DEPARTMENT OF THE ENVIRONMENT, CLIMATE AND COMMUNICATIONS

Irish Offshore Strategic Environment Assessment 6

Natura Impact Statement

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Natura Impact Statement

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GLOSSARY

AA
Appropriate Assessment

AIS
Automatic Identification System

BEIS
Business, Energy and Industrial Strategy

BOP
Blow out Preventer

CEMP
Construction Environmental Management Plan

CTS
Cuttings Transport System

DAHG
Department of Arts, Heritage and the Gaeltacht

DCENR
Department of Communications, Energy and Natural Resources

DECC
Department of Environment, Climate and Communications

DHLGH
Department of Housing, Local Government and Heritage

DP
Dynamically Positioned

EC
European Commission

EDR
Effective Deterrent Range

EM
Electromagnetic

FLO
Fisheries Liaison Officer

HF
High Frequency

HMCS
Harmonised Mandatory Control Scheme

ICES
International Council for the Exploration of Seas

INNS
Invasive Non-Native Species

IOSEA5
Irish Offshore Strategic Environmental Assessment 5

IOSEA6
Irish Offshore Strategic Environmental Assessment 6

IROPI
Imperative Reasons of Overriding Public Interest

IRPCS
International Regulations for the Prevention of Collision at Sea

ISPSG
Irish Shelf Petroleum Studies Group

JNCC
Joint Nature Conservation Committee

JUB
Jack-up barge

LCPA
List of Chemicals for Priority Action

LSE
Likely Significant Effect

PAH
Polycyclic aromatic hydrocarbon

PIP
Petroleum Infrastructure Programme

QI
Qualifying Interest

MARPOL
International Convention for the Prevention of Pollution from Ships

MCA
Maritime and Coast Guard Agency

MMO
Marine Mammal Observer

MMMU
Marine Mammal Management Unit

MODU
Mobile Offshore Drilling Units

MU
Management Units

NIEA
Northern Ireland Environment Agency

NIS
Natura Impact Statement

NPWS
National Parks and Wildlife Service

NRW
Natural Resources Wales

OBC
Ocean Bottom Cable

OBN
Ocean Bottom Nodes

OBM
Oil Based Mud

OPEP
Oil Spill Emergency Plan

OSCP
Oil Spill Contingency Plan

PBT
Persistence, Bioaccumulation and Toxicity

PCW
Pinniped Carnivores in water

PTS
Permanent Threshold Shift

PUDAC
Permits for use and discharge of added chemicals

RMR
Riserless Mud Recovery

ROV
Remotely Operated Vehicle

SAC
Special Area of Conservation

SBM
Synthetic base muds

SCI
Special Conservation Interest

SEA
Strategic Environmental Assessment

SEL
Sound Exposure level

SOLAS
Safety Of Life At Sea

SOPEP
Shipboard Oil Pollution Emergency Plans

SPA
Special Protection Area

SPL
Sound Pressure Level

TTS
Temporary Threshold Shift

VHF
Very High Frequency

VSP
Vertical Seismic Profile

WBM
Water Based Mud

1. INTRODUCTION

1.1 Background

The Department of the Environment, Climate and Communications (DECC) is preparing a 'Plan for assessment of applications for Petroleum Exploration and Production Authorisations in Irish Offshore Waters for the period to 2030' ("the Plan"). The Plan is being considered in the context of both Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA), with the entire project referred to as Irish Offshore Strategic Environmental Assessment 6 ('IOSEA6'). This Plan will replace the existing Plan (which was the subject of IOSEA5) and will incorporate recent policy and legislative developments. It will set out the approach to the granting of petroleum authorisations in Irish waters in the period to 2030, and the consenting of the possible offshore activities (seismic surveys and the drilling of wells) that could take place under an authorisation, subject to Ministerial consent.

1.1.1 The Requirement for Appropriate Assessment (AA)

Article (6)3 of the European Commission (EC) Habitats Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (the Habitats Directive) requires that any plan or project which is not directly connected with or necessary to the management of a Natura 2000 Site, but would be likely to have a significant effect on such a site, either individually or in-combination with other plans or projects, shall be subject to an 'Appropriate Assessment' (AA) of its implications for the Natura 2000 Site in view of the site's conservation objectives. The plan-making body (in this case the DECC) shall agree to the plan (the Draft Plan) only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public, unless in exceptional circumstances, the provisions of Article 6(4) are met. Article 6(4) relates to whether there are Imperative Reasons of Overriding Public Interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a European site to proceed in cases where it has been established that no less damaging alternative solution exists.

This procedure is applied in Ireland through Irish Habitat Regulations (2011) (Statutory Instrument (S.I.) No. 477 of 2011.

1.1.2 Screening for AA

Intertek carried out a Stage 1: Screening for AA of the Draft Plan in March 2022 (Intertek, 2022). The assessment identified pressure-receptor pathways and concluded that the adoption of the Draft Plan could result in a Likely Significant Effect (LSE) on 241 relevant Irish Natura 2000 sites (101 Special Protection Areas (SPAs) and 140 Special Areas of Conservation (SACs)) and 161 relevant Transboundary Natura 2000 sites (104 SACs, 56 SPAs and 1 pSPA) and as a result the Draft Plan should be subject to Stage 2 AA.

The National Parks & Wildlife Service (NPWS), in its capacity as an advisory body, reviewed the findings of the Screening for AA and agreed with the conclusions (per consultation response received 05 May 2022). As such it was determined that assessment of the Draft Plan should proceed to Stage 2 AA.

1.1.3 Requirement for a Natura Impact Statement (NIS)

The Natura Impact Statement (NIS) is a statement of the likely and possible impacts of the Draft Plan on a Natura 2000 site and is required to inform the Stage 2 AA. The NIS comprises a comprehensive ecological impact assessment of the Draft Plan; it examines the direct and indirect impacts that the Draft Plan might have on its own or in combination with other plans or projects, on one or more Natura 2000 sites in view of the sites' conservation objectives.

The Stage 2 AA is carried out by the competent authority, based on the NIS and any other information considered necessary.

1.1.4 NIS and SEA

The NIS and SEA for the Draft Plan have been conducted in parallel, due to the common overlap between the two reports. The NIS is narrower in focus compared to the SEA, focusing specifically on the effect(s) the Draft Plan may have on Natura 2000 sites and thus requires more detailed analysis. However, the findings of the NIS and the research conducted for it also feed into the SEA, allowing for a better consideration of the environmental concerns in the SEA. The NIS also aids the SEA process in the appraisal of potential alternatives, in relation to Natura 2000 sites.

This report has been prepared in accordance with current guidance:

- The European Commission notice "Managing Natura 2000 Sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC", 21 November 2018;
- The Department of Arts, Heritage and the Gaeltacht “Marine Natura Impact Statements in Irish Special Areas of Conservation: A Working Document, April 2012.”;
- The Department of Environment, Heritage and Local Government (DEHLG) Guidance “Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, 11 February 2010.”; and
- The European Commission Guidance “Assessment of plans and projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, September 2021”.

