Vermilion Exploration & Production Ireland Limited (Vermilion)

# Corrib Subsea Inspection, Maintenance and Infrastructure Renewal Surveys 2019

## EIA Screening and Environmental Risk Assessment for Annex IV Species

660841

April 2019

# RSK GENERAL NOTES

**Project No.:** 660841

**Title:** Corrib Subsea Inspection, Maintenance and Infrastructure Renewal Surveys 2019 – EIA Screening and Environmental Risk Assessment for Annex IV Species

**Client:** Vermilion Exploration & Production Ireland Limited (Vermilion)

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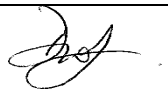
| **Authorised by:** |  David Watson | **Project QA Rep** | **Date:** | **15th April 2019** |

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# 1 INTRODUCTION

## 1.1 BACKGROUND

Vermilion Exploration & Production Ireland (Vermilion) plan to undertake a geophysical and visual survey programme of the Corrib offshore gas pipeline, sections of the umbilical, Bellanaboy Bridge Gas Terminal (BBGT) treated surface water outfall pipeline, and infield flowlines and umbilicals between the Corrib Field manifold and the landfall at Glengad, northwest Co. Mayo, in Q2 2019. In addition, the scope of work will include a programme of repair / renewal works at the P3 wellhead including some potential rectification works and integrity testing at the Corrib Field, which will also require the use of acoustic survey equipment. The surveys will inspect and assess the integrity of the subsea structures and are being undertaken to provide up-to-date seabed asset data, which will help determine the exact requirements of maintenance work scheduled for 2019 and beyond. The work will be carried out by two vessels (one for inshore and one for offshore) using a combination of acoustic survey techniques, namely multibeam echo sounder (MBES), side-scan sonar and sub- bottom profiler; furthermore, a visual survey using an underwater vessel deployed video/ and stills camera (inshore) and ROV (offshore) will also be undertaken.

## 1.2 EIA SCREENING FOR OIL AND GAS EXPLORATION ACTIVITIES

Council Directive 85/337/EEC of 27th June 1985 on the assessment of the effects of certain public and private projects on the environment ('EIA Directive') put in place a system whereby certain projects by reason of their type, size, location, etc. must be assessed as to their likely effects on the environment through the process of Environmental Impact Assessment. Projects listed under Annex I must be subject to the EIA process in all cases (with the exception of national defence projects), while for those listed under Annex II EIA is at the discretion of the member states. Annex II projects will be subject to EIA based on predetermined thresholds or assessed on a case-by-case basis, as set out in national legislation. Where thresholds are set, some sub-threshold projects may be subject to EIA due to the likelihood of significant effects on the environment due to factors such as their nature, size, location, etc.

The EIA Directive has been amended three times. Directive 97/11/EC brought in the concept of transboundary effect; increased the number of projects covered by the Directive and also presented new screening criteria (Annex III) for assessing whether an Annex II project should be subject to EIA when considered on a case-by-case basis. Directive 2003/35/EC aimed to align public participation as set out in the Directive with the Aarhus Convention on public participation in decision-making and access to justice in environmental matters. Directive 2009/31/EC added projects to Annexes I and II that related to CO2 transport, capture and storage.

The original 1985 Directive and its three amending directives were codified by Directive 2011/92/EU. In transposing the EIA Directive into Irish law (European Communities (Environmental Impact Assessment) Regulations 1989 – S.I. 349/1989 as amended), Ireland chose to set thresholds above which an EIA is required for projects listed under

Annex II, while also allowing for sub-threshold projects to be subject to EIA where the Competent Authority considers the project is likely to have significant effects on the environment.

It is understood that the proposed geophysical and visual surveys programme would not fall under Annex I or II of the EIA Directive (or the First Schedule of the Irish 1989 regulations as amended, which transposes the Directive and its Annexes), and therefore does not require an EIA to be carried out on these grounds.

Other current relevant documentation in respect of EIA screening in Ireland include the following:

- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Government of Ireland, August 2018)*;
- *Guidelines on the Information to be Contained in the Environmental Impact Assessment Reports,* Draft August 2017 (EPA, 2017)

The proposed survey programme has also been considered under the European Union (Environmental Impact Assessment) (Petroleum Exploration) Regulations 2013 (S.I. 134 of 2013), which gives the Minister the discretion to require an Environmental Impact Statement (EIS) to be prepared where a significant effect on the environment is likely. As such a high level impacts screening exercise has been carried out (Section 4). This has concluded that an EIS/EIA would not be required in relation to the proposed survey programme. The results of this exercise have been provided for confirmation. The report continues by providing an additional risk assessment for species listed under Annex IV of the EU Habitats Directive 92/43/EEC Article 12, which are considered to be the most sensitive receptors to the proposed activities.

A further codification of the EIA Directive and its amendments by Directive 2014/52/EU has taken place and this amends Directive 2011/92/EU. This has not yet been transposed into Irish legislation, although is considered in draft form. However, in accordance with the requirement that it should have been brought into force by Member States by 16 May 2017 (EC, 2017), in practice it is treated as though it has been fully enacted.

## 1.3 APPROPRIATE ASSESSMENT

This report is submitted in support of an application to the Department of Communications, Climate Action and Environment (DCCAE) (formally the Department of Communications, Energy and Natural Resources (DCENR) for permission to undertake the programme of survey work proposed. In addition to this report a Natura Impact Statement (NIS) for Appropriate Assessment (AA) report has also been submitted in support of the application. A Natura Impact Statement has been prepared in order to assist the Competent Authority to undertake an Appropriate Assessment if it is deemed that there is the potential for significant effects on any Natura 2000 site.

The NIS report describes the Natura 2000 sites in the vicinity of the proposed survey works and assesses the potential impacts on the integrity of these sites and their receptor habitats and species, including bottlenose dolphins, grey seals, and seabirds, as well as potential impacts such as an accidental fuel oil spill.

It is recommended that the NIS report be read in conjunction with this report when considering the application.

## 1.4 ENVIRONMENTAL RISK ASSESSMENT

Under the EU Habitats Directive 92/43/EEC Article 12, member states are required to establish a system of strict protection for the animal species listed on Annex IV, which in Irish waters includes all cetaceans, some turtle species, and otter. This environmental risk assessment for the proposed activities has been prepared as required under the 2011 Department of Communications, Energy and Natural Resources (DCENR[1]) *Rules and Procedures Manual for Offshore Petroleum Exploration and Appraisal Operations,* (DCENR, 2011) and relates specifically to the potential impact of the proposed activities on Annex IV species. As a result, Vermilion are required to ensure that current best industry practice is applied with regard to impact mitigation and monitoring measures during operations such as site surveys, which utilise underwater acoustic sources.

Accordingly, surveys will be carried out in accordance with the National Parks and Wildlife Service (NPWS) 2014 "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters", which recently replaced the 2007 "Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish waters' or the Code of Conduct (CoC)". Joint Nature Conservation Committee (JNCC) qualified Marine Mammal Observers (MMOs) will be present on geophysical survey vessels in an advisory capacity, although they will have the power to delay the commencement of any operations that have been assessed as potentially posing a risk to Annex IV species. All masters and duty watchkeepers of vessels are required to familiarise themselves with this risk assessment (particularly sections discussing mitigation).

The waters in the vicinity of the Corrib Field have the potential to support an ecologically diverse range of resident and/or migratory Annex IV species. Annex IV species considered to have the potential to occur in the vicinity of the proposed survey area includes five species of marine turtle: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*); and approximately 18 species of cetaceans: harbour porpoise (*Phocoena phocoena*); bottlenose (*Tursiops truncatus*), common (*Delphinus delphis*), Risso's (*Grampus griseus*), white-sided (*Lagenorhynchus acutus*), white-beaked (*Lagenorhynchus albirostris*) and striped (*Stenella coeruleoalba*) dolphins; long-finned pilot (*Globicephala melas*), false killer (*Pseudorca crassidens*), killer (*Orcinus orca*), northern bottlenose whale (*Hyperoodon ampullatus*), Cuvier's beaked (*Ziphius cavirostris*), sperm (*Physeter macrocephalus*), minke (*Balaenoptera acutorostrata*), blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus*), sei (*Balaenoptera borealis*) and humpback (*Megaptera novaeangliae*) whales. Otter (*lutra lutra*) are also listed under Annex IV of the Directive and have the potential to be present in environs of Broadhaven Bay. In addition, grey (*Halichoerus grypus*) and harbour (common) (*Phoca vitulina*) seals are also present in Irish waters, and are listed as Annex V species, a status that affords similar levels of protection, and thus are included as part of the assessment.

This report includes an assessment; the primary focus of which is the potential impacts from noise and disturbance to marine species listed under Annex IV of the EU Habitats Directive 92/43/EEC Article 12. Summary risk assessment tables are however provided, that identify and assess the full range of potential impacts from the proposed survey activities, including collision risk, shipboard pollution etc, while Section 4 provides an EIA screening assessment.

## 1.5 DOCUMENT STRUCTURE

The contents of this report are structured as follows:

Section 1 – Introduction to this EIA screening assessment and environmental risk assessment for Annex IV species;

Section 2 – Brief description of the baseline conditions;

Section 3 – Outline of the project description;

Section 4 – EIA screening assessment tables

Section 5 – Discussion of the potential impacts to Annex IV species from the proposed survey programme;

Section 6 – Outline of mitigation measures;

Section 7 – Risk assessment matrix.

Section 8 - Conclusions

[1] Since 2016 the DCENR (Department of Communications, Energy and Natural Resources) is known as the Department of Communications, Climate Action and Environment (DCCAE).

# 2 ENVIRONMENTAL BASELINE

## 2.1 GEOGRAPHICAL SETTING

The Corrib natural gas field (Corrib Field) is located in the northeast Atlantic, within frontier acreage blocks 18/20 and 18/25, approximately 65 km off the closest point on the coast of northwest County Mayo. The Corrib Field extends over an area of 15 $km^2$, over which the seabed varies in depth from approximately 335 m to 425 m. An export pipeline runs from the subsea facility to the landfall location at Glengad, Broadhaven Bay, in an approximate east/west orientation (Figure 3-1).

