

**Bremore Port Maritime Usage
Licence Application for Site
Investigation Works
Risk Assessment for Annex IV
Species**



Client	Bremore Ireland Port
Document Ref.	22032-REP-007-01
Project Title	Bremore Port Maritime Usage Licence
Date	09/05/2024

Project Title:	Bremore Port Maritime Usage Licence
Report Title:	Bremore Port Maritime Usage Licence Application for Site Investigation Works Risk Assessment for Annex IV Species
Document Reference:	22032-REP-007-01

Client:	Bremore Ireland Port
Ultimate Client:	Bremore Ireland Port
Confidentiality	Non Confidential

REVISION HISTORY

Rev	Date	Reason for Issue	Originator	Checker	Reviewer	Approver
00	09/05/2024	Draft for client review				
01	23/07/2024	Final Report				

DISCLAIMER

Gavin & Doherty Geosolutions Ltd. (GDG) has prepared this report for the sole use of Bremore Ireland Port (hereafter the "Client") in accordance with the terms of a contract between the Client and GDG. No other warranty, express or implied, is made as to the professional advice contained in the report or any other services provided by GDG. GDG does not accept any liability for the use of or reliance upon this report by any third party without our prior and express written agreement. GDG assumes no liability or duty of care to any third party in respect of or arising out of or in connection with this report and/or the professional advice contained within.

This report is the copyright of Gavin & Doherty Geosolutions Ltd. Any unauthorised reproduction or usage (in whole or in part) by any person other than the Client is strictly prohibited.

REVISION SUMMARY

Rev	Date	Section(s)	Detail of Change
00	09/05/2024	All.	First draft for client comment.
01	23/07/2024	All	Final Report

TABLE OF CONTENTS

Chapter	Page
Executive Summary	10
1 Introduction	11
1.1 Aim of the Report	11
1.2 Structure of the Report	11
1.3 Licence Area	12
1.4 Site Investigation Works	14
1.5 Survey Schedule	14
2 Legislation and Regulation	15
2.1 European Protected Species (EPS)	15
2.2 Guidance	16
3 Annex IV Species in the Vicinity of the Licence Area	18
4 Potential impacts	22
4.1 Disturbance from Vibration and Underwater Noise Associated with Surveys	22
4.2 Injury Due to Collision (Survey Vessels/Sampling Equipment)	26
4.3 Pollution Event	26
5 Risk assessment for the protection of annex IV species under article 12 of the habitats directive	27
5.1 Identification of Relevant Annex IV Species	27
5.2 Impact Assessment	27
6 Protection measures to prevent harm to annex IV species	30
6.1 Marine Mammal Monitoring	30
6.2 Pre-start Monitoring	30
6.3 Monitored Zone	30
6.4 Soft Start	31
6.5 Line Changes	31
6.6 Breaks in the Survey Periods	31
6.7 Reporting	32
6.8 Survey Vessels Speed and Course	32
7 Conclusion	33
8 References	34

LIST OF TABLES

Table 3-1 Annex IV species that may be found within or near the Licence Area according to DAHG (2009) and Ireland's Marine Atlas (2021)	18
Table 4-1 Sound Pressure Level (SPL) injury criteria proposed by Southall et al. (2007), for individual cetacean categories exposed to discrete noise events, Ghoul & Reichmuth (2014)	23
Table 4-2 Sound Pressure Level (SPL) injury criteria proposed by Southall et al. (2019), for individual marine mammals exposed to discrete noise events	23
Table 4-3 Underwater Auditory Band Width for Marine Mammal Species (Southall et al., 2007) and Leatherback turtle (Piniak et al, 2012)	24
Table 4-4 Noise sources during site investigation activities	24
Table 4-5 Annex IV species auditory band width and relevant surveys; marine mammals known in the area are also listed.	25

LIST OF FIGURES

Figure 1-1 Bremore Ireland Port Maritime Usage Licence Area (solid red boundary) and the Proposed Development Area (dashed red boundary)	13
--	----

List of Abbreviations

ADCP	Acoustic Doppler Current Profiler
AIMU	Assessment of Impacts on the Maritime Usage
API	American Petroleum Institute
BH	Borehole
COMREG	The Commission for Communications Regulation
CPOD	Continuous Porpoise Detectors
CPT	Cone Penetration Test
DAHG	Department of Arts, Heritage and the Gaeltacht
DCCAE	Department of Communications, Climate Action and Environment
DHLGH	Department of Housing, Local Government and Heritage
EC	European Commission
EEZ	Exclusive Economic Zone
EPS	European Protected Species
EU	European Union
IMO	International Maritime Organization
ISO	International Organization for Standardization
JNCC	Joint Nature Conservation Committee
LiDAR	Light Detection and Ranging
MAP	Maritime Area Planning Act 2021
MARPOL	The International Convention for the Prevention of Pollution from Ships
MBES	Multibeam echosounder
Minister	Minister for Housing, Local Government and Heritage
MMO	Marine Mammal Observer
NM	Nautical Mile
NPWS	National Parks and Wildlife Service
OWF	Offshore Wind Farm
PAM	Passive Acoustic Monitoring
PTS	Permanent Threshold Shift
SBI	Sub Bottom Imager
SBP	Sub Bottom Profiler
SISAA	Supporting Information for Screening for Appropriate Assessment
SPL	Sound Pressure Level
SSS	Side Scan Sonar
TTS	Temporary Threshold Shift
UK	United Kingdom
VC	Vibrocore
WGS	World Geodetic System

Glossary of Terms

Acoustic Doppler Current Profiler (ADCP)	An Acoustic Doppler Current Profiler is a hydroacoustic current meter similar to a sonar, used to measure water current velocities over a depth range using the Doppler effect of sound waves scattered back from particles within the water column.
Boreholes	A borehole is a narrow shaft bored in the ground, either vertically or horizontally.
Completion Campaign	Site Investigation surveys undertaken at each turbine location to inform the detailed foundation design for each individual turbine. It occurs late in the development programme often after planning consent has been granted.
Cone Penetration Test (CPT)	The cone penetration or cone penetrometer test (CPT) is a method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy.
Exclusive Economic Zone	Marine area from the territorial seas' boundary seaward to a distance of 200 miles or otherwise as agreed under international statute.
Foreshore	The foreshore of Ireland is classed as the land and seabed between the high water of ordinary or medium tides (shown HWM on Ordnance Survey maps) and the twelve-mile limit (12nm = 22.224km). The foreshore also covers the tidal reaches of rivers.
Geophysical Surveys	Geophysical surveys are ground-based physical sensing techniques that produce a detail image or map of an area. Ground-based surveys may include: Seismic surveys - vibrations are recorded with geophones to provide information about the properties of rocks.
Geotechnical investigation and evaluation	Geotechnical investigation and evaluation include methods to acquire and evaluate subsurface information, including drilling and sampling, laboratory testing, cone penetration testing, and pressure meter testing.
Grab Samples	A grab sample is a sample of sediment taken from the seabed.
Habitats Directive	Adopted in 1992, the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements. It forms the cornerstone of Europe's nature conservation policy with the Birds Directive and establishes the EU wide Natura 2000 ecological network of protected areas, safeguarded against potentially damaging developments.
Interim Campaign	Site Investigation surveys designed to build on the level of detail acquired during the preliminary campaign with the aim of developing a detailed ground model of the site that will feed into the overall design of the wind farm.
LiDAR	LiDAR is a method for measuring distances by illuminating the target with laser light and measuring the reflection with a sensor. Differences in laser

