey could disturb Atlantic salmon during migration. **Unlikely:** Although the proposed survey may overlap with the time that Atlantic salmon are migrating through the application area, given the large open area of sea, and the transient nature of the proposed survey Atlantic salmon are likely to be able to readily alter their course slightly to avoid the survey if necessary. It is considered unlikely that sufficient numbers of individuals will be affected by the proposed operations to significantly affect the conservation objectives of the sites.	No	None proposed	No
Lower River Suir SAC						
Slaney River Valley SAC						
Saltee Islands SAC	Grey seal	Disturbance to features of conservation interest Disturbance to features of conservation interest	Underwater noise from the geophysical survey could impact seal from the site if they are in the application area. **Unlikely:** Marine mammal risk assessment identified that survey equipment has the potential to cause physical injury if seals are within 10m of vessel. However seals are likely to flee if vessels approach within 900m; suggesting that they will avoid the area before they encounter sound levels that will harm them. In addition, the survey is temporary and transient and will quickly move through the application area.	No	M5	No
Pembrokeshire Marine/ Sir Benfro Forol SAC	Grey seal			No	M5	No
West Wales Marine / Gorllewin Cymru Forol SAC	Harbour porpoise			No	M5	No

E.6 SCREENING STATEMENT AND CONCLUSIONS

To determine whether the proposed survey is likely to have a significant effect on any Natura 2000 sites, either individually or in-combination with other plans or projects, AA screening was carried out.

The screening considered 30 Natura 2000 sites that were either within the direct zone of influence of the proposed surveys or contain mobile Annex II species which could potentially travel into the application area.

It was identified that the proposed survey has the potential to have the following effects:

- Temporary habitat loss during geotechnical and benthic sampling;
- Generation of underwater noise which could present a physical barrier to migratory fish; and
- Generation of underwater noise which could disturb or injure marine mammals.

Consideration was given to other planned activities in the area that could interact with the proposed survey to cause cumulative impacts. None were identified that had the potential to significantly affect the conservation objectives of the Natura 2000 sites.

The proposed survey activities are short term, localised and transient. Of the sites assessed, it is considered possible that there exists an impact-receptor pathway between the proposed survey and the designating features of seven sites. However, when these sites were assessed for likely significant effects it was concluded that it was unlikely that the proposed survey activities would significantly affect the conservation objectives of six of the sites, namely: River Barrow and River Nore SAC; Lower River Suir SAC; Slaney River Valley SAC; Saltee Islands SAC; Pembrokeshire Marine/ Sir Benfro Forol SAC; and West Wales Marine / Gorllewin Cymru Forol SAC.

It is possible that geotechnical and environmental sampling could significantly affect the reef features of the Hook Head SAC. Mitigation has been proposed to reduce the significance of the impacts on the conservation features and the site re-screened. Re-screening concluded that the mitigation is sufficient to reduce the impact on the site to a level where there will be no residual impact.

In conclusion, the proposed survey will not have a likely significant effect on the conservation objectives of any Natura 2000 site either on its own or in combination with any other plans or projects.

APPENDIX F – NPWS MEETING MINTURES 09 DECEMBER 2015

Minutes

ARUP

Project title	Greenlink	Job number	246369-00
Meeting name and number	NPWS Meeting	File reference	9-04
Location	NPWS, Custom House, Galway	Time and date	2.30pm 9 December 2015
Purpose of meeting	Discuss potential landfall options and environmental studies for the Greenlink Interconnector (DAU Ref: G Pre00357/2015)		
Present	NPWS - David Lyons Element Power - Tom Brinicombe Intertek - Anna Farley (Offshore consultant) Arup - Sheila O'Sullivan (Onshore consultant)		
Apologies	Connie Kelleher & Karl Brady (National Monuments Service - DAHG)		
Circulation	Those present		

Action

1. Introductions

David Lyons will be the NPWS point of contact for the project. David will deal with the offshore scope of work. Somebody else from NPWS will be appointed for the onshore scope of work when required at a later date in the project.

Tom Brinicombe represents the client of the project – Element Power.

Intertek are the offshore consultant for the project.

Arup are the onshore consultant for the project.

2. Project Overview

The Greenlink project is proposing to develop a 500MW interconnector between Ireland and the UK.

The project will link the power markets in Great Britain and Ireland.

Prepared by	Sheila O'Sullivan
Date of circulation	6 January 2015
Date of next meeting	N/A

Action

The current proposed connections are Pembroke in Wales and Great Island in Ireland.

Greenlink has obtained EU CEF (Connecting Europe Facility) funding to the end of next year.

Greenlink is also expected to be confirmed as an EU PCI (Project of Common Interest) early in 2016.

3. Draft Landfall Options & Environmental Constraints

A preliminary desk-top assessment & preliminary site visits have been completed to identify potential draft landfall options for the interconnector.

The shortest route corridor is preferable both from an economic point of view and an environmental point of view as it minimises potential impacts – therefore the preliminary assessment has focused on the southeast of Ireland.

The location of the landfall also requires a compromise between onshore and offshore constraints.

The southeast coast of Ireland is protected by numerous offshore environmental designations, including SAC's and SPA's and therefore create an environmental constraint to the landfall location.