### 2.1.1 Pipeline and umbilical

The Corrib Field has been developed as a subsea production facility, where all associated equipment has been placed directly on the seabed, and gas is brought to shore via a 20" subsea pipeline (approximately 83 km from the offshore manifold to the landfall at Glengad). The role of the umbilical is to control and manage conditions within the pipeline, and the injection of pipeline chemicals such as corrosion inhibitors.

### 2.1.2 BBGT surface water discharge pipeline

Treated surface runoff from potentially contaminated areas of the BBGT site are collected and treated before being discharged via a long sea outfall to a discharge diffuser off Erris Head. The outfall pipeline is piggy-backed onto the main subsea pipeline for much of its length, although in places its route does differ slightly. The pipeline is protected by a combination of concrete mattresses and deposited rock filter and armour layers where required.

### 2.1.3 In-field flowlines and umbilicals

The infield flowlines and umbilicals are at the Corrib Field and link the individual wells to the Corrib Central manifold. The umbilicals control the wells themselves and are used for the injection of a range of chemicals, while the infield flowlines bring gas from the wells to the central manifold. Where required the umbilicals and flowlines at the Corrib Field are protected by rock.

## 2.2 ANNEX IV SPECIES IN IRISH WATERS

### 2.2.1 Cetaceans

Irish waters are known to support a diverse range of cetacean species (whales, dolphins and porpoises). Twenty-four cetacean species have been recorded in Irish waters, with harbour porpoise, common, bottlenose, Risso's, Atlantic white-sided and white-beaked dolphins, and long-finned pilot whale, known to breed in Irish waters (Berrow, 2002).

Approximately 18 species of cetacean have been recorded off the northwest coast of County Mayo and are considered to have the potential to occur in the vicinity of the offshore pipeline route at least on a seasonal basis (Gordon *et al.*, 1999; O Cadhla *et al.*, 2004; RSK, 2010). At Broadhaven Bay in which the landfall is located, nine species

of cetacean have been recorded from dedicated monitoring studies undertaken since 2001 (Anderwald *et al*, 2013).

#### *2.2.1.1 Distribution and seasonality*

A number of dedicated studies, and surveys undertaken onboard 'ships of opportunity', have provided data on the distribution of cetaceans in Irish waters (e.g. Northridge *et al.*, 1995; Tasker *et al.*, 1997; Reid *et al.*, 2003; O Cadhla *et al.*, 2004). In addition, the Irish Whale and Dolphin Group (IWDG) have collected data on the distribution and relative abundance of cetaceans in Irish waters since 1991. The IWDG casual and constant effort sightings schemes record data mainly from land-based sightings and surveys. Despite this, many gaps in spatial and seasonal coverage still exist, especially off the northwest Irish coast and in all waters outside of the summer months.

Table 2-1 ((adapted from Clark & Charif, 1998, Berrow, 2002, RSK 2001, O Cadhla *et al.*, 2004, IOSEA1 (ERT, 2006), Anderwald *et al* 2013, and IWDG (2014)) summarises information on cetacean occurrence in the vicinity of the proposed survey area.

**Table 2-1: Cetacean species of the north-east Atlantic margin**

| Species | Occurrence | 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. Regularly recorded in Broadhaven Bay. | Peak in August - November |
| Bottlenose dolphin *Tursiops truncatus* | This species is often associated with coastal or inshore areas, but an offshore population is also considered to be continuously distributed along Ireland's Atlantic Margin. Breeding in Irish waters. Designated species for the West Connacht Coast SAC. Regularly recorded in Broadhaven Bay. | Year round, but peak in summer months |
| Common dolphin *Delphinus delphis* | One of the most commonly recorded species of cetacean in Irish waters, particularly in offshore areas, and is found throughout the Irish Atlantic Margin. Known to breed in Irish waters. Regularly recorded in Broadhaven Bay. | Peak during spring and summer |
| Striped dolphin *Stenella coeruleoalba* | Although generally considered to be a warm-temperate oceanic species, a number of sightings occur each year in Irish waters. | Most frequent in summer and early autumn months |
| Risso's dolphin *Grampus griseus* | Known to breed in Irish waters and recorded year round. Records exist in the vicinity of the Corrib Field area, and the entrance of Broadhaven Bay (at Erris Head). | Peak in April - Sept |
| Atlantic white-sided dolphin *Lagenorhynchus acutus* | Known to breed in Irish waters. Predominantly recorded in waters overlying the continental slope, generally not recorded with regularity in coastal waters. Recorded in Broadhaven Bay in 2002. | Summer months |
| White-beaked dolphin *Lagenorhynchus albirostris* | Known to breed in Irish waters. Generally found in offshore waters off the Irish west coast along the shelf edge and on the continental shelf, occasionally coming close to shore. Recorded in Broadhaven Bay in 2002. | Peak in late summer – autumn |
| Long-finned pilot whale *Globicephala melas* | Known to breed in Irish waters. This species is often associated with offshore areas, and waters over 1000 m in depth. | Most frequent between April and September |
| False-killer whale *Pseudorca crassidens* | Rare visitor to Irish waters. | Uncommon |
| Killer whale O*rcinus orca* | Widely distributed species. In the northeast Atlantic, normal distribution is from Iceland-Norway to the Atlantic Margin waters of north-western Britain and Ireland. Occasional sightings in Irish waters. Recorded in Broadhaven Bay. | Most frequent in Spring and autumn |

| | | |
|---|---|---|
| Northern bottlenose whale *Hyperoodon ampullatus* | Predominant occurrence in Atlantic Margin waters in late summer and autumn and may occasionally move into continental shelf waters and the Irish Sea. Rarely in coastal Irish waters, more commonly seen in deeper waters beyond continental shelf. Particularly vulnerable to underwater sound sources (Gordon *et al.*, 1998). | April to October |
| Cuvier's beaked whale *Ziphius cavirostris* | Beaked whale species are observed less regularly due to their offshore distributions, and other factors such as their diving physiology, but recent research efforts and stranding data have confirmed their presence in Irish waters. Particularly vulnerable to underwater sound sources. | Strandings peak in spring and summer |
| Sperm Whale *Physeter macrocephalus* | Sperm whales are occasionally observed in Irish waters off the continental shelf. | All year, but sightings more frequent in spring, early summer and autumn. |
| **Baleen whales (Mysticetes)** | | |
| Minke whale *Balaenoptera acutorostrata* | Widely distributed around Ireland and throughout the Irish Atlantic Margin particularly in shelf and coastal areas. Regularly recorded throughout Irish waters. Recorded in Broadhaven Bay. | Peak May - September |
| Blue whale *Balaenoptera musculus* | Few sightings in Irish waters, 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 poorly understood, although acoustic surveys show the species may be detected throughout the year. Annual migration along western seaboard. A single individual was recorded in Broadhaven Bay in 2008. | Unclear, contradictory evidence as recorded more regularly in summer months, although acoustic monitoring data suggest a peak in November - December. |
| Sei whale *Balaenoptera borealis* | Generally considered to be a deepwater pelagic species, surveys have recorded sei whales throughout the offshore waters of the Irish Atlantic margin. Some records of sightings in inshore Irish waters (Visser *et al*, 2010) but thought generally uncommon to the northwest of Ireland. | April - December. They have a northerly distribution in Irish Atlantic Margin waters between April and June and a more southerly distribution in late summer and autumn |
| Humpback whale *Megaptera novaeangliae* | Relatively uncommon in the waters of north and west Ireland. However, there have been a number of casual sightings in offshore waters off the northwest of Ireland, but chiefly off the Irish south coast (particularly counties Cork, Kerry, Waterford, and Wexford). | Peak between July and January |
| North Atlantic right whale *Eubalaena glacialis* | Likely to represent a vagrant species on the edge of their range in the northeast Atlantic. Populations historically decimated due to whaling, now extremely rare in Irish waters. | Summer months, if present. |

The distribution of marine mammals in Irish waters is thought to be closely linked to the distribution and seasonality of their prey. Baleen whales normally feed on krill and small shoaling fish. Accordingly, their distribution is related to oceanic features such as fronts and upwellings, and areas where prey items aggregate. The diet of the toothed whales (which include dolphins, beaked whales and sperm whale) consists of chiefly of fish and cephalopods. The distribution of toothed whales is also thought to be strongly related to water depth (O' Cadhla *et al.*, 2004). Harbour porpoises and bottlenose dolphins are primarily coastal and continental shelf based species. Species such as pilot whales and white-sided dolphins are predominantly found in waters overlying continental slopes and oceanic areas. The deep water found off the west and northwest of Ireland provides a habitat to these species, along with others such as sperm and beaked whales.

Recent incidental monitoring of marine mammals in the vicinity of the Corrib Field during an ocean bottom seismic survey in 2012, and marine mammal monitoring in Broadhaven Bay, tends to support the appraisal of cetacean distributions provided in Table 2-1 above. Highest numbers of sightings of cetaceans in these surveys occurred during June, followed by August, October and September.

#### *2.2.1.2 Designated areas and cetaceans*

The West Connacht Coast candidate Special Area of Conservation (SAC) (Site code: 002998) has been proposed for designation under the Habitats Directive for the presence of bottlenose dolphins. The site consists of an offshore area of 66,016 ha off the coast of the Mullet peninsula and counties Mayo and Galway.

Bottlenose dolphin are known to occur within the site throughout all seasons and the area comprises a key habitat for the species both regionally and within Irish waters as a whole. The NPWS site synopsis notes that the SAC may contain a minimum of 123 dolphins, with possibly up to 150-200 individuals or more occurring within the site as a whole. The SAC is known to be used for a variety of activities including foraging and resting, and adults closely accompanying calves are commonly observed in summer and autumn months. The SAC lies approximately 1 km from the pipeline route at its closest point, at Erris Head.

### 2.2.2 Seals

Two species of seal breed on the west coast of Ireland, the harbour (common) seal and the grey seal.