	return times and wavelengths can then be used to make digital 3-D representations of the target. It has terrestrial, airborne, and mobile applications.
Magnetometer	A magnetometer is a device that measures magnetism—the direction, strength, or relative change of a magnetic field at a particular location.
Maritime Area Planning Act 2021	Legislation reforming consenting within Ireland’s marine area, including introducing both an offshore specific consenting regime and extending the powers of the State to enable the State to operate a consenting regime across its entire EEZ and agreed continental shelf.
MARPOL	MARPOL is the main international convention aimed at the prevention of pollution from ships caused by operational or accidental causes. It was adopted at the International Maritime Organization (IMO) in 1973. The Protocol of 1978 was adopted in response to a number of tanker accidents in 1976–1977.
Metocean	Metocean conditions refer to the combined wind, wave, and climate conditions as found on a certain location. They are most often presented as statistics, including seasonal variations, scatter tables, wind roses and probability of exceedance.
Minister	In this report, Minister means the Minister for Housing, Local Government and Heritage
Multibeam Echosounder (MBES)	An echosounder uses sound waves to measure water depth. A transducer mounted under a vessel emits a pulse which travels through the water to the seafloor and bounces back to a receiver. The time it takes for the signal to return is measured, and because the speed of sound through water is known, the water depth under the boat is measured. This is the basic principle of hydrography and seafloor mapping. A multibeam echosounder (MBES) measures multiple echoes at a time.
Offshore Wind Farm Area	Area where site investigations will take place to determine the suitability of that area for the installation of Wind Turbine Generators, Offshore Substation Platform and inter-array cabling.
Pollution Event	A 'pollution incident' includes a leak, spill or escape of a substance, or circumstances in which this is likely to occur.
Preliminary Campaign	Site Investigation surveys early in the project development programme designed to give an overview of the receiving environment with the aim of developing a first stage ground model.
Receiving Environment	The receiving environment is the environment upon which a proposed activity might have effects.
Side Scan Sonar (SSS)	Side-scan uses a sonar device that emits conical or fan-shaped pulses down toward the seafloor across a wide-angle perpendicular to the path of the sensor through the water, which may be towed from a surface vessel or submarine or mounted on the ship's hull.

Sub-Bottom Profiler	A sub-bottom profiler is a type of sonar system that produces a 2-dimensional stratigraphic cross section by using acoustic energy to image sub-surface features in an aquatic environment.
Universal Transverse Mercator (UTM)	The UTM (Universal Transverse Mercator) coordinate system divides the world into sixty north-south zones, each 6 degrees of longitude wide. UTM zones are numbered consecutively beginning with Zone 1 and progress eastward to Zone 19. UTM 29N (EPSG:32629) is used to map the project area.
Vibrocore	Vibrocore is a sediment sampling methodology for retrieving continuous, undisturbed cores. Vibrocorers can work in a variety of water depths and can retrieve core samples at different lengths depending on sediment lithology and project objectives.
Wave Buoy	Wave buoys are used to measure the movement of the water surface as a wave train. The wave train is analysed to determine wave characteristics such as the significant wave height and period, and wave direction.

EXECUTIVE SUMMARY

This report forms part of the Maritime Usage Licence (MUL) Application and includes information to inform a risk assessment for Annex IV species under Article 12 of the Habitats Directive (92/43/EEC). The report aims to support the application process and provide the necessary information to the competent authorities to assist them in making an informed decision on the likely impact of this project on Annex IV species.

All species of cetacean, including whales, dolphins and porpoises, are considered European Protected Species (EPS) under Annex IV of the Habitats Directive. Eight species of cetacean have been recorded off the east coast of Ireland and could potentially be present within the proposed site investigation activities MUL Application Area. In addition, the leatherback turtle (*Dermochelys coriacea*) and the Eurasian otter (*Lutra lutra*), which occur in Irish waters, are included.

Due to the short duration and temporary nature of the proposed activities and considering the mitigation measures outlined in this report, it is concluded that the Annex IV species whose ranges overlap with the MUL Application Area will not be significantly affected by the proposed site investigation activities.

1 INTRODUCTION

Bremore Ireland Port Designated Activity Company (BIPDAC) proposes to undertake marine surveys to investigate the feasibility of developing port infrastructure at Bremore in counties Dublin and Meath.

BIPDAC has prepared this report in support of an application for a Maritime Usage Licence under the Maritime Area Planning Act (2021) to undertake site investigation activities to determine the suitability of the site for the development of new deep-water, multi-modal energy port, supporting the construction and maintenance of offshore wind farms in the Irish and Celtic Seas. This development is crucial for Ireland to meet its 2030 decarbonisation targets and to manage the expected increase in maritime freight demand and port capacity requirements up to 2050. Additionally, the project will bring economic and social benefits to local coastal communities, fostering job creation and sustainable development. The project encapsulates Ireland's commitment to sustainable development and positions Bremore Port as a cornerstone of the nation's green and economic future.

BIPDAC intends to undertake a site investigation survey campaign in the Maritime Usage Licence Application Area to inform the location and design of the proposed port infrastructure. The site investigation works (SI) will include marine geophysical, geotechnical, environmental, metocean and archaeological surveys.

The Maritime Usage Licence (MUL) area (outlined in solid red line) includes the Potential Development Area (dashed red line). The total MUL area is 159.48 km², and the Potential Development Area is 4.21 km² (Figure 1-1). While geotechnical, archaeological and geophysical survey activities will be focussed in the Potential Development Area, the MUL area includes the wider Dundalk Bay sediment cell to ensure site investigation activities gather a sufficiently robust spatial coverage of marine environmental and metocean datasets (Figure 1-1).

1.1 AIM OF THE REPORT

This report is part of a Maritime Usage Licence Application and includes information to inform a risk assessment for Annex IV species under Article 12 of the Habitats Directive (92/43/EEC).

This report aims to support the application process and provide the necessary information to the competent authorities to assist them in making an informed decision on the likely impact of this project on Annex IV species.

1.2 STRUCTURE OF THE REPORT

This report is structured into the following chapters, to provide information relating to the proposed site investigation activities, the Annex IV species that can potentially occur in the proposed survey area, the potential impacts to Annex IV species and measures to ensure Annex IV species are protected. Specifically, the chapters describe or comprise the following elements:

- Chapter 1 (this chapter): Description of the proposed site investigation activities
- Chapter 2: Legislation and regulatory background
- Chapter 3: Identification of the Annex IV species that may be found on or near the Licence Area
- Chapter 4: Identification of potential impacts of the proposed site investigation activities
- Chapter 5: Risk Assessment for protection of Annex IV species under Article 12 of the Habitats Directive
- Chapter 6: Proposed mitigation measures
- Chapter 7: Conclusions

1.3 LICENCE AREA

The Licence Area covers a total area of 159.48 km² (Figure 1-1). The coordinates of the Licence Area are provided in the Assessment of Impacts on the Maritime Usage (AIMU) report which accompanies this Application.

