NORTH CELTIC SEA
SITE INVESTIGATION
BRIEFING DOCUMENT

energia

1. SITE INVESTIGATION SURVEYS

A series of geophysical and geotechnical surveys will be undertaken to allow us to measure water depth, to identify seabed features (e.g. sand waves, reefs, archaeological features), to determine seabed sediment type and distribution (sand, mud, gravel, rock) both on and below the seabed. We will also be carrying out ecological surveys to determine the ecology on and in the seabed and in the water column. Oceanographic and hydrographic data on wind speed, current speed and direction and wave height will also be recorded.

1.1. GEOPHYSICAL SURVEYS (NON-INTRUSIVE SURVEYS)

Geophysical surveys allow for the accurate prediction of the type of material present on the seabed (e.g. rocks, pebbles, sand/mud). Geophysical surveys involve using acoustic devices to emit sound energy towards the seabed. These sound waves are reflected and the returning echoes are then detected on board the vessel. Different echo strengths and return speeds indicate different seabed features and different physical characteristics. A typical survey vessel can be seen in Figure 1.

Figure 1

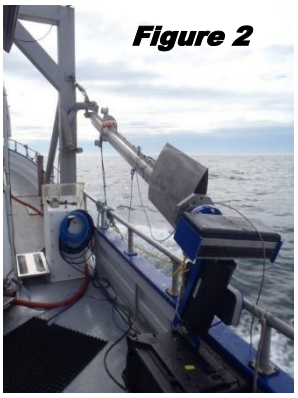


Figure 2

A **multibeam echosounder** (MBES) is a remote sensing device (see Figure 2) which uses sound waves to measure water depth and sediment type. This is a non intrusive survey type and is commonly used around the coast of Ireland. The image to the right is a schematic of a MBES survey being carried out.

Side scan sonar (see Figure 3) is a remote sensing acoustic device produces high-resolution mapping of the seabed in order to investigate particular features, a wreck for example. It is towed behind or along side the survey vessel.


Figure 3

A **magnetometer** (see Figure 4) is a passive remote sensing device that detects magnetic fields from ferrous objects such as lost anchors, sunken ships and buried pipes on/in the seabed. It is towed behind or along side the survey vessel. This again is a non intrusive survey type and is in common use around the coast of Ireland. Over the last number of year both INFOMAR and the Marine Institute use this type of survey on a regular basis.

Figure 4

Sub bottom profiling / shallow seismic provides information on the rock and sediment layers beneath the seabed. It is towed behind the vessel. Some examples of commonly used sub bottom profilers can be seen in Figure 5.

Figure 5

The precise requirements of the geophysical survey have not yet been determined. Depending on the size of the final survey area, it is anticipated that the geophysical survey may take up to 3 months to complete. The anticipated timeframe for the geophysical surveys is **Q2 2021**. The survey lines and timelines will be discussed in advance with local fisheries interests and a Notice to Mariners ("NtM") will be published in advance of the survey.

Energia intends to have further information available on the survey specification in **Q4 2020**.

1.2.GEOTECHNICAL SURVEYS (INTRUSIVE SURVEYS)

In order to confirm the predictions from the geophysical surveys, representative samples of the seabed need to be collected (ground-truthing). When the term intrusive is used, it is indicating that a piece of equipment is used in order to recover a sample from the seabed. Samples can be collected by grab or core samplers. Grab samplers (see Figure 6) collect samples to 20cm depth, gravity/box corers (see Figure 7) collect samples down to 40cm depth. These samplers fall under their own weight.