2. DESCRIPTION OF THE PLAN

2.1 Overview of the Plan

The Plan for assessment of applications for Petroleum Exploration and Production Authorisations in Irish Offshore Waters for the Period to 2030 will replace the existing Plan (which was the subject of IOSEA5) and will incorporate recent policy and legislative developments. It will set out the approach to the granting of petroleum authorisations in Irish waters in the period to 2030, and the consenting of the possible offshore activities (seismic surveys and the drilling of wells) that could take place under an authorisation, subject to Ministerial consent. The purpose of the Plan is to provide a framework for the Issuing of Petroleum Authorisations in Irish Offshore Waters which incorporates recent policy and legislative developments.

Since the publication of the existing Plan, there have been several developments. The Programme for Government - Our Shared Future - adopted in June 2020, sets a clear pathway towards less reliance on fossil fuels across every sector of society and specifically contains a commitment to end the issuing of new licences for the exploration and extraction of gas on the same basis as the decision taken in 2019 by the previous Government in relation to oil exploration and extraction.

This commitment was made effective immediately upon the current Government taking office. Holders of existing authorisations are not affected by these changes and may apply to progress their authorisations through the licensing stages towards a natural conclusion. This commitment was then placed on a statutory footing through the Climate Action and Low Carbon Development (Amendment) Act 2021 (which was commenced on 07 September 2021), which resulted in several amendments to the Petroleum and Other Minerals Development Act 1960, and a policy statement was published by the Department in August 2022 in relation to petroleum exploration and extraction, which reflects the current policy in light of the Programme for Government commitment, as well as providing clarity to stakeholders in relation to future authorisations which may be granted under legislation.

The Plan to be assessed under IOSEA6 will only grant petroleum (oil and gas) authorisations in areas currently under existing authorisations for petroleum activities to the West, South and South-East of Ireland. Offshore areas which are not currently subject to an authorisation will not be able to be licensed in the future.

2.2 Description of exploration activities

This section describes the activities which may be undertaken during a seismic survey and the drilling of exploration, appraisal and production wells.

2.2.1 Seismic survey

A 2D seismic survey is the simplest form of seismic survey and consists of a single acoustic source and a single towed streamer. These streamers are normally between 3km and 8km long but can be up to 12km long. The resulting image of the seabed represents a two-dimensional profile in time beneath the survey line. It is normally the first type of seismic survey undertaken during exploration, with the results analysed and used to inform where a follow-up 3D survey should take place or where a potential drilling target may exist.

A 3D seismic survey is a more complex survey method involving more sophisticated equipment. At a basic level, a 3D seismic survey is a dense grid of 2D seismic lines. These surveys typically use multiple towed streamers enabling the acquisition of many closely spaced 2D lines over a single sail line. The acquired data can then be used to create a 3D image or data volume of the subsurface rock. This provides a much more detailed view of the underlying geology, and it is generally used to cover a specific geological target, as informed by the 2D survey.

Both 2D and 3D seismic surveys are typically conducted by a vessel towing acoustic sound sources (air guns) 5 - 10m below the sea surface along pre-determined survey lines. The air guns emit high intensity and low frequency noise (under 200Hz frequency band with a broad peak around 20-120Hz and incidental sounds up to 22kHz) into the surrounding water by the release of bubbles of compressed air, which produces a primary energy pulse and an oscillating bubble. The air guns contain different chamber volumes designed to generate an optimal tuned energy output of specific frequencies.

Seismic surveys would also generate noise from the operations of the primary seismic vessel and guard vessel (e.g., machinery, propellers and hull flow noise) and by helicopters (e.g., for crew transport) during survey operations.

MARPOL Annex V seeks to eliminate and reduce the amount of garbage being discharged into the sea from ships and generally prohibits the discharge of all garbage into the sea, except as provided otherwise in regulations 4, 5, and 6 of the Annex. These are related to food waste, cargo residues, cleaning agents and additives and animal carcasses. Routine vessel discharges are limited to galley waste, which comprises food waste that emanates from the vessel kitchen. Legal requirements to control wastes from ships are enforced under the Sea Pollution (Prevention of Pollution by Garbage from Ships) Regulations 2012.

Sea node and sea bottom cable surveys are non-conventional seismic acquisition techniques with Ocean Bottom Cables (OBC) or Ocean-Bottom Nodes (OBN) – essentially a seismic source detached from the receivers. Nodes are attached to the seabed, to receive the seismic energy transmitted by vessels. OBC acquisition is deployed on the seafloor and connected by electrical wires. An assembly of geophones and hydrophones are connected by electrical wires deployed on the seafloor to record and relay data to a seismic recording vessel or recording buoy.

OBN is also deployed on the seafloor; however, this comprises a set of autonomous seismic receivers/recorders deployed on the sea floor. These are self-contained with a rechargeable battery and generally not connected to other receivers by cable. In addition, it is possible that electromagnetic (EM) survey may be undertaken – this can either be undertaken using a towed streamer, or can use an array of receivers deployed on the seafloor with a towed electric dipole source. The survey system measures subsurface resistivity to assist in identifying hydrocarbon accumulations.

2.2.2 Drilling

Typically, the first step in the sequence of drilling activities is to drill an exploration well, to see if hydrocarbons are present. The location of exploration wells will be guided by the results of the analysis of the seismic surveys, and the design, depth and dimension of the exploration well will be determined by the environmental characteristics of the locations and the location of the target geological horizon(s). This will also determine the type of drilling rig used (e.g. jackup, semi-submersible, drillship).

The types of drilling rig that are employed under licenses issued in accordance with the Plan would be Mobile Offshore Drilling Units (MODUs) as follows:

- Moored / anchored (e.g. semi-submersible rigs);
- Dynamically Positioned (DP) rigs, including drill ships; and
- Jack-Up rigs (used in shallower waters).

The associated subsea equipment is likely to comprise the following:

- anchors, chains and wire (for a moored drilling unit only);
- wellhead and blowout preventer stack;

- marine riser;
- any Cuttings Transport System (CTS) or Riserless Mud Recovery (RMR) system, pumps, hoses, dispersion frames and hose skids; and
- Remotely Operated Vehicle (ROV).

As drill rigs are being brought on-line in preparation for drilling, some discharge of ballast water could occur.

Typically, the first step in the sequence of drilling activities is to drill a top-hole section into the seabed into which the conductor pipe is cemented, following which the well is drilled in successively smaller diameter sections until the hydrocarbon-bearing formation is reached. Once each well section is drilled, steel casing of appropriate diameter is inserted and cemented into place, to provide stability and a barrier between the wellbore and surrounding formations. In addition, the casing provides a firm anchorage for the blow out preventer (BOP) stack and structural integrity for subsequent drilling, testing and possible future production operations. Once the BOP is in place the marine riser, a large diameter pipe that connects the BOP stack to the drilling rig, is installed.

The use of drilling fluid, also known as drilling mud, is intrinsic to all drilling operations. Drilling mud assists in a number of functions such as lubrication and cooling of the drilling bit, suspension and transport of rock cuttings to the surface and, most importantly, the provision of hydrostatic pressure to counterbalance formation pressure. Drilling mud consists of a liquid mixture of clay, water or oil, and other chemical additives. The most commonly used drilling fluids contain water as the fluid continuous phase, and are known as water-base muds (WBMs). However, certain borehole conditions might require a mud formulation where the continuous phase is oil or a synthetic fluid and these are known as oil-base muds (OBMs) or synthetic base muds (SBMs).