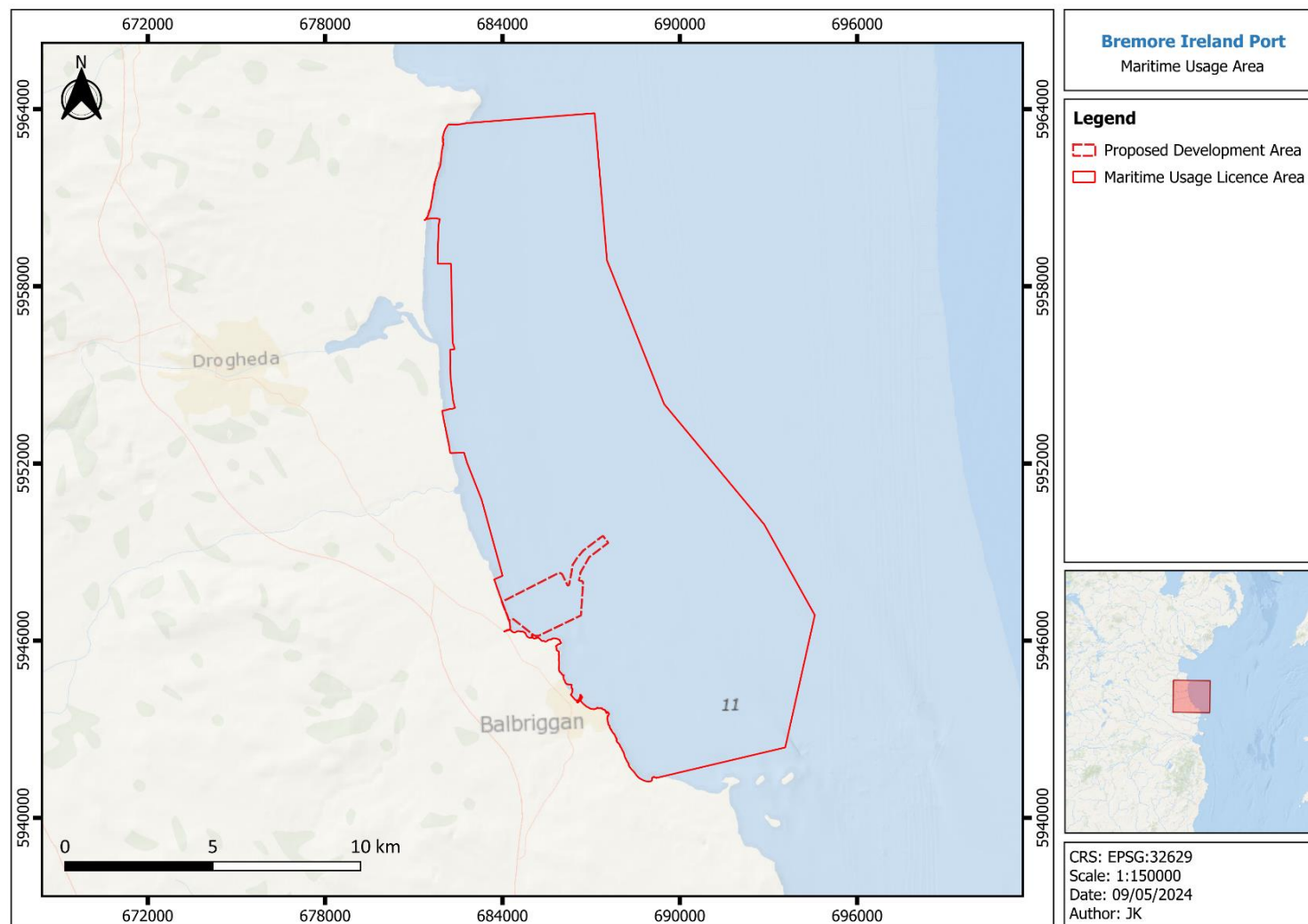


Figure 1-1 Bremore Ireland Port Maritime Usage Licence Area (solid red boundary) and the Proposed Development Area (dashed red boundary)

1.4 SITE INVESTIGATION WORKS

The objective of the proposed campaigns is to determine further the environmental conditions and seafloor and subsurface geological characteristics within the Licence Area.

The proposed programme of site investigations to be undertaken within the Licence Area is described in detail in the AIMU accompanying this Application.

The exact technical specifications of the equipment to be used will not be known until the survey contracts have been awarded. However, a description of typical equipment and expected survey parameters is provided in the AIMU.

All efforts will be made to follow survey recommendations outlined in the Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects Part 1 and 2 (DCCAE, April 2018), where the specific timeframes are indicated for the survey provision.

1.5 SURVEY SCHEDULE

The intention is to begin survey activities as soon as feasible in 2025 following licence award, with a phased programme of multiple survey campaigns to be undertaken over the duration of the licence. This phased approach will progress the overall development towards detailed design stage.

The exact mobilisation dates will not be known until the process of procuring a contractor is complete, but the approximate duration of each Site Investigation activity is provided in Table 2-3 in Section 2.2 of the AIMU document accompanying this application.

Timing of the site investigation activities is dependent on many factors including weather, tidal flows, availability of vessels and the grant of a licence. The granting of a licence will have a direct effect on the timing of site investigation activities.

2 LEGISLATION AND REGULATION

2.1 EUROPEAN PROTECTED SPECIES (EPS)

All species of cetacean (whales, dolphins and porpoises) occurring in European Union (EU) waters are considered European Protected Species (EPS) under Annex IV of the Habitats Directive (Council Directive 92/43/EEC). As directed by Article 12 of the Directive, species listed in Annex IV are considered species of community interest in need of strict protection across their entire natural range within the EU, both within and outside Natura 2000 sites. In addition to cetaceans, other EPS occurring in Irish waters are the Eurasian otter (*Lutra lutra*) and the leatherback turtle (*Dermochelys coriacea*).

The Habitats Directive has been transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No 477 of 2011). These consolidate the earlier European Communities (Natural Habitats) Regulations 1997 to 2005 and the European Communities (Birds and Natural Habitats) (Control of Recreational Activities) Regulations 2010.

These Regulations provide for the strict protection of Annex IV listed species, including all cetaceans, in their natural range. As such, it is an offence to:

- Deliberately capture or kill any specimen of these species in the wild;
- Deliberately disturb these species particularly during the period of breeding, rearing, hibernation and migration;
- Deliberately take or destroys eggs of those species from the wild;
- Damage or destroy a breeding site or resting place of such an animal; or
- Keep, transport, sell, exchange, offer for sale or offer for exchange any specimen of these species taken in the wild, other than those taken legally as referred to in Article 12(2) of the Habitats Directive.

'Deliberate' has been interpreted by the European Commission in its 2007 'Guidance document on the strict protection of animal species of community interest under the Habitats Directive 92/43/EEC', as

“‘Deliberate’ actions are to be understood as actions by a person who knows, in light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against a species, but intends this offence or, if not, consciously accepts the foreseeable results of his action”.

Therefore, anyone carrying out an activity which they should reasonably have known could cause injury as defined in the Regulations, could be committing an offence.

In Ireland, further protection is afforded to all cetaceans, as well as grey and harbour seals, the Eurasian otter and basking sharks under the Wildlife Act (1976) and its subsequent Amendments. Under the Wildlife Act and its amendments, it is an offence to hunt, injure or wilfully interfere with, disturb or destroy the resting or breeding place of a protected species (except in some instances under

licence or Ministerial permit). The Wildlife Act applies to waters within Ireland's Territorial Sea, i.e., out to the 12 nm limit from the baseline¹.

Please note, for the purposes of this assessment, grey and harbour seals and basking sharks are not included as they are not Annex IV species. Effects of the proposed site investigation activities on Natura 2000 sites where grey and/or harbour seals are designated features are considered in the Supporting Information for Screening for Appropriate Assessment (SISAA) document which accompanies this Licence Application. Effects of the proposed site investigation activities on basking sharks are considered in the AIMU document which accompanies this Licence Application.

Note that while all nine bat species resident in Ireland are protected under Annex IV of the Habitats Directive, with Leisler's bat (*Nyctalus leisleri*) and Nathusius' pipistrelle (*Pipistrellus nathusii*) known to have crossed open seas, no impacts on migration pathways of bats, or on bats themselves, from the proposed site investigation activities are envisaged and bats are not considered further in this assessment.

2.2 GUIDANCE

In 2007, the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG) produced a 'Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters' (NPWS, 2007). These were reviewed and amended in 2014 to produce 'Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters' (DAHG, 2014). This guidance aims to:

1. Give an understanding of selected sound sources introduced into the environment by specific human activities, which may impact detrimentally on protected marine mammal populations or individuals of those species,
2. Describe a structured, staged process for the informed assessment of risk and decision making with regard to such sources
3. Outline practical risk avoidance and/or risk reduction measures which must be considered in order to minimise the potential effects of sound sources on the natural ecology of marine mammal species

This DAHG (2014) guidance recommends that listed coastal and marine activities, including geophysical acoustic surveys, undergo a risk assessment for anthropogenic sound-related impacts on relevant protected marine mammal species to address any area-specific sensitivities, both in temporal and spatial extent, and to inform the consenting process. This document also sets out a generalised framework for the consideration of risk from particular sound-producing activities in the waters of Ireland's Exclusive Economic Zone (EEZ) and offers guidance for planning and risk management, where necessary. Additionally, 'The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area', published in 2010 by the JNCC, Natural England and the Countryside Council for Wales (now Natural

¹ The baseline is the low water mark from which the limit of the territorial seas is measured to (i.e. 12nm)

Resources Wales) (JNCC *et al.*, 2010), has been referenced in completing this assessment to complement the NPWS (2014) guidelines.