While assessment work is an iterative process, the following three landfalls have been identified as preferable based on draft preliminary assessments:

- Booley Bay
- Boyce's Bay
- Baginbun Beach

Booley Bay landfall is located within the River Barrow and River Nore SAC.

Boyce's Bay landfall is location within the Hook Head pNHA.

Baginbun Beach is located within the Hook Head SAC.

Habitat maps and conservations area files are available on the NPWS website.

Booley Bay is located in close proximately to a very important subtidal reef within the River Barrow and River Nore SAC (Duncannon). DL noted the exact boundary of the reef in relation to the landfall and any potential impact should be assessed. Mitigation

AF

Action

to be considered would include reinstating the top layer of the trench.

DL noted the pNHA's do not have protected status.

Summer installation would be preferable to avoid disturbance to the kittiwake colony in the Hook Head pNHA. Geese feed regularly on the shores in winter.

DL noted that the route and landfall locations within designated sites are acceptable once it can be demonstrated that there would be no negative impacts to the designated sites.

The Hook Head SAC is a rocky habitat and potential installation methodology would have to be assessed. DL noted it is preferable to use trenching or horizontal directional drilling under the designated sites rather than mattressing and/or rock protection, due to potential impact to the designated site and habitats with rock protection.

The offshore geophysical and geotechnical surveys will confirm the potential cable route installation methodology. Following confirmation of potential installation methodologies an assessment on potential impacts to the designated sites will be completed to evaluate suitability.

The installation is a relatively quick process and therefore potential impacts and mitigation for birds etc. are anticipated to be suitable for the environmental assessment.

Migratory fish species are designated features of the River Barrow and River Nore SAC. DL felt that the geophysical survey and installation would not prove to be a barrier to passage and no specific mitigation would be required.

DL noted that the estuary comprises of a sandy sediment top layer which should be suitable for installation. Within the estuary disturbance of the upper sandy sediment layers is common and therefore the quick installation is anticipated to create no significant impact with high recoverability of the seabed.

The SPA is a Ramsar site – DL to confirm. DL

4. Offshore Survey, Foreshore Licence & Environmental Constraints

A geophysical survey and geotechnical survey are proposed for the offshore route.

	Action
Pre-application has been prepared for the foreshore licence with will be submitted in the near future. DL confirm the DECLG Foreshore department will review this documentation.	
DL noted that the geophysical and geotechnical survey application should be completed together as for ease of NPWS assessment and approval.	
The actual application will be issued to the NPWS (DL) via the DECLG Foreshore department. DL noted all available information should be included within the application.	
It will take approximately 8 weeks to approve the licence once all information is submitted.	
A screening for appropriate assessment and a Marine Mammal Assessment will be required for the foreshore licence for the offshore survey.	AF
As it is a generic survey preliminary information is ok as it is understandable that the actual route is not confirmed and will be modified as results are gathered.	
It was agreed that a 1km wide corridor will be submitted to ensure all areas are covered within the application; however, it is anticipated that the survey will only require an approximate 500m wide corridor.	
It is anticipated that Multi-Beam Echo Sounder, Sidescan Sonar, Sub bottom profilers, magnetometers will be used for the survey.	
DL noted that a marine mammal observer will be required onboard for startups and works to be completed in accordance with the 'Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters'. DL highlighted the main concern for marine mammals would be the effect from sub bottom profilers in an embayment. DL outlined the area he considered to be an 'embayment' in the vicinity of the landfall locations.	
The River Barrow and River Nore SAC are protected for lamprey and salmon. DL noted this will not be an issue for the survey as noise levels created will not be significant and works also will be within a small area therefore not creating an obstacle. This will be similar for the cable installation.	
Intertek will issue actual GIS ArcView information to the NPWS, however, this will not be submitted to the Foreshore Department as not required for their systems.	

Action

5. Proposed Surveys & Studies

A separate screening for appropriate assessment (and potential Natura Impact Statement) and Environmental Report will be prepared for the actual cable installation. It is anticipated that a full EIA will not be prepared. A screening for EIA will be completed.

The offshore surveys proposed are as follows: Archaeological assessment, Marine Mammal Risk assessment, Marine Surveys (as detailed in Section 4 above), Intertidal Survey, and UXO survey.

Standard onshore (terrestrial) surveys will be completed. These will be discussed with onshore NPWS representative at a later date.

The standard onshore environmental studies anticipated are as follows: Flora & Fauna, Archaeological / Cultural Heritage, Geotechnical, Traffic, Noise, Air Quality, Flood, and Landscape & Visual.

The standard onshore ecological surveys anticipated are as follows:

- Winter Birds (landfalls)
- Breeding Birds
- Bats
- Badgers
- Otters
- Other Mammals
- Hedgerows & trees

6. Any other business

DL noted that more information may be available for the offshore marine routes from the Infomar website (geophysical data particularly should detail the sand-waves etc.)

There are no offshore marine protected sites (beyond the foreshore).

DL noted offshore Wexford is a busy fishing area with lots of trawling offshore.

Cable protection will be very important (particularly as High Voltage cable) to ensure no impacts to the cable but also to the fishing industry.

APPENDIX G – COMPANY'S MEMORANDUM AND ARTICLE OF ASSOCIATION

Converted to a Constitution under the Companies Act 2014.