Grey seals are found around the entire Irish coastline. During the annual breeding season, between September and December, grey seals predominantly stay close to shore. The moulting season follows closely, occurring between the months of November and April. Grey seals are typically the most regularly observed seal species, and marine mammal, observed in Broadhaven Bay (Anderwald *et al*, 2013). This is likely to be a result of proximity of the site to the Inishkea Islands, which represent the largest breeding and moulting colony of grey seals in Ireland (Ó Cadhla *et al.,* 2007).

Adult grey seal are known to forage over large areas, and may travel considerable distances from their haul-out sites. It is possible therefore that grey seals from important sites in Galway and Donegal may forage along the entire extent of the survey area.

Important haul-out and breeding areas for harbour seals are found in counties Galway, Sligo and Donegal. Adult harbour seals generally breed in June or July each year. Soon after breeding, in August and September, harbour seals undergo their annual moult. During this time, they spend most of their time ashore. Harbour seals are recorded regularly in Broadhaven Bay, but in much lower numbers than that of grey seals.

The foraging range harbour seals are thought to be much less than that of greys, with most trips only a few tens of kilometres from their favoured haulout sites. However, more recent studies have found that longer distance trips were not uncommon (ERT, 2006). It would be thus reasonable to assume that harbour seals may forage along the majority of the pipeline, and potentially the vicinity of the Corrib Field.

Both grey and harbour seals are listed as Annex II species (i.e. species of community interest whose conservation requires the designation of SACs.

### 2.2.3 Turtles

Five species of marine turtle have been recorded in Irish waters, and all are listed on Annex IV of the Habitats Directive. Of these, only the leatherback turtle (*Dermochelys coriacea)*, has been recorded with any regularity. Loggerhead (*Caretta caretta)* and Kemp's Ridley turtles (*Lepidochelys kempii)*, occur infrequently, sometimes being recorded in winter and spring. Green (*Chelonia mydas)* and hawksbill (*Eretmochelys imbricata)* turtles are considered vagrant species.

Providing an estimate of the number of leatherbacks foraging within Irish waters is difficult as their numbers may be extremely low. It is thought the northern distribution of leatherback turtles is limited by the position of the 15 °C isotherm (McMahon & Hayes, 2006). As the position of this varies between years, the suitability of Irish waters for foraging leatherbacks may also vary, with favourable and unfavourable years in terms of abundance. Surface water temperature in offshore areas in the vicinity of the Corrib Field are reported to generally range from 14 °C in August to 8 °C in February (ERT, 2006). Leatherbacks migrate over large distances to feed on gelatinous zooplankton in temperate waters. As a result, sightings are regularly made in the summer along the entire western seaboard of Ireland.

### 2.2.4 Other species

The European otter (*Lutra lutra*) is protected under Annex II and IV of the Habitats Directive. Dedicated marine mammal monitoring in Broadhaven Bay provides records of two animals in 2011, one sighting of three animals in 2008, and two animals in 2002 (Anderwald *et al*, 2013). Terrestrial faunal monitoring for the Corrib development, undertaken since 2001 and ongoing, has shown a constant and frequent presence of otters in and around the coastal areas of Broadhaven and Sruwaddacon Bays throughout.

Otters are a primarily terrestrial or freshwater species. As part of their feeding ecology, they may undertake foraging trips in marine environments, but require a source of freshwater to negate the formation of salt crystals in their coat, which can compromise their ability to retain heat. As such, otters are considered unlikely to occur along the survey route and are not considered further as part of the Risk Assessment.

# 3 PROJECT DESCRIPTION

## 3.1 INTRODUCTION

The proposed survey programme will comprise three main components:

- A subsea inspection and maintenance and infrastructure renewal survey programme of the subsea facilities using ROV and vessel mounted equipment deployed from the Construction / ROV Survey Support Vessel *Edda Sun*. This vessel will be responsible for the survey covering the area of the Corrib offshore field assets as well as seabed infrastructure as far inshore as Broadhaven Bay.
- The *Edda Sun* will also undertake a repair programme to the Corrib Central Manifold P3 wellhead, which will involve removal of the protection cover. No use of acoustic survey equipment is planned during the repair programme at P3.
- A subsea inspection and maintenance survey programme of the subsea infrastructure using underwater imagery and other vessel deployed equipment from the inshore survey vessel *Leah-C*. This vessel will be responsible for the inshore parts of the survey, primarily within Broadhaven Bay as far as the inshore limit of safe navigation.

The location of the proposed survey works at the Corrib Field, along the offshore pipeline / umbilical / surface water discharge pipeline route is outlined in Figure 3-1.

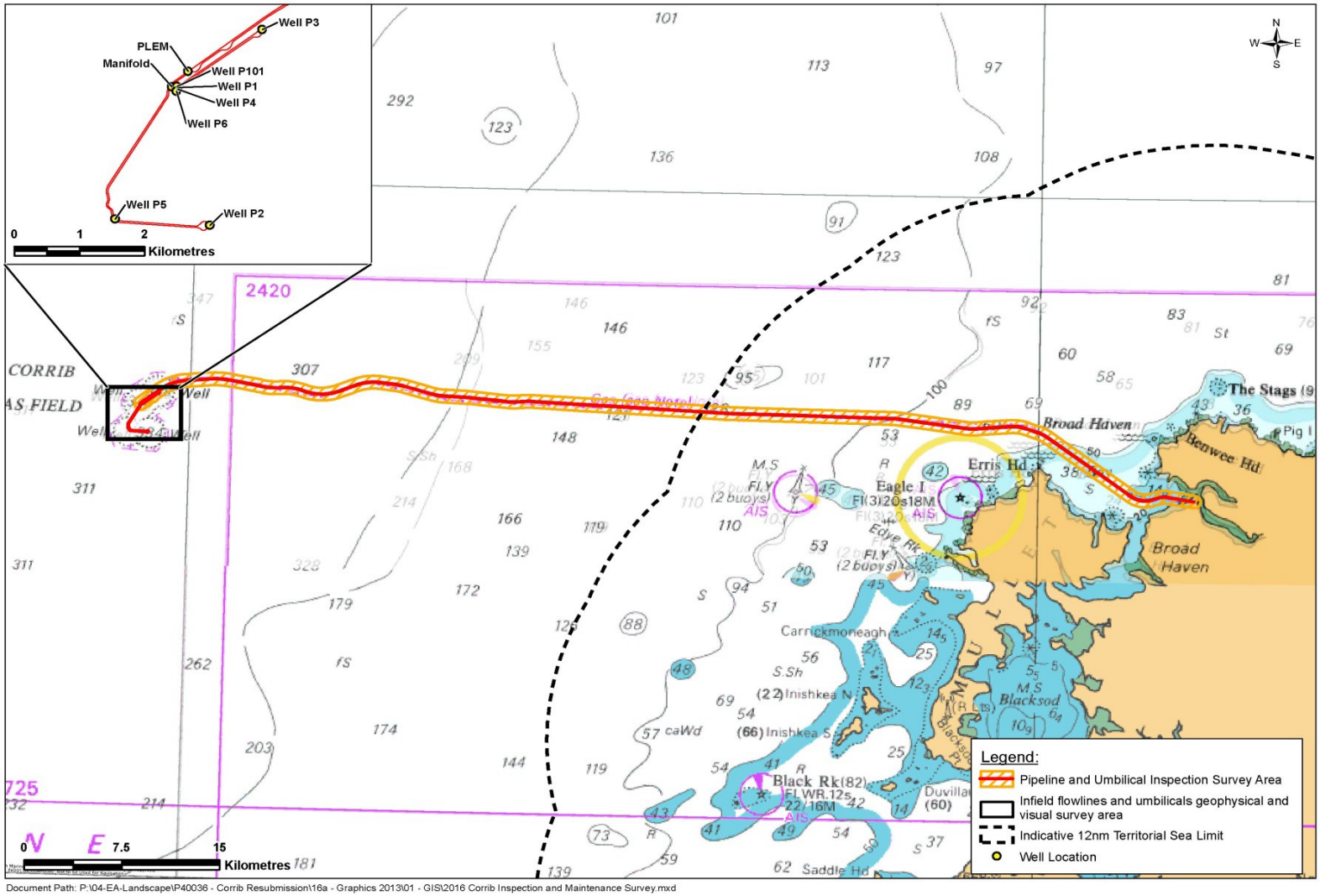


**Figure 3-1: Location of Corrib Field, pipeline and umbilical route, as well as the location of the BBGT treated surface water outfall diffuser**

## 3.2 INSPECTION SURVEY

### 3.2.1 General description

The surveys of the pipeline, sections of the umbilical, the BBGT treated surface water outfall pipeline and in-field subsea assets will investigate features such as free- spanning and scouring, and pipeline burial depth and integrity. The survey will be carried out using two vessels; the *Edda Sun* will survey the offshore sections, while the *Leah-C* will survey inshore in the vicinity of Broadhaven Bay. The survey will run between the Corrib Field along the overall extent of the route of the offshore pipeline and BBGT treated surface water discharge pipeline and the landfall at Glengad. In addition, sections of the offshore umbilical will also be inspected (Figure 3-1).

The survey will utilise a range of acoustic survey techniques, namely multibeam echo sounder (MBES), sub-bottom profiler, and side-scan sonar. In addition, a visual survey using vessel deployed underwater video/stills imagery (inshore) and ROV (offshore) will also be undertaken. A range of other sensors may also be used as part of the survey including: Sound Velocity Probes (SVPs) (used to calibrate acoustic survey equipment; pipe tracker, imaging sonar and Obstacle Avoidance Sonar; as well as navigation / positioning sensors including a subsea Ultra Short Baseline (USBL) beacon system, an altimeter, Inertial Navigation System (INS) and Doppler Velocity Log (DVL).

The determination of ‘offshore’ and ‘inshore’ areas, for the purposes of this document, has assumed a boundary at a water depth of approximately 20 m below Chart Datum, however, the location of this boundary may be refined closer to the time of the survey. The *Edda Sun* would therefore be responsible for the survey of the subsea infrastructure between the Corrib Field to Broadhaven Bay, while the *Leah-C* would limit its survey operations to within the Bay itself in depths of 20 m or less and would cover the section of the routes close to the landfall.