GDG understand the DAHG (2014) guidance is currently under review; any updated Irish government guidance published to replace the DAHG (2014) guidance by the time the proposed activities are to be undertaken will be considered during the proposed surveys.

3 ANNEX IV SPECIES IN THE VICINITY OF THE LICENCE AREA

Ireland has recorded 25 species of cetacean, all of which are recognised as protected species under the EU Habitats Directive and the Irish Wildlife Act 1976, as amended. Of these 25 species, eight - Common dolphin, Killer whale, Bottlenose dolphin, Harbour porpoise, Fin whale, Minke whale, Humpback whale and Risso's dolphin - have been recorded off the east coast and may be present in the proposed survey area at least on a seasonal basis (O'Brien *et al.*, 2009; Wall *et al.*, 2013, Ireland's Marine Atlas, 2021). Leatherback turtles have been observed in the past off the coast of counties Dublin, Meath and Louth (NPWS, 2019). Otter may also interact with coastal areas of the proposed Licence Area should they be present in any rivers within range of landfall areas.

Table 3-1 presents a short synopsis of the Annex IV species that may be found within or near the proposed Licence Area.

Table 3-1 Annex IV species that may be found within or near the Licence Area according to DAHG (2009) and Ireland's Marine Atlas (2021)

Species	Species Information
Harbour Porpoise (<i>Phocoena phocoena</i>)	Generally found in the northern latitudes of the Pacific and Atlantic oceans, mainly in the continental margins. They are the most widespread of any species in Ireland, observed in all inshore waters around the entire coastline and almost all records were within 10 km of the coast (Berrow <i>et al.</i> , 2010). The harbour porpoise is the smallest cetacean found in Irish waters and generally appears shy, avoiding other species and rarely interacting with boats, which can make observing it difficult in anything other than calm waters. Harbour porpoises are particularly abundant between Howth Head and Dalkey off Co. Dublin, where boat-based surveys conducted by IWDG produced the highest counts anywhere in Ireland (IWDG, 2022a; NPWS, 2022; 2019). More sightings were recorded in the summer months in Irish and Celtic waters (Rogan <i>et al.</i> , 2018). Harbour porpoises rarely occur over deep water but have been observed over relatively shallow (<200m) offshore banks (DAGH, 2009).
Common dolphin (<i>Delphinus delphis</i>)	Deemed the second most frequently reported species of cetacean after the harbour porpoise, and the most abundant of all cetacean species recorded in Ireland (Berrow <i>et al.</i> , 2010). Common dolphins occur in all Irish waters including offshore waters and the Irish Sea, but highest concentrations appear to occur off the south and west coasts (DAGH, 2009). There appears to be an eastward movement of this species along the south coast during autumn and winter, with sightings peaking off County Kerry towards late summer, off County Cork between September and January and off County Waterford between November and February (Berrow <i>et al.</i> , 2010).
Bottlenose dolphin (<i>Tursiops truncatus</i>)	A large, robust, and gregarious dolphin found in tropical and temperate waters worldwide (Wall <i>et al.</i> , 2013). In Ireland, bottlenose dolphin shows both a coastal and offshore distribution with most sighting records off the western seaboard and in the Celtic Sea, although it is also found in the Irish

Species	Species Information
	Sea and in waters along the edge of the continental shelf (DAGH, 2009). Resident or semi-resident populations are known from the Shannon Estuary, Tralee Bay, the Mayo coast and Cork Harbour. Results from a study by Mirimin <i>et al.</i> (2011) comparing bottlenose dolphin biopsies indicate that there is a degree of isolation of the Shannon Estuary population from animals encountered elsewhere around the coast, and that a larger pelagic population exists that is also genetically distinct from the Irish coastal populations.
Risso's dolphin (<i>Grampus griseus</i>)	In Ireland during the summer months Risso's dolphin favours inshore waters and offshore islands, especially The Saltee Islands off County Wexford, the County Cork coast and the Blasket Islands off County Kerry in contrast to deep-water habitats elsewhere in the world (IWDG, 2022b). According to Berrow <i>et al.</i> (2010), most sightings occur between May and July suggesting a late spring inshore movement. Although Risso's dolphins have been reported off all coasts in Ireland, their distribution is more clustered with regular sightings inshore off the northwest and southeast coasts, with most records of Risso's dolphins in the UK and Ireland being within 11 km of the coast (DAGH, 2009). Risso's dolphin were reported regularly in the Irish sea, with counties Wicklow and Wexford accounting for 41% of all inshore Risso's dolphin sightings (Berrow <i>et al.</i> 2010). Higher sightings of the Risso's dolphin were recorded in the Irish Sea during the summer months (Rogan <i>et al.</i> , 2018).
Killer whale (<i>Orcinus orca</i>)	Killer whales are the largest delphinid growing up to 9.5m. They are easily identified with striking coloration and large dorsal fins, particularly in the adult males. They are the most widely distributed cetacean in the world (Shirihai & Jarrett, 2006), and have been recorded off all Irish coasts in all seasons, with markedly fewer sightings in the Irish Sea (Wall <i>et al.</i> , 2013), but mainly in shallow continental shelf waters (DAGH, 2009). Photo identification has linked killer whales sighted off Ireland with the "West Coast Community" resident off Scotland (Berrow <i>et al.</i> , 2010).
Minke whale (<i>Balaenoptera acutorostrata</i>)	The minke whale is the most common and widely distributed of the baleen whales in Ireland and the most likely to be encountered in shallow waters. It occurs off all coasts, including the Irish Sea, but most records are from southern and southwestern coastal waters. The species has also been observed over offshore banks (DAGH, 2009). The smallest of the baleen whales, their length averages 8.5 metres. Usually encountered singly or in small groups, sightings are most frequent off the Irish coast in spring and autumn (Wall <i>et al.</i> , 2013).
Fin whale (<i>Balaenoptera physalus</i>)	Growing up to 24m, Fin whales are the second-largest animal in the world after the blue whale (<i>Balaenoptera musculus</i>) and the largest baleen whale likely to be present close to shore off Ireland. The Fin whale has a worldwide distribution in mainly temperate and polar sea (Shirihai & Jarrett, 2006). In Irish waters, nearshore sightings cluster to the south and southwest of the country with peaks in the number of animals in the autumn and early winter (DAGH, 2009), but they are also well-represented off the shelf edge in deeper waters (Wall <i>et al.</i> , 2013).