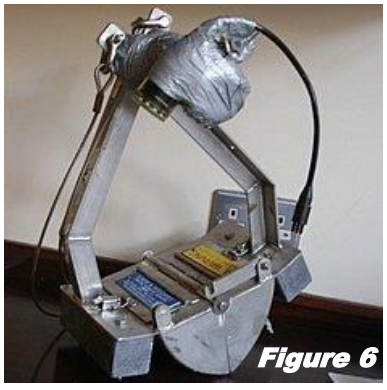


Figure 6

Figure 7

A **vibrocore** (see Figures 8 & 9) penetrates to 6m deep. A vibrocorer uses an electrical motor that creates vibrations that allow a metal cylinder to penetrate the soft seabed. Cores are up to 15cm in diameter. This, while it does penetrate the seabed, is less than 6 inches in diameter and will backfill very quickly once the core sample is extracted.

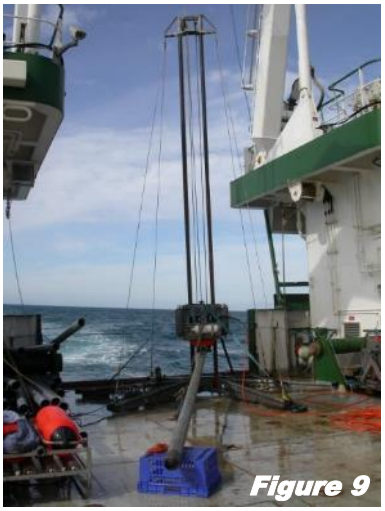


Figure 9


Figure 8

Piston corers (see Figure 10) can collect sediment from 15 to 30m deep, with a core diameter of *c*. 6.5cm. Piston pushes core into seabed. Once the core has been retrieved the seabed will backfill again very quickly.

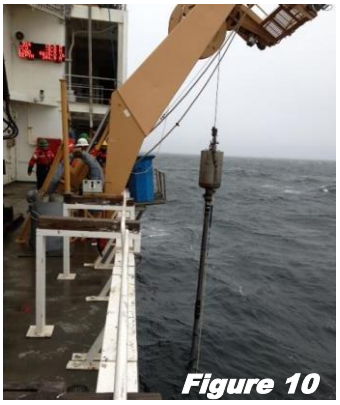


Figure 10

Boreholes are drilled into seabed (see Figure 11). The depth of drilling depends on ground conditions at each location and will be determined once further detail of the surveys are available, however, they are expected to be in the region of 20-30m deep, diameter of hole will be *c*.15cm.

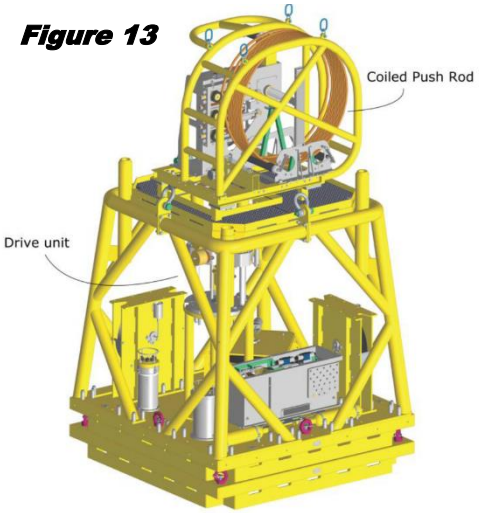

Figure 11

It is envisaged that a Jack-up barge (see Figure 12) will be used to achieve the boreholes.


Figure 12

Cone Penetration Testing (CPT) is widely used for *in-situ* geotechnical characterisation of the ground. The testing is performed with a cylindrical penetrometer with a conical tip (cone) pushed into the ground until it meets resistance (see Figure 13). The example shown right is lowered to the seabed and the CPT operation is controlled from the surface vessel.

Figure 13



Trial pits are excavated in the intertidal zone, 3m x 1m and 5m deep. They are typically dug using an excavator (either from a boat of from land depending on access). The pits are fully reinstated upon completion. Trial pits will be required in areas being examined for landfall sites (up to 10 trial pits per landfall site).

The locations of the sampling sites are unknown at this stage and will depend on the results of the geophysical survey. The location(s) will be agreed in advance with local fisheries interests and a NtM will be published in advance of the survey.