MBES, sub-bottom profiler, and side-scan sonar systems are transducer-based pieces of equipment, where in acoustic terms, a transducer is an antenna that converts electrical energy into sound waves and vice versa. MBES are also commonly used to create densely-sampled digital terrain models that can be used to further define topography and assist in oil and gas field development phases, when planning the location of wellheads, platforms, and pipelines, and in maintenance activities which require detailed seabed information.

MBES, like other sonar systems, transmit sound energy and analyse the return signal (echo) that has reflected off the seafloor or other objects. This is done by emitting sound waves from directly beneath a ship's hull (or similar) to produce fan-shaped coverage of the seafloor. The MBES system records the time for the acoustic signal to travel from the transmitter (transducer) to the seafloor (or object) and back to the receiver. MBES produce a “swath” of soundings (i.e. depths) to ensure full coverage of an area. The coverage width on the seafloor is dependent on the depth of the water, with coverage typically being two to four times the water depth.

Sub-bottom profiler systems are used to identify and measure the various marine sediment layers that exist below the sediment/water interface. These acoustic systems use a technique that is similar to single beam echo sounders and emit an acoustic signal vertically downwards into the water and a receiver monitors the return signal reflected off the seafloor. Some of the acoustic signal will penetrate the seabed and be reflected when it encounters a boundary between two layers that have different acoustic impedance. Acoustic impedance is related to the density of the material and the rate at which sound travels through the material. When there is a change in acoustic impedance, part of the transmitted sound is reflected. The system uses this reflected energy to produce a profile of the marine sediment layers beneath.

Side-scan sonar is used to determine the texture, topography and character of the seabed sediments and to detect features such as boulders, outcrops, pipelines, wellheads and other equipment lying on, attached to, or buried immediately beneath the seafloor. A side-scan transmits sound energy and analyses the return signal (echo) that has bounced off the seafloor or other objects. Side-scan sonar typically consists of three basic components: towfish or hull mounted transducers, transmission cable, and topside processing unit.

In a side-scan, the transmitted energy is formed into the shape of a fan that sweeps the seafloor from directly under the towfish or vessel to either side, typically to a distance of up to 100 metres (depending on factors including water depth, and signal strength). The strength of the return echo is continuously recorded, creating a "picture" of the ocean bottom. For example, objects that protrude above the seabed create a dark area (strong return) and shadows from these objects are light areas (little or no return). Side-scan sonar is typically used in conjunction with multibeam to meet full bottom coverage specifications.

It should be noted that the acoustic sources proposed for the survey are a number of orders of magnitude lower in intensity than those used in conventional seismic surveys.

In addition to the primary survey sensor described above, for both the inshore and offshore survey components a range of other equipment for navigation/positioning and calibration will also be used that will have an acoustic signature. A Valeport Mini Sound Velocity probe will be deployed occasionally throughout the surveys to provide salinity, conductivity, temperature and sound velocity depth information. These probes operate at an extremely high frequency of around 2.5 MHz at a very low level of intensity. This allows periodic calibration of the primary acoustic survey sensors. Both vessels will also have single beam depth echosounders and an Ultra Short Baseline (USBL) beacon system for maintaining position and communications with any deployed equipment. USBL systems operate at a frequency of between 21 and 31 kHz at a very low intensity. The ROV on the *Edda Sun* will utilise a Doppler Velocity Log (DVL) for accurate positioning and speed determination. This operates at a relatively high frequency of 1200 kHz, also at negligible intensity, while a similar system will operate on the vessel itself operating at an extremely high frequency of 2 MHz, at negligible source levels of intensity.

### 3.2.2 Survey programme

It is anticipated that the total data acquisition period will be approximately 2 weeks in duration (dependent on weather conditions), with the survey taking place for both vessels during the summer months of 2019 (between June and September). It is likely that the inshore and offshore elements will overlap during this time period.

During data acquisition, the vessels will follow a pre-determined survey programme that may be subject to change depending on prevailing current and wind conditions.

### 3.2.3 Vessels

Basic survey vessel specifications are presented in Table 3-1.

**Table 3-1: Survey vessel specifications**

| Parameter | Specification | |
|---|---|---|
| Name | *Leah-C* | *Edda Sun* |
| Owner | Michael Callaghan, Killybegs Co. Donegal – operated by Belcross Enterprises | Østensjø Rederi AS operated by Fugro |
| Type | Multipurpose inshore vessel | ROV Survey / Construction Support Vessel |
| Length (overall) | 11 m | 85.3 m |
| Draught (Mean) | 1.2 m | 6.8 m |
| Tonnage (Gross) | 8.5 t | 4398 t |


**Figure 3-2: *Leah-C***


**Figure 3-3: *Edda Sun***

### 3.2.4 Survey equipment

Details of the survey equipment proposed for the *Leah-C* and *Edda Sun* are presented in Table 3-2.

**Table 3-2: Proposed principal acoustic survey equipment specifications and operational frequency ranges**

| Vessel | Specification | Operating frequency range |
|---|---|---|
| *Leah-C* (Vessel mounted) | **Preferred Option**: Innomar SES2000: | 3 to 8 kHz |
| | **Alternative Option**: Kongsberg - Geoacoustics TR-1075D Sub Bottom Profiler | 3 – 8 kHz |
| | **Preferred Option**: Teledyne Reson Seabat 7125 dual head Multibeam echo sounder | 200 kHz - 400 kHz<br>Typical operation between 350 and 400 kHz |
| | **Alternative Option:** Various | 190 kHz – 420 kHz |
| | **Preferred Option:** Klein 3000H Dual Frequency Side-scan sonar<br><br>**Alternative Option:** Various dual frequency options | dual frequency 445 and 900 kHz |
| *Edda Sun* (ROV mounted) | Reson Seabat 7125 dual head Multibeam echosounder | 400 kHz |
| | Kongsberg MS1000 – Obstacle avoidance sonar | 675 kHz |
| | RDI Workhorse Doppler Velocity Log | 1200 kHz |
| | Valeport MVS Sound Velocity Sensor | 2.5 MHz |
| | Tritech SK704 altimeter | 500 kHz |
| | Vessel single beam echo sounder | 38 kHz – 200 kHz (Typically operates at 50kHz) |
| | HiPAP vessel USBL system | 21 -31 kHz |
| | TSS 440 – Pipe tracker | Negligible strength of magnetic field |
| | Vessel Doppler Velocity Log | 2 MHz |

### 3.2.5 Soft start

A soft start, or ramp up, procedure is the process whereby sound output into the marine environment is gradually increased from the lower range of the equipment's operating range, to the full output necessary to carry out the activity.

If the intensity cannot gradually be increased from a low level to operational levels, then the equipment can be switched on and off in a sequential manner for a few seconds at a time for a soft start / ramp up period of 20 minutes prior to the equipment being used for operations (NPWS, 2014).

According to NPWS (2014) guidance, soft start for acoustic surveys is required for surveys within bays, inlets or estuaries and within 1,500 m of the entrance of enclosed bays/inlets/estuaries or as advised by the relevant Regulatory Authority. In view of this, soft start procedures will be required for survey work within Broadhaven Bay in accordance with the Department of the guidance. However, in line with environmental best practice, soft start procedures will be followed throughout the extent of the survey route.

The inshore surveys from the *Leah-C* when operating acoustic survey equipment aim to survey from inshore, moving gradually further offshore within Broadhaven Bay in an effort to prevent animals in proximity that actively avoid the sound source from heading further inshore into constrained waters.

# 4 EIA SCREENING ASSESSMENT

Table 4-1 presents the findings of the screening assessment for an EIA based on Annex III of the amended 2014 EU EIA Directive (Directive 2014/52/EU), which sets out the criteria under Article 4 whether a project requires an EIA. In addition, reference is made to the EIA guidance relating to the EIA Directive, summarised in ERM (2001) and the updates in the 2014 amendments in WYG (2017).

**Table 4-1: EIA Screening Assessment Table**

| Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance | Yes/No/? Briefly describe | Is this likely to result in a significant effect? Yes/No/? – Why? |
|---|---|---|
| A description of the project activities is provided in Section 3 | | |
| 1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, *etc*)? | No – Geophysical / Visual Survey | No |
| 2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply? | Yes – Fuel Oil / Diesel / Lube Oil will be used on survey vessels | No – Limited extent of survey |
| 3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health? | Yes - Vessel fuel / Lube Oil / Hydraulic Fluids etc and other related chemicals | No – Other regulations and safety measures will limit risk from vessel fuel and other related chemicals |
| 4. Will the Project produce solid wastes during construction or operation or decommissioning? | Yes – Relatively small quantities of shipboard solid wastes generated | No – all shipboard wastes will be controlled according to MARPOL 73/78 |
| 5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air? | Yes – Vessel engines and plant exhausts | No - Low levels of emissions and temporary nature of operations |

| Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance | Yes/No/? Briefly describe | Is this likely to result in a significant effect? Yes/No/? – Why? |
|---|---|---|
| 6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation? | Yes – Noise and disturbance from survey vessel operations and operation of geophysical survey equipment | No – Limited extent of survey area affected. Use of appropriate mitigation measures in the form of soft starts, |

| Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance | Yes/No/? Briefly describe | Is this likely to result in a significant effect? Yes/No/? – Why? |
|---|---|---|
| | | adherence to NPWS guidance. Equipment frequency with minimal overlap with the auditory sensitivity of receptor species.<br>Temporary nature of operations. |
| 7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal waters or the sea? | Yes – Accidental releases of fuel or chemicals could impact on the receiving environment. | No - Following of industry recognised best practice and relevant regulations will minimise potential risk. |
| 8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment? | Yes - Risks related to vessel operations at sea | No – Following of industry recognised best practice and relevant regulations will minimise potential risk |
| 9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment? | No | N/A |
| 10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality? | No | N/A |
| 11. Are there any areas on or around the location which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project? | Yes - West Connacht Coast SAC, Broadhaven BAY SAC and other Natura 2000 sites.<br><br>Refer to accompanying Natura Impact Statement report | No – Limited potential for disturbance. Short duration of survey activities. |
| 12. Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other waterbodies, the coastal zone, mountains, forests or woodlands, which could be | No | N/A |

| Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance | Yes/No/? Briefly describe | Is this likely to result in a significant effect? Yes/No/? – Why? |
|---|---|---|
| affected by the project? | | |
| 13. Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project? | Yes - Marine mammals and seabird use the waters in the vicinity of the proposed survey operations | No – Limited extent and Temporary nature of proposed operations along with appropriate mitigation measures in place |
| 14. Are there any inland, coastal, marine or underground waters on or around the location which could be affected by the project? | Yes - Operation is to be undertaken at sea | No – Likely impacts have been considered to be of only minor overall significance |
| 15. Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project? | No | N/A |
| 16. Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the project? | No | N/A |
| 17. Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project? | No | N/A |
| 18. Is the project in a location where it is likely to be highly visible to many people? | No | N/A |
| 19. Are there any areas or features of historic or cultural importance on or around the location which could be affected by the project? | No – The area to be surveyed is an established offshore pipeline route corridor | N/A |
| 20. Is the project located in a previously undeveloped area where there will be loss of greenfield land? | No – surveys an existing Marine pipeline route / infrastructure corridor | N/A |
| 21. Are there existing land uses on or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, | No | N/A |

| Questions to be Considered For further guidance on factors to be considered see the more detailed questions listed in the Scoping Guidance | Yes/No/? Briefly describe | Is this likely to result in a significant effect? Yes/No/? – Why? |
|---|---|---|
| community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project? | | |
| 22. Are there any plans for future land uses on or around the location which could be affected by the project? | No | N/A |
| 23. Are there any areas on or around the location which are densely populated or built-up, which could be affected by the project? | No | N/A |
| 24. Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project? | No | N/A |
| 25. Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project? | Yes – The area is used for sea fisheries | No – Temporary nature of operation and communication with other marine users will take place |
| 26. Are there any areas on or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project? | No | N/A |
| 27. Is the project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems? | Yes – The survey area has an open aspect to the North Atlantic and is therefore subject to frequent bad weather conditions. | No – Operations are designed to be undertaken in such locations |

The screening assessment has concluded that in all likelihood that an EIA would not be required. Further consideration of the impacts and suggested mitigation measures for species listed under Annex IV of the EU Habitats Directive 92/43/EEC Article 12 are discussed in Sections 5-7.

# 5 IMPACT ASSESSMENT

One of the most important environmental concerns arising from the proposed activities are the potential effects of underwater sound on different marine biota, specifically animals protected under Annex IV of the EU Habitats and Species Directive.

During the deployment of acoustic survey equipment, there exists the potential for marine life to be disturbed or displaced. In order to assess the potential impacts of acoustic geophysical surveys on Annex IV species, the characteristics of the sound source, sound propagation, the auditory sensitivity of the biota, and mitigation measures all need to be considered.

## 5.1 SOUND SOURCE CHARACTERISTICS

### 5.1.1 MBES

MBES is proposed for use along the entire length of pipeline, from the Corrib Field manifold and survey of the infield assets, to the landfall, to undertake the inspection, maintenance and renewal survey work. The MBES system proposed for use in shallow water on the *Leah-C* will operate at a relatively high frequency range (200 - 400 kHz), compared to lower frequencies units designed for deep water works (higher frequency ranges are often favoured where possible to allow for the acquisition of higher resolution data).

MBES survey work is also proposed to be carried out using the *Edda Sun* and its associated ROV capabilities. The MBES system in this instance will be mounted on an ROV, allowing for the use of a higher frequency (400 kHz) than could normally be used from a vessel mounted device in deeper waters areas, such as those present in the Corrib Field.

Based on the proposed models of MBES (see Table 3-2), the peak source level expected, or maximum amplitude, will be in the range of 223 dB re: 1µPa @1 m.

### 5.1.2 Sub-bottom profiler

A sub-bottom profiler system is proposed for use to assess pipeline burial depth and integrity within Broadhaven Bay. The systems proposed for use on the *Leah-C* will operate in relatively low frequency ranges (3 – 8 kHz), compared to other forms of high resolution geophysical survey equipment. This frequency range lies outside of the hearing range of some toothed whales (particularly beaked whales) and porpoise species, although overlaps with that of baleen whales and some toothed whale species, as well as pinnipeds.

Sound energy generated by the use of the sub-bottom profiler will be directed downwards to the seabed (from a hull mounted transducer on the *Leah-C*), and the pulse duration of sub- bottom profilers is extremely short, in the order of tens to hundreds of milliseconds (Nedwell *et al*, 2008).

Based on the proposed model of sub-bottom profiler for use during the inshore survey (see Table 3-2), the peak source level is expected to be in the range of 214 dB re: 1µPa @1 m.

### 5.1.3 Side-scan sonar

The proposed side-scan sonar equipment will be either hull mounted or deployed as a towfish for the nearshore (inshore) sections of the survey from the *Leah-C*. This equipment can operate at a range of frequencies depending on water depth, ranging from between 445 and 900 kHz. The selection of frequency will depend on water depth, with lower frequencies recommended for deeper water and higher frequencies for shallower depths. Operating at typical operational frequencies the maximum expected amplitude will be c. 200- 230 dB re: 1µPa @1 m.

The range of frequencies 445-900 kHz available on this equipment are considered to be outside of the peak hearing thresholds of most cetaceans and pinnipeds. (Richardson *et al.,* 1995; Southall *et al.* 2007). In addition to spreading loss for acoustic propagation in the water column, high frequency acoustic energies are more quickly absorbed through the water column than sounds with lower frequencies.

### 5.1.4 Other acoustic sources

The obstacle avoidance sonar and altimeter systems proposed for use (on the *Edda Sun* ROV) operate at relatively high frequencies (500-675 kHz), compared to that of much of the other equipment in use. These high frequencies are outside of the peak hearing thresholds of most cetaceans and pinnipeds, with ~500 kHz being beyond the upper limit of harbour porpoises peak hearing frequency threshold (Richardson *et al.,* 1995; Southall *et al.* 2007).

The Sound Velocity probes operate at a very high frequency and at an extremely low sound pressure intensity level that would not be detectable to any receptor animals, while the USBL beacons operating at a much lower frequency (in the range 21-31 kHz) are within the range of hearing for small cetaceans and pinnipeds. However, these are also operating at a very low sound pressure intensity level compared with equipment that operates in a similar range, such as the sub-bottom profiler (the USBL transponders are for communicating a position relative to the survey vessel); therefore, the acoustic pulses from these are not considered likely to cause undue disturbance to those animals.

In addition to spreading loss for acoustic propagation in the water column, high frequency acoustic energies are more quickly absorbed through the water column than sounds with lower frequencies. Again, most of the sound energy generated is likely to be orientated downwards towards to the seabed, over a relatively short distance. Due to these factors the use of ROV mounted acoustic equipment is considered to result in a negligible risk of an injury or disturbance to cetaceans.

Table 5-1 (adapted from: Evans & Nice, 1996; Richardson *et al.*, 1995, in IOSEA2 (ERT/Aqua-Fact International Services, 2007)) shows various anthropogenic sources and received levels of sound in the marine environment.

**Table 5-1: Sound sources from various maritime activities**

| Activity | Frequency range (kHz) | Average source level (dB re 1µPa-m) | Estimated received level at different ranges (km) by spherical spreading[a] | | | |
|---|---|---|---|---|---|---|
| | | | 0.1 km | 1 km | 10 km | 100 km |
| High resolution geophysical survey; pingers, side-scan, echo sounder | 10 to 400 | <230 | 190 | 169 | 144 | 69 |
| Low resolution geophysical seismic survey; seismic air gun | 0.008 to 0.2[b] | 248 | 210[c] | 144[c] | 118[c] | 102[d] |
| | | | 208 | 187 | 162 | 87 |
| Production drilling | 0.25 | 163 | 123 | 102 | 77 | 2 |
| Jack-up drilling rig | 0.005 to 1.2 | 85 to 127 | 45 to 87 | 24 to 66 | <41 | 0 |
| Semi-submersible rig | 0.016 to 0.2 | 167 to 171 | 127 to 131 | 106 to 110 | 81 to 85 | 6 to 10 |
| Drill ship | 0.01 to 10 | 179 to 191 | 139 to 151 | 118 to 130 | 93 to 105 | 18 to 30 |
| Large merchant vessel | 0.005 to 0.9 | 160 to 190 | 120 to 150 | 99 to 129 | 74 to 104 | <29 |
| Military vessel | - | 190 to 203 | 150 to 163 | 129 to 142 | 104 to 117 | 29 to 42 |
| Super tanker | 0.02 to 0.1 | 187 to 232 | 147 to 192 | 126 to 171 | 101 to 146 | 26 to 71 |

*a Spherical spreading is calculated here using the formula presented in IOSEA2(ERT/Aqua-Fact International Services, 2007 ).*

*b Seismic surveys produce occasional sounds with frequencies of 1 to 22 kHz (Evans, 1998)*

*c Actual measurements in St George's Channel, Irish Sea.*

*d Extrapolated figure as presented by Evans & Nice, 1996.*

## 5.2 SOUND PROPAGATION

In general sound sources that have high sound pressure levels (intensity) and low frequency (i.e. large air gun array seismic sources) will travel the greatest distances underwater. The spread of low frequency sound in the sea is efficient, with little loss due to attenuation (i.e. due to absorption and scattering). Conversely high frequency sources (i.e. side- scan sonar and echo sounder) tend to have greater attenuation over distance. The overall degree of attenuation is dependent on the propagation conditions (propagation is impacted by varying pressure, temperature and salinity). Additionally, spherical spreading loss (the reduction in intensity caused by the spreading of waves into an ever increasing space) results in signal intensity dropping quickly.

The intensity of sound waves decay exponentially and although low-level signals travel for long distances, higher amplitude waves lose much of their energy very close to the sound source (Gisiner, 1998).