Species	Species Information
Humpback whale (<i>Megaptera novaeangliae</i>)	The Humpback whale is a global species found in all the major ocean basins. In Ireland, Humpback whales have been recorded in small numbers close inshore mainly off the south and southwest coasts, although all coasts are represented, including the Irish Sea; However, records offshore are relatively scarce (DAGH, 2009). Sightings of the iconic humpback have increased recently in Irish waters, with the Irish photo-ID catalogue of unique humpback whale sightings currently comprised of 92 animals (IWDG, 2022c).
Leatherback turtle (<i>Dermochelys coriacea</i>)	<p>The leatherback turtle (<i>Dermochelys coriacea</i>) is the most widely distributed living reptile species, being found in all oceans except the Southern Ocean. Within the North Atlantic its range extends from the tropics to the high latitudes of Newfoundland right across to Europe's north-easterly fringe. It is a widely roaming species, with individuals making extensive pan-oceanic movements. Breeding is confined to warm tropical regions because of thermal constraints on egg incubation, but the species has many unique anatomical and physiological adaptations that permit it, unlike other marine turtles, to forage seasonally into cooler temperate waters. Consequently, leatherback populations have a very dynamic range. During the summer months their range is at its greatest extent with individuals located throughout the North Atlantic, whereas during the winter months their range is restricted to areas where the sea surface temperature is >15°C. (NPWS, 2019)</p> <p>Recent studies have shown that after nesting in the tropics the majority of North Atlantic leatherbacks head north towards cooler temperate waters. Some of these individuals head north towards the north-east Atlantic and Irish waters where they forage on jellyfish for the summer months before turning south again in the autumn as water temperatures decline (NPWS, 2019). They are generally spotted off the south and southwest coasts of Ireland during the summer months, with live sightings peaking in August (NPWS, 2019; OSPAR, 2009; King and Berrow, 2009; Doyle <i>et al.</i>, 2007). They have also been spotted in recent years off the coast of Wicklow.</p>
Eurasian otter (<i>Lutra lutra</i>)	The otter is a semi-aquatic mammal, which occurs in a wide variety of aquatic habitats such as rivers, streams, lakes, estuaries and on the coast. Coastal dwelling populations use shallow, inshore marine areas for feeding but they also require access to fresh water for bathing and terrestrial areas for resting and breeding, therefore their foraging range in the marine environment is limited to coastal areas. In Ireland, the territory of female otters is 6.5 ± 1.0 km in coastal environments (de Jongh <i>et al.</i> 2010) and males may have a larger extent; it has been suggested that the otter's range is approximately 12 km along the coast and 80 m seaward from the coast (NWPS, 2015; NPWS, <i>Lutra lutra</i> (1355) Conservation Status Assessment Report). Under water, hearing sensitivity is significantly reduced when compared to sea lions and other pinniped species, demonstrating that otter hearing is primarily adapted to receive airborne sounds (Ghoul <i>et al.</i> , 2014).

Although not considered specifically in this assessment due to their lower likelihood of occurrence, any assessment of, or mitigation measures put in place for, the species assessed here are considered to be appropriate for other less commonly occurring species.

4 POTENTIAL IMPACTS

The following are the potential impacts that have been identified, given the nature of the site investigation activities proposed under this application:

- Disturbance from vibration and underwater noise associated with surveys.
- Injury due to collision with survey vessels/sampling equipment.
- Pollution event causing harm to Annex IV species.

4.1 DISTURBANCE FROM VIBRATION AND UNDERWATER NOISE ASSOCIATED WITH SURVEYS

Geophysical surveys in the marine environment are a potential source of anthropogenic sound and therefore may have an impact on the marine environment. The level of environmental impact associated with this acoustic activity is variable depending on several factors including the type of equipment being used, its sound signal and propagation characteristics, and the depth in which it is operating (DAHG, 2014).

Cetaceans have evolved to use sound as an important aid in navigation, communication, and hunting (Richardson *et al.*, 1995). It is widely accepted that the main environmental concern relating to marine mammals is the potential effects of anthropogenic underwater noise/sound (see Nowacek *et al.*, 2007 for review). Such exposure can induce a range of effects on marine mammals: physical effects may include a temporary reduction in hearing sensitivity (Temporary Threshold Shift - TTS) which is reversible over time; or following intense noise exposure, Permanent Threshold Shift (PTS). Other impacts include masking of biologically important noises by anthropogenic noise (perceptual impacts); behavioural changes such as displacement from feeding, resting, or breeding grounds; and stress (Southall *et al.*, 2007; 2019; DAHG, 2014).

Acoustic instruments and equipment used in targeted marine geophysical investigations produce sound at frequencies within the hearing range of marine mammals (Nowacek *et al.*, 2007). In order to evaluate the potential of the proposed survey equipment to cause harm to marine mammals, an assessment has been conducted using the approach described in Southall *et al.* (2007), in line with the current guidance from DAHG (2014). The Southall *et al.* (2007) noise exposure criteria have been updated by the US National Marine Fisheries Service (NMFS, 2016; NMFS, 2018) and Southall *et al.* (2019). It should be noted here that the NMFS (2018) / Southall *et al.* (2019) weightings and criteria are similar to those of Southall *et al.* (2007), although the naming of the hearing groups differs. In line with the current guidance from DAHG (2014), the criteria from the Southall *et al.* (2007) have been used in this report.

Southall *et al.* (2007) separated marine mammals into groups based on their functional hearing, namely low-frequency cetaceans, mid-frequency cetaceans, high-frequency cetaceans, pinnipeds in water and pinnipeds in air. For each of these groups sound pressure levels that would result in injury (PTS or TTS) were proposed for individuals exposed to single, multiple and non-pulsed sources (Table

4-1). The Southall et al. (2019) criteria are also presented in Table 4-2 for reference only. For the purposes of this assessment, pinnipeds are not assessed as they are not Annex IV species.

Table 4-1 Sound Pressure Level (SPL) injury criteria proposed by Southall et al. (2007), for individual cetacean categories exposed to discrete noise events, Ghoul & Reichmuth (2014).

Marine Mammal group	Injury Criteria	
	TTS	PTS
Low-Frequency Cetaceans (Baleen whales)	224dB re: 1μPa (peak)	230dB re: 1μPa (peak)
Mid-Frequency Cetaceans (including Bottlenose dolphins)	224dB re: 1μPa (peak)	230dB re: 1μPa (peak)
High Frequency Cetaceans (including harbour porpoise)	224dB re: 1μPa (peak)	230dB re: 1μPa (peak)
Sea otter (in water) (proxy for Eurasian otter)	212dB re: 1μPa (peak)	218 dB re: 1μPa (peak)

Table 4-2 Sound Pressure Level (SPL) injury criteria proposed by Southall et al. (2019), for individual marine mammals exposed to discrete noise events.

Marine Mammal group	Injury Criteria	
	TTS	PTS
Low-Frequency Cetaceans (LF) (Baleen whales)	213dB re: 1μPa (peak)	219dB re: 1μPa (peak)
High-frequency cetaceans (HF) (including Bottlenose dolphins)	224dB re: 1μPa (peak)	230dB re: 1μPa (peak)
Very-high Frequency Cetaceans (VHF) (including harbour porpoise)	196dB re: 1μPa (peak)	202dB re: 1μPa (peak)

The following auditory band widths for marine mammals which may be present in the vicinity of the Licence Area are from Southall *et al.* (2007), as cited in the current DAHG (2014) guidance, are shown in Table 4-3. Leatherback turtle are known to hear in the very low frequency range, with a range of 50 - 1200 Hz with maximum sensitivity between 100-400 Hz in water (Piniak *et al.*, 2012).

Table 4-3 Underwater Auditory Band Width for Marine Mammal Species (Southall et al., 2007) and Leatherback turtle (Piniak et al, 2012)

Frequency	Marine Mammal/Species	Estimated Auditory Band Width (kHz)
Low Frequency Cetaceans	Baleen whales (Minke whale, Humpback whale)	0.007 - 22
Mid Frequency Cetaceans	Most toothed whales and dolphins (including Common & Risso's Dolphin)	0.15 - 160
High Frequency Cetaceans	Certain toothed whales and porpoises (including Harbour porpoise)	0.2 - 180
Low Frequency Pinnipeds in water	Grey seal & harbour seal	0.075 - 75
Low Frequency	Sea otter	0.125-38
Very Low Frequency	Leatherback turtle	0.05 – 1.2

Noise characteristics of the proposed survey activities are detailed in Table 4-4 below.