Energia expects to have further information available on the survey specification in Q4 2020.

OCEANOGRAPHIC & HYDROGRAPHIC SURVEYS

Wind speed will be recorded from a floating wind lidar buoy, an example of which can be seen in Figures 14 & 15. It will sit on the sea surface and be moored to the seabed. If required for navigational safety reasons, it will be accompanied by a marker buoy. Both buoys will be appropriately lit and marked in accordance with the requirements of Commissioner of Irish Lights. The location of the Lidar buoy is not known at this stage and the buoy may be positioned at two or more locations throughout the monitoring campaign. The location(s) will be agreed in advance with local fisheries interests and will be published in a NtM. The anticipated timeframe for the installation of the Lidar buoy is Q2 2021 for a period of 12-24 months


Figure 14

Current speed and direction and wave height will be recorded by an **ADCP** (Acoustic Doppler Current Profiler) which will be bottom mounted in a trawl resistance frame, examples of which are shown in Figures 16 & 17. Indicative frame dimensions are 1.5m wide by 1.5m long and *c.* 0.5m high. It may be marked at the surface by a buoy or an acoustic release maybe used (no surface marker). Up to 4 locations may be monitored using an ADCP. The number of locations monitored at any one time is unknown at this stage as are the monitoring location(s). The locations will be agreed in advance with local fisheries interests and will be published in a NtM. The wave and current measurement campaign may extend for a period of up to 24 months and it is anticipated that an initial deployment will occur in Q2 2021.

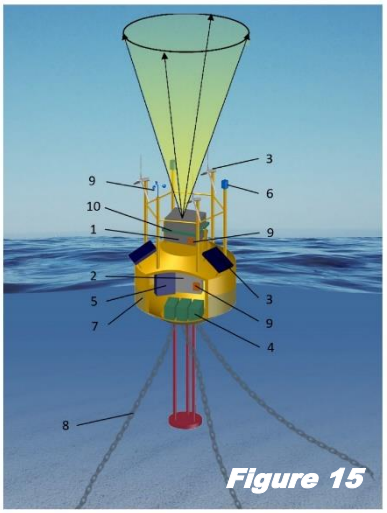


Figure 15

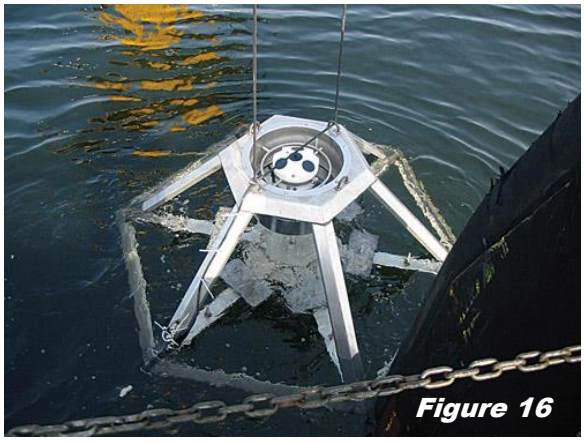


Figure 16

Figure 17

2. ECOLOGICAL SURVEYS

The marine based ecological surveys include the following:

Monthly seabird and marine mammal surveys carried out from the M.V. Pelican (Fastnet Shipping, Figure 18). Eighteen transects lines (running north south) are surveyed over a 2-day period each month (see Figure 19). Observers on board the vessel record sightings of seabirds and marine mammals along each transect. These surveys have been ongoing since July 2019 off the coast of Co. Waterford and will continue for a further 18 months minimum.