The top-hole section of the well has to be drilled without the conductor and BOP in place, and thus with no riser from the seabed to the drilling platform. This means that all drilling fluids, rock cuttings, and cement returns from the top section are discharged directly from the top of the well onto the seabed. Once the marine riser is in place, the drill fluids and cuttings can be circulated from the well back up to the drilling rig where they will be treated so that the drilling mud can be re-used and the cuttings disposed of appropriately.

Although some of the WBM is discharged with cuttings it readily disperses and tends not to form cuttings piles. There is, however, the potential for these cuttings to contain oil from the reservoir section of an oil well.

If OBMs or SBMs are used it would be only when a marine riser is in place, with recovery to the drill rig through the marine riser for either skip-and-ship to shore, or part or full processing on the rig. Ireland does not permit the offshore discharge of OBM or SBM; instead, the cuttings must be skipped and shipped for onshore treatment, re-use or disposal.

If hydrocarbons are found well testing may be required in order to test the productivity of the well and determine parameters such as pressure, flow rates and other reservoir and fluid characteristics and this can involve short duration flaring. Borehole seismic surveys, such as a checkshot survey or Vertical Seismic Profile (VSP) may be undertaken, which measure the seismic travel time (i.e. the elapsed time for a seismic wave to travel from its source to a given reflector and return to a receiver at the Earth's surface) from the surface to a known depth in the borehole, thereby allowing the well data to be correlated with the seismic data.

2.3 Alternative Options

The SEA considers two alternative options to the Plan, these are based on the number of wells drilled, 2D / 3D surveys to be permitted within a single year and over the plan duration. The levels of activity identified in the alternative options have been developed to inform the environmental assessment of

the Plan. It is possible that actual levels of activity will be lower than these values. For comparison, whilst the Plan for assessment of applications for Petroleum Exploration and Production Authorisations in Irish Offshore Waters during the Period 2015 to 2020 (which was the subject of IOSEA5) was undertaken on the basis of assumptions of a maximum of 10 wells per annum, 25,000km^2 of 2D seismic survey per annum and 20,000km^2 of 3D seismic survey per annum, the actual levels of activity were well below those values. Over the entire duration of the Plan (i.e. in the period 2015-2020), there was a sum total of three wells drilled, 15,533.5km^2 2D seismic acquisition and 20,695km^2 3D seismic acquisition.

The Options assessed are:

Option A:

To proceed with issuing authorisations, as well as permitting petroleum (oil and gas) activities up to the maximum levels of activity presented in Table 2-1, subject to modifications to the regulatory regime which may derive from the SEA/AA process. These modifications represent the proposed mitigation measures resulting from the assessment, e.g. restriction of timing of activities.

Table 2-1 Option A maximum levels of activity

Activity	Maximum over duration of plan	Maximum in any one year
Wells drilled	15	3
2D seismic survey acquired	8,000km	2,000km
3D seismic survey acquired	4,000km^2	1,000km^2

Option B:

To proceed with issuing authorisations, as well as permitting petroleum (oil and gas) activities up to the maximum levels of activity presented in Table 2-2, subject to modifications to the regulatory regime which may derive from the SEA/AA process. These modifications represent the proposed mitigation measures resulting from the assessment, e.g. restriction of timing of activities.

Represents a 50% increase in potential activities over the lifetime of the Plan and a 100% increase in activities in any one year.

Table 2-2 Option B maximum levels of activity

Activity	Maximum over duration of plan	Maximum in any one year
Wells drilled	23	6
2D seismic survey acquired	12,000km^2	4,000km^2
3D seismic survey acquired	6,000km^2	2,000km^2

The AA Guidance (DEHLG, 2010) requires that alternatives are considered in Stage 3 (if required). Therefore this NIS has been undertaken on the greater level of activities in accordance with the precautionary principle.

2.4 Summary of Elements of the Plan that have the potential to Impact Natura 2000 Sites

Potential pressures arising from activities associated with the implementation of the Plan on the Qualifying Interests (QI's) and Special Conservation Interests (SCI's) of relevant Natura 2000 sites have

been identified. The activities associated with the Plan include seismic surveys and drilling activities. The assessment focuses on seismic surveys and drilling activities in line with what has been assessed in the previous IOSEAs and because these activities are the most significant in terms of impacts. Other project level survey activities such as benthic surveys, sub-bottom profiling and survey inspections have not been included, however, these activities would be assessed at the project level.

3. SCREENING FOR APPROPRIATE ASSESSMENT SUMMARY

3.1 Identification of potential pressures

The Screening for AA report (Intertek, 2022) identified four potential aspects of the seismic survey activities (Table 3-1) and five potential aspects of the drilling activities (Table 3-2) with associated pressures that could have an LSE on the QIs and SCIs of relevant Natura 2000 sites.

Table 3-1 Seismic survey aspects and associated potential pressures as assessed in the Screening for AA

Aspects	Associated pressure(s)
Generation of underwater noise during seismic survey(s)	Underwater noise changes
Presence of vessel(s) and towed equipment	Visual and above water noise disturbance
	Collision above and below water with static or moving objects not naturally found in the marine environment
Seabed disturbance from placement of equipment on seabed (e.g. sea nodes or sea bottom cable surveys)	Temporary habitat disturbance including penetration and abrasion
	Smothering and siltation rate changes
Unplanned event such as streamer rupture or collision with another vessel.	Hydrocarbon & polycyclic aromatic hydrocarbon (PAH) contamination

Table 3-2 Drilling activity aspects and associated potential pressures as assessed in the Screening for AA

Aspect	Associated Pressure(s)
Generation of underwater noise e.g. vessel presence, conductor driving, vertical seismic profile (VSP) / checkshot surveys	Underwater noise changes
Presence of vessel(s) and equipment	Visual and above water noise disturbance
	Collision above and below water with static or moving objects not naturally found in the marine environment
Seabed disturbance from placement of equipment on seabed (e.g. wellhead, anchors, concrete mattresses) or release of mud, cement and cuttings from tophole well section	Temporary habitat disturbance including penetration and abrasion
	Smothering and siltation rate changes
	Physical change (to another sediment type)
Marine discharges	Sediment contamination / potential for bioaccumulation in food chain
	Deterioration of water quality / toxic effects on species

Aspect	Associated Pressure(s)
Unplanned event hydrocarbon and/or chemical spill e.g. during bunkering or in extreme scenario well blow out	Hydrocarbon & PAH contamination

3.2 Identification of sensitive receptors

To assess whether any element of the Draft Plan can have an LSE on a Natura 2000 site, it is first necessary to identify which, if any, features of a Natura 2000 site have the potential to be sensitive to, and interact with, the aspects (and their potential pressures) of the Plan.

When considering SACs, receptors which could potentially be affected were determined to be:

- Annex II marine mammals (bottlenose dolphin (*Tursiops truncatus),* harbour porpoise (*Phocoena phocoena*), grey seal (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) and European otter *Lutra lutra*);
- Annex II fish (Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lamprey fluviatilis*), allis shad (Alosa alosa) and twaite shad (*Alosa fallax*));
- Annex II estuarine species such as white-clawed crayfish (*Austropotamobius pallipes*) and freshwater pearl mussel (*Margaritifera margaritifera*); and
- Annex I habitats which are offshore or along the coast and have connectivity to the marine environment.