Table 4-4 Noise sources during site investigation activities

Survey technique	Operating frequency (kHz)	Estimated sound level at 1m over frequency band Sound pressure level	Typical length of towed equipment	Source/ Reference	Indicative Equipment Specification
Side-scan sonar (SSS)	300-500 (low) 500-900 (high)	220-230 dB re 1µPa	<300 m from vessel	EdgeTech (2021) and IWDG (2007)	EdgeTech 4205
Multi-beam Echosounder (MBES)	211	198 re 1µPa @1m	Hull- or Pole-mounted	Kongsberg (2022)	Kongsberg EM2040
Sub Bottom Profiler (Parametric Pinger)	85 - 115	232 Source Level rms (dB re 1 µPa @ 1m)	Pole-mounted, or Equipment mounted	CSA (2020)	Innomar "Standard" Sub-Bottom Profiler
Sub Bottom Profiler (Sparker)	0.4-5 kHz	203 dB	Towed	CSA (2020)	Geomarine, Geo-source or similar dual 400 tip sparker (<800J)
Sub Bottom Profiler (Boomer)	0.1-5	205 (SLrms (dB re 1 µPa m)	Towed	CSA (2020)	AA, triple plate S-Boom (700-1,000 J) ³

Survey technique	Operating frequency (kHz)	Estimated sound level at 1m over frequency band Sound pressure level	Typical length of towed equipment	Source/ Reference	Indicative Equipment Specification
		211 SL _{0-pk} (dB re 1 µPa m)			
Sub Bottom Imager (SBI)	4.5 – 12.5 kHz	190dB re 1µPa @1m	Pole mounted from a vessel or ROV mounted	Kraken Robotics	Kraken Robotics Sub Bottom Imager
Vessel noise	0.05 – 0.3	160 – 175 dB re 1µPa @ 1m	-	Southall et al., 2007	-
Geotechnical Drilling (Rotary)	(0.041 – 0.045kHz) ¹ (0.028 – 0.120kHz) ²	160 dB	-	¹ (Long-Fei. H, 2023) ² (SubAcousTech, 2021)	-

Comparing the data on Annex IV species auditory band width (Table 4-3) and the noise characteristics of the surveys (Table 4-4) it is deemed that the following will be audible to marine mammals, otter and leatherback turtle:

- Sub Bottom Profiler (Sparker)
- Sub Bottom Profiler (Parametric Pinger)
- Sub Bottom Profiler – Boomer (SBP)
- Sub Bottom Imager (SBI)
- Vessel noise
- Geotechnical Drilling (including seismic CPTs)

The survey types which emit noise within the audible band width for marine mammals, otter and leatherback turtle are presented in Table 4-5.

Table 4-5 Annex IV species auditory band width and relevant surveys; marine mammals known in the area are also listed.

Frequency	Marine Mammal/Species	Estimated Auditory Band Width (kHz)	Audible Survey
Low Frequency Cetaceans	Baleen whales (Minke whale, Humpback whale)	0.007 - 22	SBP, SBI, Vessel noise, Geotechnical Drilling (Including Seismic CPTs)
Mid Frequency Cetaceans	Most toothed whales and dolphins (including Common & Risso's Dolphin)	0.15 - 160	SBP, SBI, Vessel noise, Geotechnical Drilling (Including Seismic CPTs)
High Frequency Cetaceans	Certain toothed whales and porpoises (including Harbour porpoise)	0.2 - 180	SBP, SBI, Vessel noise, Geotechnical Drilling (Including Seismic CPTs)

Frequency	Marine Mammal/Species	Estimated Auditory Band Width (kHz)	Audible Survey
Low Frequency	Sea otter	0.125-38	SBP, SBI, Vessel noise, Geotechnical Drilling (Including Seismic CPTs)
Very low frequency	Leatherback turtle	0.05 – 1.2	SBP, Vessel noise, Geotechnical Drilling (Including Seismic CPTs)

4.2 INJURY DUE TO COLLISION (SURVEY VESSELS/SAMPLING EQUIPMENT)

There is a risk of collision between marine mammals and survey vessels. However, it is largely recognised that the key factor contributing to collision between marine mammals and vessels is speed (see Schoeman *et al.*, 2020 for review). Injuries to marine mammals from vessel strikes are species-dependent but are generally more severe at higher impact speeds, with ships travelling at 14 knots or faster being the most likely to cause lethal or serious injuries (Wang *et al.*, 2007).

4.3 POLLUTION EVENT

Proposed site investigation activities will result in a temporary increase in vessels using the area, which would therefore theoretically increase the risk of accidents and resultant fuel spills.

5 RISK ASSESSMENT FOR THE PROTECTION OF ANNEX IV SPECIES UNDER ARTICLE 12 OF THE HABITATS DIRECTIVE

The purpose of this section is to examine the possible impacts of the proposed activities on those Annex IV species identified as having the potential to be present in the area, and identify protective measures aimed at reducing any impact to these species.

5.1 IDENTIFICATION OF RELEVANT ANNEX IV SPECIES

The following Annex IV species have been identified as having the potential to be present in the area:

- Harbour porpoise
- Common dolphin
- Bottlenose dolphin
- Fin whale
- Minke whale
- Humpback whale
- Killer whale
- Risso's dolphin
- Leatherback turtle
- Otter

5.2 IMPACT ASSESSMENT

The species listed above may be impacted by disturbance from underwater noise associated with surveys and through injury due to collision with survey vessels/sampling equipment.

Noise emitted by SBP equipment can be detected by some of the Annex IV species, with the potential for TTS onset in individuals near the sound source. This could cause localised short-term behavioural impacts such as temporary avoidance. However, injury effects are not anticipated, as an animal would need to remain in the highly localised zone of ensonification for a prolonged period, which is unlikely (JNCC *et al.*, 2010; JNCC, 2020). Thomson *et al.* (2013) suggest that short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises.

Geotechnical drilling and shipping noise are categorised as a non-impulsive, non-pulsed, or continuous noise sources. Nedwell and Brooker (2008) took a series of measurements of the underwater noise during underwater pin pile drilling operations as part of the installation of the SeaGen tidal turbine device in Strangford Lough, Northern Ireland. These recordings were made at ranges of 28 m to 2 km from the drilling operation and indicated a source SPL of 162 dB re 1 μ Pa @ 1 m, which is comparable to the proposed geotechnical survey work (see Table 4-4). Their results indicate that the perceived noise levels fall below background noise levels a few hundred metres from the drilling operation and that the noise emitted did not exceed the 90 dB_{ht} level (Table 4-4) at any measured range. For harbour

porpoise (*Phocoena phocoena*), the most noise-sensitive of the Annex IV Species identified for this assessment, the data indicate that perceived levels of background noise were generally higher than perceived levels of drilling noise, with drilling noise only occasionally increasing above minimum background noise levels. The most frequent level of perceived drilling noise was at 62 dB_{ht} for *Phocoena phocoena*, below the threshold for significant avoidance reaction.

Depending on what frequency is used, the Sub Bottom Profiler (Parametric Pinger) may emit noise in an audible frequency for marine mammals which can reach a SPL which could cause TTS and PTS injury according to the SPL injury criteria proposed by Southall et al. 2007, and 2019.

Sparker and Boomer SBP systems may emit noise in an audible frequency for marine mammals which could cause TTS injury to seals and otters according to the SPL injury criteria proposed by Southall et al. 2007. None of the other proposed site investigation activities emit noise in an audible frequency for marine mammals which can reach a Sound Pressure Level which could cause injury to marine mammals.

Continuous audible noise from drilling may cause disturbance to marine mammals.

Therefore, Annex IV Species are considered likely to be disturbed by noise emitted by the proposed site investigation activities prior to mitigation being implemented.

There is a risk of injury to Annex IV species in the Licence Area through collision with survey vessels and/or equipment. These vessels will be moving at slow speeds, in a predefined trajectory, while engaged in the survey activities, allowing for animals to predict movement of the vessels and avoid collisions. During transit times, the survey vessels will be travelling at speeds greater than 5 knots. However, these movements are not considered to deviate from normal vessel traffic in the Licence Area. Annex IV species in the area are exposed to marine traffic on a regular basis and should therefore be accustomed to vessel movements. The limited number of vessels that will be required for these surveys will not significantly increase vessel traffic in the area. Collisions between survey vessels and Annex IV species are unlikely and there is no likely risk of significant effects to any of the species considered.