An animal's ability to detect sounds produced by anthropogenic activities depends on the amount of natural ambient or background sound. Wind, precipitation, vessel traffic, and biological sources all contribute to ambient sound.

## 5.3 AUDITORY SENSITIVITY

Section 2.2 lists the species of marine mammal which may be present in the vicinity of the proposed survey area. These species have differing auditory ranges, and hence are not equally sensitive to the same noise sources. Table 5-2 (adapted from NPWS, 2014 and Southall *et al.*, 2007) presents the estimated auditory bandwidths for a range of marine mammals, and species that may be present in the vicinity of the proposed survey activities.

**Table 5-2: Estimated auditory bandwidths for marine mammals**

| Cetaceans Low frequency 7 Hz-22 kHz | Cetaceans Mid-frequency 150 Hz-160 kHz | Cetaceans High frequency 200 Hz–180 kHz | Pinnipeds in water 75 Hz–75 kHz |
|---|---|---|---|
| | Peak sensitivity ~ 15 KHz | Peak sensitivity 16 to 140 kHz | |
| Baleen whales | Most toothed whales, dolphins | Certain toothed whales, porpoises | All species |
| *Humpback whale*<br>*Blue whale*<br>*Fin whale*<br>*Sei whale*<br>*Minke whale* | *Sperm whale*<br>*Killer whale*<br>*Long-finned pilot whale*<br>*Beaked whale* species<br>*Dolphin species* | *Pygmy sperm whale*<br>*Harbour porpoise* | *Grey seal*<br>*Harbour seal* |

### 5.3.1 Cetaceans

Baleen whales are reported to have hearing sensitivity ranges in the region of 10 Hz to 20 kHz, with greatest sensitivities usually below 1 kHz (Evans, 1998). Source frequencies associated with high resolution geophysical surveys typically fall outside of this hearing range (Table 5-2). Low frequency output associated with some types of acoustic survey equipment, such as seismic surveys and low frequency sub-bottom profilers, do however overlap with the hearing range of baleen whales, which has the potential to mask long distance communication between whales over significant distances, and prevent the detection of other faint sounds (Evans & Nice, 1996).

Toothed whales rely on sound for echolocation, foraging and communication. The auditory sensitivities range for most species is considered to be from 75 Hz to 180 kHz, with greatest sensitivities around 20 kHz.

Observations undertaken during low frequency acoustic surveys (seismic surveys) in UK and adjacent waters were analysed to examine effects on cetaceans (Stone & Tasker, 2006). Sighting rates, distance from sound source and orientation were compared for periods when airguns were active and when they were silent. The results indicated that different taxonomic groups of cetaceans may adopt different strategies in response to acoustic disturbance from seismic surveys. Some small toothed whales (odontocetes) move out of the immediate area, while the slower moving baleen whales (mysticetes)

orient away from the vessel and increase their distance from the source but may not move away from the area completely.

In addition, Southall *et al.* (2007) carried out an extensive review of the available literature and formulated scientific recommendations for marine mammal exposure criteria. For low frequency hearing cetaceans (typically baleen whales, with an auditory sensitivity range estimated at 7 Hz to 22 kHz) and mid frequency hearing cetaceans (typically most toothed whales and dolphins, and an auditory sensitivity range estimated at 150 Hz to 160 kHz), the sound pressure level (SPL) for injury was set at 230 dB re 1μP @1 m. The sound exposure level (SEL) for injury was set at 198 dB re 1μP a2$^{-s}$. The fundamental difference between these two parameters is that SPL can be an instantaneous value and SEL is the total noise energy to which the mammal is exposed during a given duration – 1 second in this case. It should be stressed that no marine mammal mortality or damage to tissue has been documented for exposure to geophysical surveys, and that the exposure level for injury is a theoretical value extrapolated from experimental data. Also, it is recognised that many variables affect the nature and extent of responses to a particular stimulus. Such variables may include the recent experience of marine mammals with the sound stimulus, and their current activity (e.g. feeding vs. migrating).

### 5.3.2 Seals

The estimated auditory bandwidth for seals is thought to be in the range of 75 Hz – 75 kHz (Table 5-2). Studies dedicated to the effect of noise from acoustic survey on seals are limited, despite seals being recognised as having good underwater hearing. Of the few dedicated studies undertaken, Thompson (1998) provides an assessment of the physiological responses of grey and harbour seals to airguns. The study showed that harbour seals exhibited fright responses when a sound source (a source levels of 215 to 224 dB) was switched on, followed by strong avoidance behaviour. The seals also stopped feeding during this time. The behaviour of the harbour seals soon returned to normal after the sound source was switched off. Similar avoidance responses were recorded in grey seals at similar exposure levels, with seals changing from foraging behaviour to transiting away from the sound source. The grey seals were recorded as returning to normal behaviour within two hours of the sound source ceasing. For seals Southall *et al.* (2007) gives the SPL threshold for injury at 218 dB re: 1 µPa (peak).

## 5.4 IMPACT OF SURVEY ON ANNEX IV MARINE MAMMALS

There are various potential effects of exposure to sound from anthropogenic activities that can be characterised as pathological, physiological or behavioural. Criteria can be established for zones of influence based on ambient sound levels, absolute hearing thresholds of the species of interest, slight changes in behaviour of the species of interest (including habituation), stronger disturbance effects (e.g. avoidance), temporary hearing impairment (TTS) and permanent hearing impairment (PTS) or other physical damage.

### 5.4.1 Cetaceans

The hearing range of most toothed whales is unlikely to overlap with the type of MBES and side-scan sonar equipment to be used in the proposed survey; however, they may

be sensitive to the operational frequencies of the sub-bottom profiler unit proposed for use from the *Leah-C* (3 - 8 kHz).

The lower frequencies generated by SBP equipment has the potential to cause localised short-term impacts on behaviour, possibly resulting in avoidance at close proximities (Nedwell *et al* (2008). However, it is unlikely that this would be considered a significant disturbance. Considering the natural avoidance behaviour, the peak source level of the sound source (214 dB re: 1µPa @1 m), and the SPL (230 dB re: 1 µPa) and SEL (198 dB re 1µPa $2^{-s}$) for injury it is unlikely that injury would occur as an animal would need to locate in the very small zone of ensonification and stay in that zone associated with the vessel for a period of time.

Cetaceans which use higher frequencies, such as harbour porpoise, may be sensitive to certain frequencies within the operational capability of the MBES systems. Estimates provided by Nedwell *et al* (2008) using comparable MBES specifications (maximum source level of 220 dB re: 1µPa @1 m and an operating frequency of 200kHz), and using harbour porpoise as being the worst case scenario and a 90 dBht (dB values above hearing threshold) strong avoidance impact criterion (Nedwell *et al* 2008)), it was estimated that a strong avoidance reaction might occur at up to a distance of 30 m from the sound source. Again, considering the natural avoidance behaviour, the peak source level of the sound source and the SPL and SEL for injury it is unlikely that injury would occur. It should be noted that the proposed peak source level of 223 dB re: 1µPa @1 m is a maximum and will also drop exponentially due to spherical spreading and greater attenuation of high frequencies (Section 5.2).

The proposed side-scan sonar equipment for the inshore survey operates at relatively high frequencies (between 445 - 900 kHz). These higher frequencies are outside of the peak hearing thresholds of most cetaceans and pinnipeds and beyond the upper limit of harbour porpoises and bottlenose dolphins peak hearing threshold (Richardson *et al.*, 1995; Southall *et al.* 2007).

The maximum SPL at 1m distance for the side scan sonar proposed for the survey is estimated to be approximately 225 dB re 1µPa.

In addition to spreading loss for acoustic propagation in the water column, high frequency acoustic energies are more quickly absorbed through the water column than sounds with lower frequencies.

Further to this, the employment of mitigation measures outlined in the Section 6 will mitigate against potential impacts.

### 5.4.2 Seals

The hearing range of seals is unlikely to overlap with the type of MBES, or the operating range of the side-scan sonar, and ROV positioning equipment proposed for use in the survey, however, they may be sensitive to the operational frequencies of the proposed sub-bottom profiler on the inshore part of the survey. The USBL transponders may also be audible to seals, however due to the very low intensity at which this equipment operates, impacts are considered negligible.

The maximum amplitude of the proposed sub bottom profiler is expected to be 214 dB re:

1µPa @1 m, and the amplitude will drop off rapidly from the source. Given the SPL threshold for injury for seals is 218 dB re: 1 µPa (Southall *et al.* (2007)) the potential for injury to seals from the acoustic sound sources proposed for this survey is low, especially for the offshore component of the survey (where SBP will not be used) and also as the frequency of occurrence of seals decreases with increasing distances from areas of known coastal sensitivity.

Although energy levels will drop off rapidly from the source of the sub-bottom profiler, the sound will be detectable to seals. Detection could be at a distance of tens of kilometres from source. If animals are closer to the source, then it is likely that animals responses could be in the form of avoidance (Thompson, 1998).

The maximum amplitude of the proposed side-scan sonar equipment proposed for the inshore survey component is 225 dB re: 1µPa @1 m (when operating at typical frequencies of around 500-600 kHz). The equipment proposed for usage on the inshore survey can operate between 445-900 kHz are well outside the audible range for grey seals. Attenuation of the sound source through spherical spreading and also through increased absorption associated with source levels at higher frequencies, will result in the source amplitude rapidly decreasing with distance and therefore the potential for injury to seals from the acoustic sound sources proposed for this component of the survey is considered to be extremely low.

Appropriate mitigation will decrease impacts, such as the implementation of soft start procedures and the presence of a qualified MMO (see Section 6 for detailed information regarding mitigation).

### 5.4.3 Turtles

Small-scale behavioural experiments on loggerhead and green turtles have indicated that exposure to seismic sound levels over 155 dB resulted in increased swimming activity, and at over 164 dB, individuals began to exhibit erratic swimming patterns, possibly indicative of an agitated state (McCauley *et al.*, 2000).

It is considered unlikely that turtle species will be encountered within the survey area during the proposed works. However, should any individuals be present, appropriate mitigation measures (outlined in the Section 6) will reduce potential impacts.