Figure 18

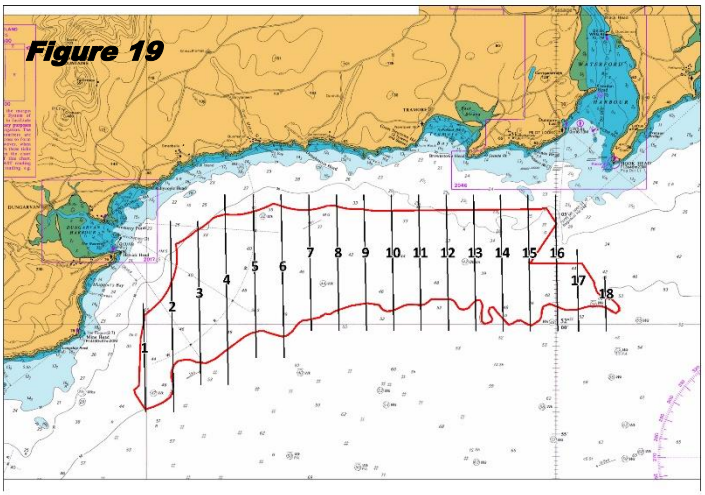


Figure 19

Acoustic listening devices (**C-PODs**) will be deployed at up to 4 locations across the site to record marine mammal presence in the area. A C-POD can be seen in Figure 20 and it can be deployed using an acoustic release (also seen on the right) with sacrificial mooring or standard bottom mooring with surface marker buoy. These CPODs will be attached to a clump chain and raised approximately 3m off the seabed. A sound-trap (to record underwater sound) may be deployed alongside one of the CPODs for periods throughout the monitoring campaign. The locations of the C-PODs are unknown at this stage. The locations will be agreed in advance with local fisheries interests and will be published in a NtM. The C-PODs will be recovered every 3 months to download the data and change the batteries. It is anticipated that recovery will be carried out during the boat-based monthly surveys. The initial deployment of C-PODs is anticipated for Q2 2021 and monitoring will be required for a period of up to 24 months.

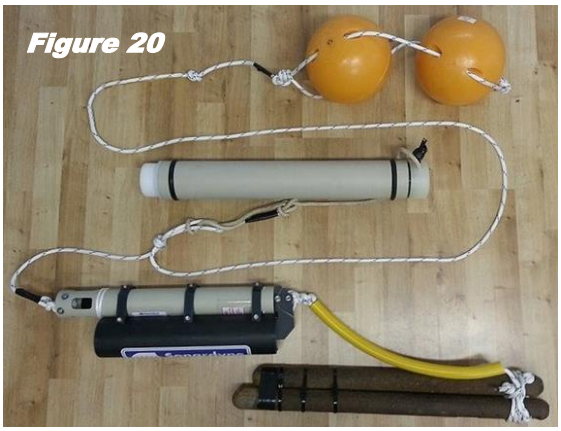


Figure 20

Subtidal habitat assessments will be carried out using a variety of methods depending on sediment type, habitat type and depth. These surveys may include grab/dredge sampling, sediment profile imagery (SPI) survey, drop-down video/ROV survey and

SCUBA dive survey. Sediment samples would be collected for faunal and sediment analysis. The grab, dredge and SPI surveys would be carried out over a number of days from a vessel similar to the M.V. Pelican. A smaller vessel would be sufficient for the underwater video surveys and these would also be carried out over a number of days. It is anticipated that these surveys will be carried out in Q2/Q3 2021.

Intertidal surveys would be carried out on foot between the low and high-water mark in locations being examined as potential cable landfall sites. It is anticipated that up to 3 potential locations would be surveyed. Each location would be typically surveyed in 1 day. Sediment samples would be collected for faunal and sediment analysis. It is anticipated that these surveys will be carried out in Q2/Q3 2021.

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Images Sources: Chelonia – Figure 20; EdgeTech – Figure 5; Energia – Figure 19; Fastnet Shipping Ltd. – Figures 12 & 18; Fugro – Figures 11, 13 & 14; Geometrics – Figure 4; Infomar - Figures 6, 7, 9; International Ocean Systems – Figures 15 & 16; Kongsberg – Figure 5; MS Geotech - Figure 8; Pods – Figure 17; R2Sonic - Figure 2; USGS – Figures 3 & 10; XYZ Offshore - Figure 1.