The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78, MARPOL is short for maritime pollution and 73/78 short for the years 1973 and 1978) is one of the most important international marine environmental conventions. It aims to prevent both operational and accidental discharge into the marine from sea going vessels. Ireland ratified the various elements of the MARPOL Convention through the Sea Pollution Act 1991, the Sea Pollution (Amendment) Act 1999 and the Sea Pollution (Miscellaneous Provisions) Act 2006. It was given further legal effect through several Statutory Instruments under these Acts. The Acts place a legal obligation upon operators of vessels to implement measures to prevent both operational and accidental discharges from ships of substances, which may damage the marine environment as well as human health.

While the site investigation activities will result in a temporary increase in vessels using the area, which would therefore theoretically increase the risk of accidents and resultant fuel spills, in light of the legal obligations outlined above, an incidence of pollution, whether from operational activities or from an accidental occurrence, is considered not likely.

All vessels used during the survey campaign shall, as required by law, be MARPOL compliant and fully certified by the Maritime Safety Office. This is standard practice for all survey activities irrespective of the survey operator and as it is required by law is built into the survey design. Therefore, it is considered not likely that there would be any occurrence of a pollution event either accidental or otherwise that could directly or indirectly affect any Annex IV Species. It is not considered further as an impact to Annex IV species in this report.

It is considered that standard mitigation measures, such as pre-works survey and soft start as detailed in the DAHG (2014) guidance, will prevent individual animals from suffering physical or auditory injury. Protection measures proposed in relation to these surveys are outlined in the section 0 below.

6 PROTECTION MEASURES TO PREVENT HARM TO ANNEX IV SPECIES

In line with current Irish best practice guidelines ‘Guidance to manage the risk to marine mammals from man-made sound sources in Irish waters’ (DAHG, 2014), which will be incorporated into the standard operating procedures of the proposed survey works, and international best practice, the measures detailed in sections 6.1 – 6.8 below will be applied to, where possible, prevent and, if not, reduce injury and disturbance to Annex IV species during all noise emitting site investigation activities which may cause disturbance to marine mammals.

While the measures outlined below are not specifically aimed at leatherback turtle, the mitigation proposed for cetacean species, in particular the soft-start procedure, will also be relevant to leatherback turtles, who have a small maximum sensitivity range for sound detection (100 - 400 Hz in water, Piniak *et al*, 2012).

6.1 MARINE MAMMAL MONITORING

A qualified and experienced Marine Mammal Observer (MMO) will be appointed to monitor for marine mammals and to log all relevant events using standardised data forms provided in the DAHG 2014 guidance. During daylight hours the MMO(s) will carry out visual observations and during hours of darkness the MMO(s) will carry out Passive Acoustic Monitoring (PAM) to monitor for the presence of marine mammals before the soft start commences and will recommend delays in the commencement of the site investigations should any species be detected within the relevant monitored zone.

6.2 PRE-START MONITORING

Marine Mammal monitoring will be conducted for a pre-soft start search of 30 minutes i.e., prior to the commencement of noise emitting site investigation activities which may cause disturbance to marine mammals. This will involve a visual observation (during daylight hours) or acoustic monitoring (during hours of darkness) to determine if any marine mammals are within the relevant zone of the activities.

6.3 MONITORED ZONE

Should any Annex IV marine mammal species be detected within a radial distance of the relevant zone of the survey vessel, commencement of site investigation activities will be delayed until their passage, or the transit of the vessel, results in the cetaceans being of sufficient distance from the vessel. In both cases, there will be a 30-minute delay from the time of the last sighting / acoustic detection within the relevant zone of the survey vessel to the commencement / recommencement of the operations. The MMO will use a distance measuring stick or reticule binoculars to ascertain distances to Annex IV marine mammals. Note: once started, site investigations will not cease should marine mammals approach the survey vessel.

6.4 SOFT START

A soft start is the gradual ramping of power over a set period of time, to give any Annex IV species adequate time to leave the area.

Once the soft start commences, there is no requirement to halt or discontinue the procedure at night-time, if weather or visibility conditions deteriorate, or if Annex IV marine mammal species enter the monitored zone.

In commencing a seismic survey operation, including any testing of seismic sound sources, where the output peak sound pressure level exceeds 170 dB re: 1µPa @1m, the following ramp up procedure will be undertaken:

- a) Energy output will commence from a low energy start-up and be allowed to gradually build up to the necessary maximum output over a period of 20-40 minutes (the exact time period will be dependent on survey parameters and equipment and will be designed in consultation with an experienced marine ecologist).
- b) This controlled build-up of energy output will occur in consistent stages to provide a steady and gradual increase over the ramp-up period.
- c) If marine mammals enter or are detected within the monitored zone while the ramp-up procedure is under way but incomplete, the energy output will not be increased until the marine mammals are no longer within the monitored zone.

6.5 LINE CHANGES

Where the duration of a survey line or station change is greater than 40 minutes, the activity will, on completion of the line/station being surveyed, either cease (i.e., shut down) or preferably undergo a reduction in energy output to a lower state where the peak sound pressure level from any operating source is ≤ 170 dB re 1 µPa @ 1 m. Prior to the start of the next line/station, if the power was shut down, all pre-survey monitoring measures and soft start procedures will be followed as for start-up. If there has been a reduction in power, a soft start will be undertaken gradually from the lower output level. The latter sound reduction measure will be applied to line changes at night-time or in daytime conditions of poor visibility. Where the duration of a survey line/station change is less than 40 minutes the activity will continue as normal (i.e. under full output).

6.6 BREAKS IN THE SURVEY PERIODS

If there is a break in sound output from survey equipment for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line/station change) then all pre-start monitoring measures and ramp-up procedures will recommence prior to re-starting.

6.7 REPORTING

All recordings of Annex IV marine mammal species will be made using standardised data forms provided by the NPWS. Full reporting on operations and mitigation will be provided to the NPWS to facilitate reporting under Article 17 of the EC Habitats Directive and future improvements to guidance (DAHG, 2014). The report will also include feedback on how successful the measures were. This requirement will be communicated to the MMOs at project start up meetings and at crew change.

6.8 SURVEY VESSELS SPEED AND COURSE

The project survey vessels will be moving at a maximum speed of approximately 5 knots during surveys to allow marine mammal species to move away from the vessel should they be disturbed by the vessel presence or noise emissions. During transit times, the survey vessels will be travelling at speeds greater than 5 knots. However, these movements are not considered to deviate from normal vessel traffic in the Licence Area. Should an Annex IV species be found to be in the direct path of a survey vessel, during or outside of survey times, the survey vessel will slow down or, if possible, alter course to avoid collision.

7 CONCLUSION

The proposed activities will be short in duration and of a temporary nature. The mitigation measures outlined above will ensure that the proposed site investigation activities will not have a significant effect on the species considered in this report.

Therefore, it can be concluded that the proposed site investigation activities will not result in the committing of any offence under Article 12 of the Habitats Directive towards any of the species listed in Annex IV of the Habitats Directive that are likely to occur within the site and have been considered in this report.

8 REFERENCES

Berrow, S.D., Whooley, P., O’Connell, M. and Wall, D. (2010). Irish Cetacean Review (2000-2009). Irish Whale and Dolphin Group, 60pp.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. OJ L 206, 22.7.1992, p. 7–50. Available online at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

DAHG (2014). Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters. Available from https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf [Retrieved 15/09/2021]

DAHG (2009). Conservation Plan for Cetaceans in Irish Waters. December 2009. Prepared by the National Parks and Wildlife Service of the DAHG.

DAHG (2007). Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters. Available from <https://www.iwdg.ie/downloads/AcousticSurveys.pdf> [Retrieved 15/09/2021]

Doyle, T.K. (2007). *Leatherback Sea Turtles (Dermochelys coriacea) in Irish waters*. Irish Wildlife Manuals, No. 32. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Dow Piniak, W. E., Eckert, S. A., Harms, C. A. and Stringer, E. M. (2012). Underwater hearing sensitivity of the leatherback sea turtle (*Dermochelys coriacea*): Assessing the potential effect of anthropogenic noise. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. OCS Study BOEM 2012-01156. 35pp.