When considering SPAs, receptors which could potentially be affected were determined to be:

- SCI bird species which make significant use of the marine environment, including intertidal areas.

3.3 Identification of affected Natura 2000 sites

Screening determined that the Draft Plan could result in an LSE on 241 relevant Irish Natura 2000 sites (101 SPAs and 140 SACs) and 161 relevant Transboundary Natura 2000 sites (104 SACs, 56 SPAs and 1 pSPA).

All Irish Natura 2000 sites considered in this NIS are listed in Table 3-3. All UK Natura 2000 sites considered in this NIS are listed in Table 3-4. Figures 3-1 (Drawing Number: P2510-PROT-006) and Figure 3-2 (Drawing Number: P2510-PROT-005) show the SPAs and SACs to be considered within this NIS respectively.

Table 3-3 Irish Natura 2000 sites included in the Assessment

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Achill Head SAC (IE0002268)	SAC	No	No	Yes
Akeragh, Banna and Barrow Harbour SAC (IE0000332)	SAC	No	No	Yes
Aran Island (Donegal) Cliffs SAC (IE0000111)	SAC	No	No	Yes
Ardboline Island and Horse Island SPA (IE0004135)	SPA	No	No	Yes
Ardmore Head SAC (IE0002123)	SAC	No	No	Yes
Aughris Head SPA (IE0004133)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Baldoyle Bay SAC (IE0000199)	SAC	No	No	Yes
Baldoyle Bay SPA (IE0004016)	SPA	No	No	Yes
Ballinskelligs Bay and Inny Estuary SAC (IE0000335)	SAC	No	No	Yes
Ballintemple and Ballygilgan SPA (IE0004234)	SPA	No	No	Yes
Ballycotton Bay SPA (IE0004022)	SPA	No	No	Yes
Ballyhoorisky Point to Fanad Head SAC (IE0001975)	SAC	No	No	Yes
Ballymacoda (Clonpriest and Pillmore) SAC (IE0000077)	SAC	No	No	Yes
Ballymacoda Bay SPA (IE0004023)	SPA	No	No	Yes
Ballyness Bay SAC (IE0001090)	SAC	No	No	Yes
Ballysadare Bay SAC (IE0000622)	SAC	No	No	Yes
Ballysadare Bay SPA (IE0004129)	SPA	No	No	Yes
Ballyteige Burrow SAC (IE0000696)	SAC	No	No	Yes
Ballyteige Burrow SPA (IE0004020)	SPA	No	No	Yes
Bannow Bay SAC (IE0000697)	SAC	No	No	Yes
Bannow Bay SPA (IE0004033)	SPA	No	No	Yes
Barley Cove to Ballyrisode Point SAC (IE0001040)	SAC	No	No	Yes
Beara Peninsula SPA (IE0004155)	SPA	No	No	Yes
Belgica Mound Province SAC (IE0002327)	SAC	Yes	Yes	Yes
Bellacragher Saltmarsh SAC (IE0002005)	SAC	No	No	Yes
Bills Rocks SPA (IE0004177)	SPA	No	No	Yes
Black Head-Poulsallagh Complex SAC (IE0000020)	SAC	No	No	Yes
Blacksod Bay/Broad Haven SPA (IE0004037)	SPA	No	No	Yes
Blackwater Bank SAC (IE0002953)	SAC	No	No	Yes
Blackwater Estuary SPA (IE0004028)	SPA	No	No	Yes
Blackwater River (Cork/Waterford) SAC (IE0002170)	SAC	No	No	Yes
Blackwater River (Kerry) SAC (IE0002173)	SAC	No	No	Yes
Blasket Islands SAC (IE0002172)	SAC	Yes	Yes	Yes
Blasket Islands SPA (IE0004008)	SPA	No	No	Yes
Boyne Coast and Estuary SAC (IE0001957)	SAC	No	No	Yes
Boyne Estuary SPA (IE0004080)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Bray Head SAC (IE0000714)	SAC	No	No	Yes
Broadhaven Bay SAC (IE0000472)	SAC	No	No	Yes
Buckroney-Brittas Dunes and Fen SAC (IE0000729)	SAC	No	No	Yes
Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (IE0000625)	SAC	No	No	Yes
Cahore Marshes SPA (IE0004143)	SPA	No	No	Yes
Cahore Polders and Dunes SAC (IE0000700)	SAC	No	No	Yes
Carlingford Lough SPA (IE0004078)	SPA	No	No	Yes
Carlingford Shore SAC (IE0002306)	SAC	No	No	Yes
Carnsore Point SAC (IE0002269)	SAC	No	No	Yes
Carrowmore Dunes SAC (IE0002250)	SAC	No	No	Yes
Carrowmore Point to Spanish Point and Islands SAC (IE0001021)	SAC	No	No	Yes
Castlemaine Harbour SAC (IE0000343)	SAC	No	No	Yes
Castlemaine Harbour SPA (IE0004029)	SPA	No	No	Yes
Clare Island Cliffs SAC (IE0002243)	SAC	No	No	Yes
Clare Island SPA (IE0004136)	SPA	No	No	Yes
Clew Bay Complex SAC (IE0001482)	SAC	No	No	Yes
Cliffs of Moher SPA (IE0004005)	SPA	No	No	Yes
Clogher Head SAC (IE0001459)	SAC	No	No	Yes
Cloghernagore Bog and Glenveagh National Park SAC (IE0002047)	SAC	No	No	Yes
Clonakilty Bay SAC (IE0000091)	SAC	No	No	Yes
Clonakilty Bay SPA (IE0004081)	SPA	No	No	Yes
Codling Fault Zone SAC (IE0003015)	SAC	No	No	Yes
Connemara Bog Complex SAC (IE0002034)	SAC	No	No	Yes
Connemara Bog Complex SPA (IE0004181)	SPA	No	No	Yes
Cork Harbour SPA (IE0004030)	SPA	No	No	Yes
Courtmacsherry Bay SPA (IE0004219)	SPA	No	No	Yes
Courtmacsherry Estuary SAC (IE0001230)	SAC	No	No	Yes
Cross Lough (Killadoon) SPA (IE0004212)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Cruagh Island SPA (IE0004170)	SPA	No	No	Yes
Cummeen Strand SPA (IE0004035)	SPA	No	No	Yes
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (IE0000627)	SAC	No	No	Yes
Dalkey Islands SPA (IE0004172)	SPA	No	No	Yes