## 5.5 CUMULATIVE IMPACTS

Due to the nature of the proposed activities, and the widespread use of underwater acoustic devices on other vessels in the area, there is potential for cumulative underwater sound impacts. Cumulative impacts may arise as a result of operation of underwater acoustic sources on both the *Leah-C* and the *Edda Sun*, and from increased levels of vessel movements. It is however understood at this time that no additional work programmes are scheduled to take place that will coincide with the proposed survey period.

It is recognised that the scheduling of the inshore and offshore surveys may result in a degree of unavoidable overlap between the two programmes. However, this overlap will

be of as short duration as possible and will also mean that the overall duration of disturbance from the combined programme is shortened. It is also anticipated that the two surveys (inshore and offshore) will not be in close proximity for a long period of time.

No other related activities are understood to be planned to coincide with geophysical / visual survey works in Broadhaven Bay.

# 6 MITIGATION MEASURES

The NPWS "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" (NPWS, 2014) provides mitigation measures for the protection of Annex IV species from geophysical acoustic surveys in Irish waters, including seismic surveys and multibeam, single beam, side-scan sonar and sub-bottom profiler surveys. These measures are outlined in the sections below.

## 6.1 NPWS GUIDANCE

These mitigation measures are applicable to:

- all seismic surveys (including the testing and full operational use of airguns, sparkers, boomers and vertical seismic profiling (VSP) or checkshot systems) in inshore and offshore Irish waters;
- all multibeam, single beam, side-scan sonar and sub-bottom profiler (e.g., pinger or chirp system) surveys within bays, inlets or estuaries and within 1,500 m of the entrance of enclosed bays/inlets/estuaries;
- or as advised by the relevant Regulatory Authority.

The following mitigation measures will be employed during the survey in order to minimise the potential for impact to Annex IV species potentially present within and in proximity to the survey area, in accordance with the NPWS Code of Practice (NPWS, 2007) (updated by the NPWS Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014). These measures are specified by the NPWS for water depths of up to 200 m.

The mitigation measures outlined below will be in implemented for the entire extent of the pipeline and over vessels, in line with best practice.

### 6.1.1 General Mitigation

Generic mitigation measures that will be in place to minimise the impact of sound generated from the proposed activities are as follows:

- Use of the lowest equipment output possible in order to obtain the required data quality;
- At the start of proposed activities, power will increase slowly from a low intensity (a 'soft start') to encourage avoidance reactions by marine mammals, fish and marine reptiles;
- A qualified and experienced Marine Mammal Observer (MMO) will be present onboard both the nearshore and offshore geophysical survey vessels. The MMO will have undergone marine mammal observation training (JNCC or equivalent) and have spent a minimum of six weeks of marine mammal survey experience at sea over a three-year period;
- The MMO must submit a report, as outlined in NPWS code of practice, within 30 days of completion of the proposed activities to the relevant Licensing Authority, and copy the report to the NPWS;

- The geophysical vessel operator must provide a report (including a daily log) on the operation of survey equipment that will indicate the soft starts and their duration to the MMO. This information will be made available to NPWS;
- The MMO must use a distance measuring stick, reticle telescope or binoculars to ascertain distances to marine mammals.
- Vessel(s) working in or in vicinity to Broadhaven Bay SAC will operate in accordance with the Vessel Code of Conduct for Inspection and Maintenance Surveys (Document No. COR-14-SH-0227, 2018). This document forms part of the Operators Environmental Management Plan (EMP and details specific measures for vessel operators to avoid impacts to marine mammals (particularly small cetaceans). Where at all possible when operating acoustic geophysical survey equipment, the *Leah-C* will work in an inshore to offshore direction, in an effort to retain an open aspect for animals to leave the confines of Broadhaven Bay, rather than animals wishing to increase their distance from the sound sources having to head further inshore.

In addition, a number of aspect-specific mitigation measures will be in place and are described below.

### 6.1.2 Mitigation for Annex IV species from multibeam, single beam, side-scan sonar & sub-bottom profiler surveys

**Pre soft start scans**

- Sound-producing activities will only commence in daylight hours where effective visual monitoring, as performed and determined 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.
- An 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.
- MMOs should survey the area for the presence of Annex IV species **30 minutes** before the onset of the soft start.
- A minimum distance of **500 m** is required between the centre of the sound source and the nearest Annex IV species before soft start can commence.
- If Annex IV species seen within **500 m** of the centre of the sound source the start of the sound source(s) should be delayed until they have moved away, allowing adequate time after the last sighting for the animals to leave the area (**30 minutes**). If Annex IV species do not leave the area it is recommended that the survey vessel alters course to ensure that the animals are outside the **500 m** exclusion zone when soft start commences.
- Soft start should commence after a **500 m** area around the vessel has been confirmed clear of Annex IV species for **30 minutes**.

### 6.1.3 Soft start/Ramp up procedure

- In commencing an acoustic survey operation using the above equipment, the following soft start (or ramp up) must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1µPa @1m:
    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 (e.g., output peak sound pressure level of 170 dB→180 dB→190 dB→200 dB→200+ dB over **20 minutes**).
    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.
- In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output should be minimised to prevent unnecessary high-level sound introduction into the environment.
- 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 Annex IV species occur within a **500 m** radial distance of the sound source, i.e., within the Monitored Zone.

### 6.1.4 Break in sound input

- 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 (where appropriate following Pre-Start Monitoring) must be undertaken.
- For higher output survey operations which have the potential to produce injurious levels of underwater sound (see sections 2.4, 3.2) as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter **5- 10 minute break** limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up.

## 6.2 ACCIDENTAL EVENTS - SPILLAGE OF FUEL OR CHEMICALS

**Fuel or Chemicals**

The following measures will be in place to mitigate against accidental spills:

- Refuelling of vessels will not be undertaken at sea, but in port where spills, although unlikely to happen, can be responded to more easily, and will reduce the risk of any exposure to marine life;
- The vessels will operate with strict safety, navigational, operating and communications procedures in place in order to avoid collisions. These will include use of Automatic Identification System (AIS) tracking, adherence to the Collision Regulations, communication with other vessels, and 24 hour look ahead plans;
- The fuel to be used by vessels is regular marine grade oil (MGO) and not heavy fuel oil (HFO) that could represent a greater environmental hazard if spilled;
- Onboard the vessel, the valves between fuel tanks will be kept closed, thereby minimising potential for complete fuel loss. Refuelling will occur according to a specific procedure;
- Shipboard Oil Pollution Emergency Plans (SOPEP), spill mitigation equipment and other facilities are kept onboard all vessels in order to contain or minimise spills; all the vessel crews have been trained in the use of the plans and equipment; and
- The Emergency Response Plan will set out how all spill response resources (personnel, command structure, equipment, etc.) will interface, including co-ordination between other seismic survey operators, if applicable.

# 7 RISK ASSESSMENT

## 7.1 INTRODUCTION

Impacts expected to occur despite the mitigation measures proposed are often referred to as 'residual impacts' and are covered in the first part of the risk assessment (Section 7.3). Those impacts that have the potential to occur as a result of accidental events are discussed in the second part (Section 7.4).

The following sections provide risk assessment matrices, where the proposed survey programme has been broken down into a number of activities, and impacts are identified for each activity. Activities which have potential impacts are identified as 'aspects'. The types of potential impacts have been identified for each aspect. Consideration has been given to mitigation or control measures incorporated into the design of the activities, which reduce the potential impacts. This may result in the potential for impact to be eliminated. In other cases there remains a possibility for impact, in spite of the mitigation measures. The remaining impact is estimated where possible and listed as a predicted impact.

## 7.2 EVALUATION OF RELATIVE SIGNIFICANCE

The evaluation of the relative significance of the effects is shown in Table 7-1. The relative significance of a predicted impact is summarised from a scale from significant through to negligible (or beneficial). The evaluation considers the vulnerability, temporal sensitivity and recoverability of Annex IV species and the geographical extent of the effect. Criteria for assessing the significance of predicted impacts have been closely defined.

**Table 7-1: Assessment of the significance of impact**

| Significance category | | Severity of impact (after implementation of mitigation measures) |
|---|---|---|
| I | Significant | Substantial adverse changes in the ecology of Annex IV species, and/or a reduction in population number. These changes are well outside the range of natural variation. The recovery of affected species may be protracted. |
| II | Moderate | Moderate adverse changes in the ecology of Annex IV species. These changes may exceed the range of natural variation. The potential for recovery is good. It is recognised that a low level of impact may remain. |
| III | Minor | Minor adverse changes in the ecology of Annex IV species. These changes may be noticeable but fall within the range of natural variation. Effects are potentially short-lived, with a short-term recovery. It is recognised that potentially a low level of impact may remain. |
| IV | Negligible | Changes in the ecology of Annex IV species that are unlikely to be noticeable (i.e. well within the scope of natural variation). |

| | | |
|---|---|---|
| V | Beneficial | Changes resulting in positive, desirable, or beneficial effects to Annex IV species ecology. |
| Note: The definitions are intended to categorise predicted impacts following the implementation of mitigation measures or controls. An impact that would have been 'Significant' without action by the Project may be assessed to be 'Moderate', 'Minor', or 'Negligible', after effective mitigation or control measures are in place. | | |

## 7.3 RESIDUAL RISK ASSESSMENT

This section summarises the aspects, potential impacts, mitigation measures, predicted impacts, and significance of the predicted impacts for the proposed activities.

It should be noted that the risk assessment focuses on the hazards and risks posed to Annex IV species as a whole (cetaceans, marine turtles and pinnipeds), and is not species specific. Furthermore, the assessment is based on a number of assumptions that should be considered when interpreting the risk assessment:

- Some Annex IV species are easier / more difficult to detect. In the case of cetaceans, smaller species such as the harbour porpoise can be difficult to detect in sea states of more than 2 on the Beaufort scale.
- It is likely that some of the species discussed in section 2.2 will not be in the proximity of the survey area during the survey. This may be due to seasonality, which means animals may not be present at the time of the survey, or due to the fact the some of the species discussed are uncommon to Irish waters.
- The assumption has been made that Annex IV species will leave the area during the survey as a result of the 'soft start' approach. Some species, including cetaceans, have been known to approach geophysical vessels during acoustic survey activities.
- The assessment is based on use of soft start procedures. There is the possibility that the soft start procedures may not be sufficient for a particular species, or an individual animal to vacate the area before commencement of full scale operations (maximum output of survey equipment).