Ghoul, A., & Reichmuth, C. (2014). Hearing in the sea otter (*Enhydra lutris*): Auditory profiles for an amphibious marine carnivore. *Journal of Comparative Physiology A: Neuroethology, Sensory, Neural, and Behavioral Physiology*, 200(11), 967-981. <https://doi.org/10.1007/s00359-014-0943-x>

Hammond, P.S., McLeod, K., Scheidat M. (2006). SCANS II estimates of abundances. Available at: <http://biology.st-andrews.ac.uk/scans2/inner-furtherInfo.html>

Hammond, P.S., McLeod, K., Gillespie, D., Swift, R. and Winship, A. (2010). Cetacean Offshore Distribution and Abundance in the European Atlantic (CODA). Sea Mammal Research Unit, Gatty Marine Laboratory, University of St. Andrews, St. Andrews, Fife, KY16 2LB UK.

Ireland’s Marine Atlas (2021). Species distribution data accessed through Ireland’s Marine Atlas at <http://atlas.marine.ie/> [Accessed 16/11/2022]

IWDG (2022a). *Harbour porpoise species information page*. <https://iwdg.ie/harbour-porpoise/#> [Consulted 16/11/2022]

IWDG (2022b). *Risso's dolphin species information page*. <https://iwdg.ie/rissos-dolphin/> [Consulted 16/11/2022]

IWDG (2022c). *Humpback whale species information page*. <https://iwdg.ie/humpback-whale/> [Consulted 16/11/2022]

King, G.L. and Berrow, S.D. (2009). *Marine Turtles in Irish waters*. The Irish Naturalists' Journal 30: 1-30.

JNCC, NE and CCW (2010). The protection of marine EPS from injury and disturbance. Guidance for the marine area in England and Wales and the UK offshore marine area.

JNCC (2020). Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). JNCC Report No. 654, JNCC, Peterborough, ISSN 0963-8091.

Long-Fei, H, e. a., 2023. Underwater Noise Characteristics of Offshore Exploratory Drilling and its Impact on Marine Mammals. *Frontiers in Marine Science*, Volume 10.

Lysaght, L and Marnell, F. (Eds) (2016) Atlas of Mammals in Ireland 2010-2015, National Biodiversity Data Centre, Waterford pp 120-172

Mirimin, L., Miller, R. & Dillane, E. & Berrow, Simon & Ingram, Simon & Cross, Tom & Rogan, E. (2011). Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters. *Animal Conservation*. 14. 342 - 353. 10.1111/j.1469-1795.2010.00432.x.

Nedwell, J.R. and Brooker, A.G. (2008). Measurement and assessment of background underwater noise and its comparison with noise from pin pile drilling operations during installation of the SeaGen tidal turbine device, Strangford Lough. Subacoustech Report No. 724R0120 to COWRIE Ltd.

Nedwell, J.R., Turnpenny, A.W.H., Lovell, J., Parvin, S.J., Workman, R., Spinks, J.A.L., and Howell, D. (2007). A validation of the dB_{ht} as a measure of the behavioural and auditory effects of underwater noise. Subacoustech Report No: 534R1231, October 2007, To: Chevron Ltd, TotalFinaElf Exploration UK PLC, Shell UK, ITF, JNCC, UK MoD.

NOAA (2016). Ocean Noise Strategy Roadmap. <https://cetsound.noaa.gov/road-map>

Nowacek, D.B., Thorne, L.H., Johnston, D.W., and Tyack, P.L. (2007). Response of cetaceans to anthropogenic noise. *Mammal Review* 37 (2): 81-115.

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Conservation Status in Ireland of Habitats and Species listed on the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC.

NPWS (2022). *Harbour Porpoise Information Page*. <https://www.npws.ie/marine/marine-species/harbour-porpoise> [Consulted 21/11/2022]

O'Brien, J., Berrrow, S., McGrath, D., Evans, P., (2009). Cetaceans in Irish Waters: A Review of Recent Research. *Biology and Environment: Proceedings of the Royal Irish Academy*, vol 109B, No. 2. pp. 63-88.

OSPAR (2009). Background Document for Leatherback turtle (*Dermochelys coriacea*). Biodiversity Series. Available online from <https://www.ospar.org/documents> [Retrieved 21/02/2022]

Piniak *et al* (2012), Dow Piniak W. E., Eckert, S. A., Harms, C. A. and Stringer, E. M. 2012. Underwater hearing sensitivity of the leatherback sea turtle (*Dermochelys coriacea*): Assessing the potential effect of anthropogenic noise. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Herndon, VA. OCS Study BOEM 2012-01156. 35pp

Richardson, W.J.; Greene Jr., C.R.; Malme, C.I.; Thomson, D.H. (1995). *Marine mammals and noise*. Academic Press: San Diego. ISBN 0-12-588441-9

E. Rogan, P. Breen, Mick Mackey, Ana Cañadas, M. Scheidat, S.C.V. Geelhoed, Mark Jessopp, Aerial surveys of cetaceans and seabirds in Irish waters: occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin Ireland. 297pp.

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011. <http://www.irishstatutebook.ie/eli/2011/si/477/made/en/print>

Schoeman R.P., Patterson-Abrolat C. and Plön S. (2020) A Global Review of Vessel Collisions With Marine Animals. *Front. Mar. Sci.* 7:292. doi: 10.3389/fmars.2020.00292

Shirihai, Hadoram & Jarrett, Brett (2006). *Whales, Dolphins and Seals: a field guide to the marine mammals of the world*. Bloomsbury Publishing, London.

SNCB (2017). Joint SNCB Interim Displacement Advice Note. Statutory Nature Conservation Bodies: Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs (Northern Ireland), Natural England, Scottish Natural Heritage and Joint Nature Conservation Committee (UK).

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene., C. R. Jr., Kastak, D., Ketten, D. R., Miller, J. H., Nachtigall, P. E., Richardson, W. J., Thomas, J. A., and Tyack, P. L. (2007). Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33(4): 411-521.

Southall, Brandon, Finneran, James, Reichmuth, Colleen, Nachtigall, Paul, Ketten, Darlene, Bowles, Ann, Ellison, William, Nowacek, Douglas, Tyack, Peter (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals*. 45. 125-232. 10.1578/AM.45.2.2019.125.

Thompson, P.M., Brookes, K.L., Graham, I.M., Barton, T.R., Needham, K., Bradbury, G. and Merchant, N.D. (2013). Short-term disturbance by a commercial two-dimensional seismic survey does not lead to long-term displacement of harbour porpoises. *Proceedings of the Royal Society B* 280: 20132001.

Wall D., Murray C., O'Brien J., Kavanagh L., Wilson C., Ryan C., Glanville B., Williams D., Enlander I., O'Connor I., McGrath D., Whooley P. and Berrow S. (2013). Atlas of the distribution and relative abundance of marine mammals in Irish offshore waters 2005 - 2011. Irish Whale and Dolphin Group, Merchants Quay, Kilrush, Co Clare.

Wang, C., Lyons, S. B., Corbett, J. J., and Firestone, J. (2007). Using Ship Speed and Mass to Describe Potential Collision Severity with Whales: An Application of the Ship Traffic, Energy and Environment Model (STEEM) [Report by the University of Delaware].

A world map with a light gray background. Black dots are placed on the map to indicate the locations of 25 research sites. The dots are distributed across North America (USA, Canada), South America (Brazil, Argentina), Europe (UK, France, Germany, Italy, Spain, etc.), Africa (North, Central, and South), Asia (India, China, etc.), and Australia.

10. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 10, 1271-1276.

11

■■■■■■■■■■

████████████████████

© 2006 The Authors

□ ☐ ☐