Deenish Island and Scariff Island SPA (IE0004175)	SPA	No	No	Yes
Dingle Peninsula SPA (IE0004153)	SPA	No	No	Yes
Dog's Bay SAC (IE0001257)	SAC	No	No	Yes
Donegal Bay (Murvagh) SAC (IE0000133)	SAC	No	No	Yes
Donegal Bay SPA (IE0004151)	SPA	No	No	Yes
Doogort Machair SPA (IE0004235)	SPA	No	No	Yes
Drongawn Lough SAC (IE0002187)	SAC	No	No	Yes
Drumcliff Bay SPA (IE0004013)	SPA	No	No	Yes
Dundalk Bay SAC (IE0000455)	SAC	No	No	Yes
Dundalk Bay SPA (IE0004026)	SPA	No	No	Yes
Dungarvan Harbour SPA (IE0004032)	SPA	No	No	Yes
Durnesh Lough SAC (IE0000138)	SAC	No	No	Yes
Duvillaun Islands SAC (IE0000495)	SAC	Yes	Yes	Yes
Duvillaun Islands SPA (IE0004111)	SPA	No	No	Yes
Erris Head SAC (IE0001501)	SAC	No	No	Yes
Farranamanagh Lough SAC (IE0002189)	SAC	No	No	Yes
Galley Head to Duneen Point SPA (IE0004190)	SPA	No	No	Yes
Galway Bay Complex SAC (IE0000268)	SAC	No	No	Yes
Glenamoy Bog Complex SAC (IE0000500)	SAC	No	No	Yes
Glengarriff Harbour and Woodland SAC (IE0000090)	SAC	No	No	Yes
Great Island Channel SAC (IE0001058)	SAC	No	No	Yes
Greers Isle SPA (IE0004082)	SPA	No	No	Yes
Gweedore Bay and Islands SAC (IE0001141)	SAC	No	No	Yes
Helvick Head SAC (IE0000665)	SAC	No	No	Yes
Helvick Head to Ballyquin SPA (IE0004192)	SPA	No	No	Yes
Hempton's Turbot Bank SAC (IE0002999)	SAC	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
High Island, Inishshark and Davillaun SPA (IE0004144)	SPA	No	No	Yes
Hook Head SAC (IE0000764)	SAC	No	No	Yes
Horn Head and Rinclevan SAC (IE0000147)	SAC	No	No	Yes
Horn Head to Fanad Head SPA (IE0004194)	SPA	No	No	Yes
Hovland Mound Province SAC (IE0002328)	SAC	No	No	Yes
Howth Head Coast SPA (IE0004113)	SPA	No	No	Yes
Howth Head SAC (IE0000202)	SAC	No	No	Yes
Illancrone and Inishkeeragh SPA (IE0004132)	SPA	No	No	Yes
Illanmaster SPA (IE0004074)	SPA	No	No	Yes
Illaunnanoon SPA (IE0004221)	SPA	No	No	Yes
Illaunonearaun SPA (IE0004114)	SPA	No	No	Yes
Inagh River Estuary SAC (IE0000036)	SAC	No	No	Yes
Inishbofin and Inishshark SAC (IE0000278)	SAC	Yes	Yes	Yes
Inishbofin, Inishdooey and Inishbeg SPA (IE0004083)	SPA	No	No	Yes
Inishduff SPA (IE0004115)	SPA	No	No	Yes
Inisheer Island SAC (IE0001275)	SAC	No	No	Yes
Inishglora and Inishkeeragh SPA (IE0004084)	SPA	No	No	Yes
Inishkea Islands SAC (IE0000507)	SAC	Yes	Yes	Yes
Inishkea Islands SPA (IE0004004)	SPA	No	No	Yes
Inishkeel SPA (IE0004116)	SPA	No	No	Yes
Inishmaan Island SAC (IE0000212)	SAC	No	No	Yes
Inishmore Island SAC (IE0000213)	SAC	No	No	Yes
Inishmore SPA (IE0004152)	SPA	No	No	Yes
Inishmurray SPA (IE0004068)	SPA	No	No	Yes
Inishtrahull SAC (IE0000154)	SAC	No	No	Yes
Inishtrahull SPA (IE0004100)	SPA	No	No	Yes
Inner Galway Bay SPA (IE0004031)	SPA	No	No	Yes
Ireland's Eye SAC (IE0002193)	SAC	No	No	Yes
Ireland's Eye SPA (IE0004117)	SPA	No	No	Yes
Iveragh Peninsula SPA (IE0004154)	SPA	No	No	Yes
Keeragh Islands SPA (IE0004118)	SPA	No	No	Yes
Kenmare River SAC (IE0002158)	SAC	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Kerry Head Shoal SAC (IE0002263)	SAC	No	No	Yes
Kerry Head SPA (IE0004189)	SPA	No	No	Yes
Kilkee Reefs SAC (IE0002264)	SAC	No	No	Yes
Kilkeran Lake and Castlefreke Dunes SAC (IE0001061)	SAC	No	No	Yes
Kilkieran Bay and Islands SAC (IE0002111)	SAC	No	No	Yes
Killala Bay/Moy Estuary SAC (IE0000458)	SAC	No	No	Yes
Killala Bay/Moy Estuary SPA (IE0004036)	SPA	No	No	Yes
Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC (IE0000365)	SAC	No	No	Yes
Kilpatrick Sandhills SAC (IE0001742)	SAC	No	No	Yes
Kingstown Bay SAC (IE0002265)	SAC	No	No	Yes
Lackan Saltmarsh and Kilcummin Head SAC (IE0000516)	SAC	No	No	Yes
Lady's Island Lake SAC (IE0000704)	SAC	No	No	Yes
Lady's Island Lake SPA (IE0004009)	SPA	No	No	Yes
Lambay Island SAC (IE0000204)	SAC	No	No	Yes
Lambay Island SPA (IE0004069)	SPA	No	No	Yes
Leannan River SAC (IE0002176)	SAC	No	No	Yes
Long Bank SAC (IE0002161)	SAC	No	No	Yes
Loop Head SPA (IE0004119)	SPA	No	No	Yes
Lough Cahasy, Lough Baun and Roonah Lough SAC (IE0001529)	SAC	No	No	Yes
Lough Corrib SAC (IE0000297)	SAC	No	No	Yes
Lough Eske and Ardnamona Wood SAC (IE0000163)	SAC	No	No	Yes
Lough Foyle SPA (IE0004087)	SPA	No	No	Yes
Lough Gill SAC (IE0001976)	SAC	No	No	Yes
Lough Hyne Nature Reserve and Environs SAC (IE0000097)	SAC	No	No	Yes
Lough Melvin SAC (IE0000428)	SAC	No	No	Yes
Lough Swilly SAC (IE0002287)	SAC	No	No	Yes
Lough Swilly SPA (IE0004075)	SPA	No	No	Yes
Lower River Shannon SAC (IE0002165)	SAC	Yes	Yes	Yes
Lower River Suir SAC (IE0002137)	SAC	Yes	Yes	Yes
Magharee Islands SAC (IE0002261)	SAC	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Magharee Islands SPA (IE0004125)	SPA	No	No	Yes