Table 7-2 presents the aspects, potential impacts, mitigation measures, predicted impacts and an assessment of the significance of the predicted impacts for the normal scheduled operations associated with the survey. The impacts of accidental events are considered separately (see Table 7-3).

**Table 7-2: Residual risk assessment of potential impacts, proposed mitigation measures and predicted impacts**

| **Aspect**<br>***Potential impact*** | **Mitigation measures** | **Significance** |
|---|---|---|
| Mobilisation of survey vessels from port to site<br><br>*Physical and acoustic presence* | • The survey will be scheduled to minimise the duration of the *Leah-C* and *Edda Sun* at sea. Activities will be confined to as small an area as possible to minimise acoustic and visual presence.<br><br>• Vessel(s) will operate in accordance with the inspection and maintenance survey vessel Code of Conduct (Document No. COR-14-SH-0227, 2018) for operations within and adjacent to Broadhaven Bay SAC. | **Minor**<br><br>• For any reduction in Annex IV species abundance from an area, rapid repopulation is likely, as responses by animals is likely to be behavioural and temporary in nature. No changes in overall species abundances are anticipated.<br><br>• Likelihood of collision with animals considered extremely low.<br><br>• Residual risk of visual/acoustic presence of vessel traumatising Annex IV species is low. |

| Aspect<br>*Potential impact* | Mitigation measures | Significance |
|---|---|---|
| Physical presence of the geophysical survey vessels, ROV, MBES, sub-bottom profiler, side-scan sonar, or stills/video camera system<br><br>*Physical presence and potential for interaction* | • The work will be scheduled so as to minimise the duration of project activities and to confine activities to as small an area as possible (i.e. directly over the pipeline and umbilical route, and other seabed assets being surveyed).<br><br>• Dedicated MMO and vessel crew will monitor and report immediately any interactions with Annex IV species that cause concern.<br><br>• With the potential exception of the side-scan sonar towfish on the inshore survey, acoustic survey equipment will be mounted directly to the hull of the *Leah-C*, or to the ROV of the *Edda Sun*, reducing the likelihood of interaction (such as entanglement) with Annex IV species.<br><br>• The camera system will be lowered to the seabed using a taut vertical oceanographic cable, reducing the likelihood of interaction (such as entanglement) with Annex IV species<br><br>• Vessel(s) will operate in accordance with the inspection and maintenance survey vessel Code of Conduct (Document No. COR-14-SH-0227, 2018) for operations within and adjacent to Broadhaven Bay SAC. | **Minor**<br><br>• No known records of similar animal entanglement.<br><br>• Residual risk of acoustic source from presence of vessel traumatising Annex IV species is low.<br><br>• For any reduction in Annex IV species abundance, rapid repopulation is likely as responses by animals will be behavioural and temporary in nature. No changes in overall species abundances are anticipated.<br><br>• Likelihood of collision or entanglement with animals considered extremely low. |

| Aspect<br>*Potential impact* | Mitigation measures | Significance |
|---|---|---|
| Operation of geophysical survey equipment<br><br>*Acoustic disturbance* | • The work will be scheduled so as to minimise the duration of project activities and to confine activities to as small an area as possible to minimise extent of acoustic presence.<br><br>• Soft start procedure will ensure controlled build-up of acoustic energy output is undertaken in consistent stages, providing a steady and controlled graduation acoustic source levels that will allow animals the opportunity to vacate the area.<br><br>• Dedicated MMO and vessel crew on survey vessels will monitor and report immediately any interactions with Annex IV species that cause concern. | **Minor**<br><br>• For any reduction in Annex IV species abundance, rapid repopulation is likely, as impacts are expected to be limited to behavioural (likely to be temporary) responses or temporary disturbances.<br><br>• Residual risk of traumatising Annex IV species is low. |
| Vessel operations / routine emissions and discharges<br><br>*Water quality and toxicological effects.* | • All waste will be handled in accordance with the vessels waste management plan, which will operate in accordance with all national and international legislation/regulations and corporate guidelines.<br><br>• Compliance with MARPOL 73/78.<br><br>• The work will be scheduled so as to minimise the duration of project activities and to confine activities to as small an area as possible.<br><br>• Air emissions will be minimised through regular maintenance of all engines onboard, in line with Maritime Registry of Shipping (MRS), MARPOL 73/78 Annex VI and other similar requirements. | **Minor**<br><br>• Potential attraction of Annex IV species to the area, due to potential attraction of prey species (vertebrates and invertebrates) at certain times (during discharges). There is a chance for this to result in an increased potential for laceration with propeller/interaction with the vessel or equipment, although the likelihood of this is considered to be extremely low. |

## 7.4 ACCIDENTAL EVENTS - RISK ASSESSMENT

The proposed survey has the potential to affect Annex IV species within a relatively localised area in the vicinity pipeline route. However, accidental events such as a large oil or chemical spill, has the potential to affect a wider geographical area.

This following table summarises the aspects, potential impacts, mitigation measures, and predicted impacts to Annex IV species from accidental events, which may occur during the planned survey. The potential for accidental events to occur during planned activities have also been considered and summarised in Table 7-3.

**Table 7-3: Accidental events: risk assessment of potential impacts, proposed mitigation measures and predicted impacts**

| **Aspect**<br>***Potential impact*** | **Mitigation measures** | **Predicted impact / significance** |
|---|---|---|
| Vessels operations, fuel and oil spills from the vessel<br><br>Vessel Collision – Loss of fuel inventory<br><br>*Water quality and toxicological effects* | • No refuelling of the vessels will take place at sea.<br><br>• Refuelling operations will be managed through detailed vessel specific procedures and be supported by emergency response plans.<br><br>• The use of well-maintained and modern vessels, with modern navigational systems to identify/avoid obstacles.<br><br>• All fuels and chemicals aboard the survey vessels will be stored according to regulations and manufacturer's directions. Material Safety Data Sheets (MSDSs) for all chemicals stored onboard will be readily available. Procedures will be in place for dealing with spills and leaks.<br><br>• Vessel decks will have measures in place to contain fuel / lubricant / chemical leaks, such as bunding. Spill response equipment will also be present on board vessels and personnel will be trained in its usage.<br><br>• The vessels will operate with strict safety, navigational, operating and communications procedures in place in order to avoid collisions. These will include use of Automatic Identification System (AIS) tracking, adherence to the Collision Regulations, communication with other vessels, and 24 hour look ahead plans.<br><br>• Use of marine grade oil (MGO), rather than traditional heavy | **Minor**<br><br>• In the event of significant loss of fuel in an open offshore environment, spills would be rapidly dispersed and diluted with little long-term residual impact. Any reduction in Annex IV species abundance would be low and rapid repopulation is likely.<br><br>• The effect on prey and food sources of Annex IV species would be localised and recovery would be expected to be short-term. |

| Aspect<br>*Potential impact* | Mitigation measures | Predicted impact / significance |
|---|---|---|
| | bunker fuel. In the event of a release of oil, this will disperse more readily in the offshore environment. | |
| Accidental loss of equipment during operations<br><br>*Physical presence and potential for interaction* | • Acoustic survey equipment will be mounted directed to the hull of the *Leah-C*, or to the ROV of the *Edda Sun*, reducing the potential for entanglement and loss of equipment.<br><br>Vessel(s) will operate in accordance with the inspection and maintenance survey vessel Code of Conduct (Document No. COR-14-SH-0227, 2018) for operations within and adjacent to Broadhaven Bay SAC. | **Negligible**<br><br>• In the event of a loss of equipment, which ultimately could not be recovered, there is a possibility that survey equipment may become entangled in other sea bed obstacles and/or fishing gear, which in turn may provide a potential source of entanglement to Annex IV species. |

# 8 CONCLUSIONS

This assessment has undertaken an initial screening assessment for an EIA and considered the potential impacts to Annex IV species associated with the proposed survey programme. Potential impacts to Natura 2000 sites and any species or habitats that are included as designating features of these sites are considered in the Natura Impact Statement report in support of an Appropriate Assessment (if required), which also accompanies this application.

The auditory ranges of the majority of cetaceans and seals are unlikely to overlap significantly with the operating frequencies of the MBES equipment proposed for this survey. While there is the potential for the lower frequency sound from the sub-bottom profiler, and potentially from the side-scan sonar (both used only on the inshore parts of the survey) to result in some avoidance behaviour at close ranges, it is important to consider that the source levels at which this equipment operates are considerably less than the lower frequency and higher source levels used in exploration seismic surveys.

Impacts will be mitigated by the use of soft-start procedures and MMO's, and the surveys will be carried out following the NPWS best-practice guidance: "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" (NPWS, 2014).

The disturbance to animals by the direct presence of the survey vessels are also not considered likely to result in any significant impacts. Vessels will be relatively slow moving, and not prone to sudden or erratic changes in direction. Animals will therefore have the opportunity to move away from approaching vessels. MMO's will be present on board the survey vessels and when working within Broadhaven Bay they will operate according to the inspection and maintenance survey Code-of-Conduct for vessels and personnel operating within and adjacent to Broadhaven Bay SAC (Document No. COR-14-SH-0227, 2018). This outlines specific guidance for vessels to avoid disturbance or injury to marine mammals (in particular, small cetaceans).

The screening assessment has concluded that this project would not require an EIA. The impact assessment for Annex IV species has concluded that the shallow geophysical survey techniques and any direct disturbance from the vessels themselves are not likely to have an adverse effect on the species that have been identified as key receptors within the zone of influence of the proposed works. Any impacts that do occur will be limited to short-term avoidance behaviour of minor or negligible magnitude, with no lasting ecological effects.

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