Magherabeg Dunes SAC (IE0001766)	SAC	No	No	Yes
Malahide Estuary SAC (IE0000205)	SAC	No	No	Yes
Malahide Estuary SPA (IE0004025)	SPA	No	No	Yes
Maumturk Mountains SAC (IE0002008)	SAC	No	No	Yes
Mid-Clare Coast SPA (IE0004182)	SPA	No	No	Yes
Mid-Waterford Coast SPA (IE0004193)	SPA	No	No	Yes
Mount Brandon SAC (IE0000375)	SAC	No	No	Yes
Mullet/Blacksod Bay Complex SAC (IE0000470)	SAC	No	No	Yes
Mulroy Bay SAC (IE0002159)	SAC	No	No	Yes
Mweelrea/Sheeffry/Erriff Complex SAC (IE0001932)	SAC	No	No	Yes
Newport River SAC (IE0002144)	SAC	No	No	Yes
North Bull Island SPA (IE0004006)	SPA	No	No	Yes
North Dublin Bay SAC (IE0000206)	SAC	No	No	Yes
North Inishowen Coast SAC (IE0002012)	SAC	No	No	Yes
North-West Porcupine Bank SAC (IE0002330)	SAC	No	No	Yes
Old Head of Kinsale SPA (IE0004021)	SPA	No	No	Yes
Owenduff/Nephin Complex SAC (IE0000534)	SAC	No	No	Yes
Owenduff/Nephin Complex SPA (IE0004098)	SPA	No	No	Yes
Porcupine Bank Canyon SAC (IE0003001)	SAC	No	No	Yes
Puffin Island SPA (IE0004003)	SPA	No	No	Yes
Rathlin O'Birne Island SAC (IE0000181)	SAC	No	No	Yes
Rathlin O'Birne Island SPA (IE0004120)	SPA	No	No	Yes
Raven Point Nature Reserve SAC (IE0000710)	SAC	No	No	Yes
River Barrow and River Nore SAC (IE0002162)	SAC	Yes	Yes	Yes
River Boyne and River Blackwater SAC (IE0002299)	SAC	No	No	Yes
River Finn SAC (IE0002301)	SAC	No	No	Yes
River Moy SAC (IE0002298)	SAC	No	No	Yes
River Nanny Estuary and Shore SPA (IE0004158)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
River Shannon and River Fergus Estuaries SPA (IE0004077)	SPA	No	No	Yes
Roaninish SPA (IE0004121)	SPA	No	No	Yes
Roaringwater Bay and Islands SAC (IE0000101)	SAC	Yes	Yes	Yes
Rockabill SPA (IE0004014)	SPA	No	No	Yes
Rockabill to Dalkey Island SAC (IE0003000)	SAC	Yes	Yes	Yes
Rogerstown Estuary SAC (IE0000208)	SAC	No	No	Yes
Rogerstown Estuary SPA (IE0004015)	SPA	No	No	Yes
Rutland Island and Sound SAC (IE0002283)	SAC	No	No	Yes
Saltee Islands SAC (IE0000707)	SAC	Yes	Yes	Yes
Saltee Islands SPA (IE0004002)	SPA	No	No	Yes
Seven Heads SPA (IE0004191)	SPA	No	No	Yes
Sheephaven SAC (IE0001190)	SAC	No	No	Yes
Sheep's Head to Toe Head SPA (IE0004156)	SPA	No	No	Yes
Skelligs SPA (IE0004007)	SPA	No	No	Yes
Skerries Islands SPA (IE0004122)	SPA	No	No	Yes
Slaney River Valley SAC (IE0000781)	SAC	Yes	Yes	Yes
Slieve League SAC (IE0000189)	SAC	No	No	Yes
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC (IE0000190)	SAC	No	No	Yes
Slyne Head Islands SAC (IE0000328)	SAC	Yes	Yes	Yes
Slyne Head Peninsula SAC (IE0002074)	SAC	Yes	Yes	Yes
Slyne Head to Ardmore Point Islands SPA (IE0004159)	SPA	No	No	Yes
South Dublin Bay and River Tolka Estuary SPA (IE0004024)	SPA	No	No	Yes
South Dublin Bay SAC (IE0000210)	SAC	No	No	Yes
South East Rockall Bank SAC (IE0003002)	SAC	No	No	Yes
South-West Porcupine Bank SAC (IE0002329)	SAC	No	No	Yes
Sovereign Islands SPA (IE0004124)	SPA	No	No	Yes
St. John's Point SAC (IE0000191)	SAC	No	No	Yes
Stags of Broad Haven SPA (IE0004072)	SPA	No	No	Yes
Streedagh Point Dunes SAC (IE0001680)	SAC		No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Tacumshin Lake SAC (IE0000709)	SAC	No	No	Yes
Tacumshin Lake SPA (IE0004092)	SPA	No	No	Yes
Termon Strand SAC (IE0001195)	SAC	No	No	Yes
Termoncarragh Lake and Annagh Machair SPA (IE0004093)	SPA	No	No	Yes
The Bull and The Cow Rocks SPA (IE0004066)	SPA	No	No	Yes
The Murrough SPA (IE0004186)	SPA	No	No	Yes
The Murrough Wetlands SAC (IE0002249)	SAC	No	No	Yes
The Raven SPA (IE0004019)	SPA	No	No	Yes
The Twelve Bens/Garraun Complex SAC (IE0002031)	SAC	No	No	Yes
Three Castle Head to Mizen Head SAC (IE0000109)	SAC	No	No	Yes
Tory Island Coast SAC (IE0002259)	SAC	No	No	Yes
Tory Island SPA (IE0004073)	SPA	No	No	Yes
Tralee Bay and Magharees Peninsula, West to Cloghane SAC (IE0002070)	SAC	No	No	Yes
Tralee Bay Complex SPA (IE0004188)	SPA	No	No	Yes
Tramore Back Strand SPA (IE0004027)	SPA	No	No	Yes
Tramore Dunes and Backstrand SAC (IE0000671)	SAC	No	No	Yes
Tranarossan and Melmore Lough SAC (IE0000194)	SAC	No	No	Yes
Trawbreaga Bay SPA (IE0004034)	SPA	No	No	Yes
Unshin River SAC (IE0001898)	SAC	No	No	Yes
Valencia Harbour/Portmagee Channel SAC (IE0002262)	SAC	No	No	Yes
West Connacht Coast SAC (IE0002998)	SAC	Yes	Yes	Yes
West Donegal Coast SPA (IE0004150)	SPA	No	No	Yes
West Donegal Islands SPA (IE0004230)	SPA	No	No	Yes
West of Ardara/Maas Road SAC (IE0000197)	SAC	No	No	Yes
Wexford Harbour and Slobs SPA (IE0004076)	SPA	No	No	Yes
Wicklow Head SPA (IE0004127)	SPA	No	No	Yes
Wicklow Reef SAC (IE0002274)	SAC	No	No	Yes

Table 3-4 UK Natura 2000 sites included in the Assessment

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Afon Teifi/ River Teifi (UK0012670)	SAC	No	No	Yes
Afon Tywi / River Tywi (UK0013010)	SAC	No	No	Yes
Afonydd Cleddau / Cleddau Rivers (UK0030074)	SAC	No	No	Yes
Ailsa Craig (UK9003091)	SPA	No	No	Yes
Anglesey Terns / Morwenoliaid Ynys Môn (UK9013061)	SPA	No	No	Yes
Anton Dohrn Seamount (UK0030387)	SAC	No	No	Yes
Ardvar and Loch a' Mhuilinn Woodlands (UK0030231)	SAC	No	No	Yes
Bae Caerfyrddin/ Carmarthen Bay (UK9014091)	SPA	No	No	Yes
Bae Cemlyn/ Cemlyn Bay (UK0030114)	SAC	No	No	Yes
Bann Estuary (UK0030084)	SAC	No	No	Yes
Belfast Lough (UK9020101)	SPA	No	No	Yes
Belfast Lough Open Water (UK9020290)	SPA	No	No	Yes
Braunton Burrows (UK0012570)	SAC	No	No	Yes
Bridgend Flats, Islay (UK9003052)	SPA	No	No	Yes
Bristol Channel Approaches / Dynesfeydd Môr Hafren (UK0030396)	SAC	Yes	Yes	Yes
Burry Inlet (UK9015011)	SPA	No	No	Yes
Canna and Sanday (UK9001431)	SPA	No	No	Yes
Cape Wrath (UK9001231)	SPA	No	No	Yes
Cardigan Bay/ Bae Ceredigion (UK0012712)	SAC	Yes	Yes	Yes
Carlingford Lough (and proposed marine extension) (UK9020161)	SPA	No	No	Yes
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd (UK0020020)	SAC	Yes	Yes	Yes
Castlemartin Coast (UK9014061)	SPA	No	No	Yes
Cladagh (Swalinbar) River (UK0030116)	SAC	No	No	Yes
Coll and Tiree (UK9020310)	SPA	No	No	Yes
Copeland Islands (UK9020291)	SPA	No	No	Yes
Croker Carbonate Slabs (UK0030381)	SAC	Yes	Yes	Yes
Darwin Mounds (UK0030317)	SAC	No	No	Yes
Dee Estuary/ Aber Dyfrdwy (UK0030131)	SAC	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Drigg Coast (UK0013031)	SAC	No	No	Yes
Dunraven Bay (UK0030139)	SAC	No	No	Yes
Durness (UK0012786)	SAC	No	No	Yes
East Coast Marine (UK9020320)	pSPA	No	No	Yes
East Mingulay (UK0030364)	SAC	No	No	Yes
East Rockall Bank (UK0030389)	SAC	No	No	Yes
Eileanan agus Sgeiran Lios mor (UK0030182)	SAC	No	No	Yes
Exmoor Heaths (UK0030040)	SAC	No	No	Yes
Fal and Helford (UK0013112)	SAC	Yes	Yes	Yes
Falmouth Bay to St Austell Bay (UK9020323)	SPA	No	No	Yes
Firth of Lorn (UK0030041)	SAC	No	No	Yes
Flannan Isles (UK9001021)	SPA	No	No	Yes
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island (UK9013121)	SPA	No	No	Yes
Glannau Môn: Cors heli / Anglesey Coast: Saltmarsh (UK0020025)	SAC	No	No	Yes
Glannau Ynys Gybi/ Holy Island Coast (UK0013046)	SAC	No	No	Yes
Glen Beasdale (UK0030154)	SAC	No	No	Yes
Gower Commons/ Tiroedd Comin Gŵyr (UK0012685)	SAC	No	No	Yes
Grassholm (UK9014041)	SPA	No	No	Yes
Gruinart Flats, Islay (UK9003051)	SPA	No	No	Yes
Haig Fras (UK0030353)	SAC	No	No	Yes
Hatton Bank (UK0030388)	SAC	No	No	Yes
Inverpolly (UK0030171)	SAC	No	No	Yes
Irish Sea Front (UK9020328)	SPA	No	No	Yes
Isles of Scilly (UK9020288)	SPA	No	No	Yes
Isles of Scilly Complex (UK0013694)	SAC	Yes	Yes	Yes
Kenfig/ Cynffig (UK0012566)	SAC	No	No	Yes
Killough Bay (UK9020221)	SPA	No	No	Yes
Kinloch and Kyleakin Hills (UK0030176)	SAC	No	No	Yes
Laggan, Islay (UK9003053)	SPA	No	No	Yes
Lands End and Cape Bank (UK0030375)	SAC	No	No	Yes
Larne Lough (UK9020042)	SPA	No	No	Yes
Limestone Coast of South West Wales/ Arfordir Calchfaen de Orllewin Cymru (UK0014787)	SAC	Yes	Yes	Yes
Liverpool Bay / Bae Lerpwl (UK9020294)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Lizard Point (UK0030374)	SAC	No	No	Yes
Loch Creran (UK0030190)	SAC	No	No	Yes
Loch Laxford (UK0030192)	SAC	No	No	Yes
Loch Moidart and Loch Shiel Woods (UK0030209)	SAC	No	No	Yes
Loch nam Madadh (UK0017070)	SAC	No	No	Yes
Loch Roag Lagoons (UK0017074)	SAC	No	No	Yes
Lochs Duich, Long and Alsh Reefs (UK0017077)	SAC	No	No	Yes
Lough Foyle (UK9020031)	SPA	No	No	Yes
Luce Bay and Sands (UK0013039)	SAC	No	No	Yes
Lundy (UK0013114)	SAC	Yes	Yes	Yes
Lyme Bay and Torbay (UK0030372)	SAC	No	No	Yes
Magilligan (UK0016613)	SAC	No	No	Yes
Mersey Estuary (UK9005131)	SPA	No	No	Yes
Mersey Narrows and North Wirral Foreshore (UK9020287)	SPA	No	No	Yes
Mingulay and Berneray (UK9001121)	SPA	No	No	Yes
Moine Mhor (UK0019839)	SAC	No	No	Yes
Monach Islands (UK0012694)	SAC	No	No	Yes
Morecambe Bay (UK0013027)	SAC	No	No	Yes
Morecambe Bay and Duddon Estuary (UK9020326)	SPA	No	No	Yes
Mull Oakwoods (UK0030219)	SAC	No	No	Yes
Mull of Galloway (UK0030220)	SAC	No	No	Yes
Murlough (UK0016612)	SAC	No	No	Yes
Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal (UK9020282)	SPA	No	No	Yes
North Anglesey Marine / Gogledd Môn Forol (UK0030398)	SAC	Yes	Yes	Yes
North Antrim Coast (UK0030224)	SAC	No	No	Yes
North Channel (UK0030399)	SAC	Yes	Yes	Yes
North Colonsay and Western Cliffs (UK9003171)	SPA	No	No	Yes
North Rona (UK0012696)	SAC	No	No	Yes
North Rona and Sula Sgeir (UK9001011)	SPA	No	No	Yes
North Uist Machair (UK0019804)	SAC	No	No	Yes
North Uist Machair and Islands (UK9001051)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
North West Rockall Bank (UK0030363)	SAC	No	No	Yes
Northern Cardigan Bay / Gogledd Bae Ceredigion (UK9020327)	SPA	No	No	Yes
Obain Loch Euphoirt (UK0017101)	SAC	No	No	Yes
Oronsay and South Colonsay (UK9020299)	SPA	No	No	Yes
Outer Ards (UK9020271)	SPA	No	No	Yes
Owenkillew River (UK0030233)	SAC	No	No	Yes
Pembrokeshire Marine/ Sir Benfro Forol (UK0013116)	SAC	Yes	Yes	Yes
Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau (UK0013117)	SAC	Yes	Yes	Yes
Pisces Reef Complex (UK0030379)	SAC	Yes	Yes	Yes
Plymouth Sound and Estuaries (UK0013111)	SAC	Yes	Yes	Yes
Ramsey and St David`s Peninsula Coast (UK9014062)	SPA	No	No	Yes
Rathlin Island (UK0030055)	SAC	No	No	Yes
Rathlin Island (UK9020011)	SPA	No	No	Yes
Red Bay (UK0030365)	SAC	No	No	Yes
Ribble and Alt Estuaries (UK9005103)	SPA	No	No	Yes
River Axe (UK0030248)	SAC	No	No	Yes
River Bladnoch (UK0030249)	SAC	No	No	Yes
River Camel (UK0030056)	SAC	No	No	Yes
River Dee and Bala Lake/ Afon Dyfrdwy a Llyn Tegid (UK0030252)	SAC	No	No	Yes
River Derwent and Bassentwaite Lake (UK0030032)	SAC	No	No	Yes
River Eden (UK0012643)	SAC	No	No	Yes
River Ehen (UK0030057)	SAC	No	No	Yes
River Faughan and Tributaries (UK0030361)	SAC	No	No	Yes
River Foyle and Tributaries (UK0030320)	SAC	No	No	Yes
River Kent (UK0030256)	SAC	No	No	Yes
River Roe and Tributaries (UK0030360)	SAC	No	No	Yes
River Usk/ Afon Wysg (UK0013007)	SAC	No	No	Yes
River Wye/ Afon Gwy (UK0012642)	SAC	No	No	Yes
Rum (UK0012594)	SAC	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
Rum (UK9001341)	SPA	No	No	Yes
Seas off St Kilda (UK9020332)	SPA	No	No	Yes
Severn Estuary (UK9015022)	SPA	No	No	Yes
Severn Estuary/ Môr Hafren (UK0013030)	SAC	No	No	Yes
Sheep Island (UK9020021)	SPA	No	No	Yes
Shell Flat and Lune Deep (UK0030376)	SAC	No	No	Yes
Shiant Isles (UK9001041)	SPA	No	No	Yes
Skerries and Causeway (UK0030383)	SAC	Yes	Yes	Yes
Skomer, Skokholm and the Seas off Pembrokeshire / Sgomer, Sgogwm a Moroedd Penfro (UK9014051)	SPA	No	No	Yes
Sléibhtean agus Cladach Thiriodh (Tiree Wetlands and Coast) (UK9003032)	SPA	No	No	Yes
Solan Bank Reef (UK0030386)	SAC	No	No	Yes
Solway Firth (UK0013025)	SAC	Yes	Yes	Yes
Solway Firth (UK9005012)	SPA	No	No	Yes
Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) (UK0019802)	SAC	No	No	Yes
Sound of Barra (UK0012705)	SAC	Yes	Yes	Yes
Sound of Gigha (UK9020318)	SPA	No	No	Yes
South Uist Machair (UK0012713)	SAC	No	No	Yes
South Uist Machair and Lochs (UK9001082)	SPA	No	No	Yes
South-East Islay Skerries (UK0030067)	SAC	No	No	Yes
St David`s / Ty Ddewi (UK0013045)	SAC	No	No	Yes
St Kilda (UK0013695)	SAC	Yes	Yes	Yes
St Kilda (UK9001031)	SPA	No	No	Yes
Stanton Banks (UK0030359)	SAC	No	No	Yes
Start Point to Plymouth Sound & Eddystone (UK0030373)	SAC	No	No	Yes
Strangford Lough (UK0016618)	SAC	No	No	Yes
Strangford Lough (UK9020111)	SPA	No	No	Yes
Sunart (UK0019803)	SAC	No	No	Yes
Taynish and Knapdale Woods (UK0012682)	SAC	No	No	Yes
Tayvallich Juniper and Coast (UK0030287)	SAC	No	No	Yes
The Dee Estuary (UK9013011)	SPA	No	No	Yes

Site Name and EU Code	Type	Potential for LSE from seismic survey activities	Potential for LSE from drilling activities	Potential for LSE from accidental event
The Lizard (UK0012799)	SAC	No	No	Yes
The Maidens (UK0030384)	SAC	Yes	Yes	Yes
Tintagel-Marsland-Clovelly Coast (UK0013047)	SAC	No	No	Yes
Traeth Lafan/ Lavan Sands, Conway Bay (UK9013031)	SPA	No	No	Yes
Treshnish Isles (UK9003041)	SPA	No	No	Yes
Upper Ballinderry (UK0030296)	SAC	No	No	Yes
West Coast of the Outer Hebrides (UK9020319)	SPA	No	No	Yes
West Wales Marine / Gorllewin Cymru Forol (UK0030397)	SAC	Yes	Yes	Yes
Y Fenai a Bae Conwy/ Menai Strait and Conwy Bay (UK0030202)	SAC	No	No	Yes
Ynys Seiriol / Puffin Island (UK9020285)	SPA	No	No	Yes

IOSEA6 – Natura Impact Statement

PROTECTED SITES

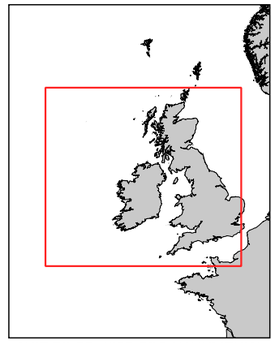
SPAs Included in the Assessment

Drawing No: P2510-PROT-006-A	B

Legend

- IOSEA6 Study Area
- 12 NM Limit
- EEZ Boundary
- ROI SPA
- UK SPA
- UK pSPA

N



NOT TO BE USED FOR NAVIGATION

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Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Emma Langley

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

intertek

0 50 100 150 200 km

IOSEA6 – Natura Impact Statement

PROTECTED SITES

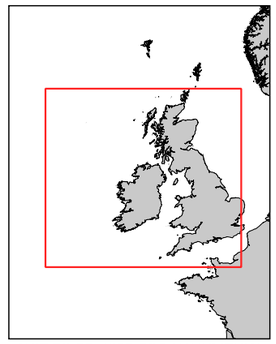
SACs Included in the Assessment

Drawing No: P2510-PROT-005-A	B

Legend

- IOSEA6 Study Area
- 12 NM Limit
- EEZ Boundary
- ROI SAC
- UK SAC

N



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Created By	Lewis Castle
Reviewed By	Emma Langley
Approved By	Emma Langley

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Department of the Environment, Climate and Communications

intertek

0 50 100 150 200 km

4. CONSULTATION FEEDBACK

The report to inform Screening for AA was consulted upon in April 2022. Following review of initial feedback the report was updated to address comments received and submitted for further consultation in July 2022. The edits made to the report mainly consisted of inclusion of missing sites and re-ordering the screening tables.

The comments received on the Screening for AA are summarised in Table 4-1 with comments on how they have been addressed.

Table 4-1 Consultation Feedback for the Screening for AA

Consultee	Date Received	Issue Raised	Summary of Action Taken
Department of Housing, Local Government and Heritage (DHLGH)	05/05/2022	Screening concluded that an LSE could not be excluded. DHLGH concurs with this conclusion and recommends that a Natura Impact Statement is generated to evaluate the potential interaction with designated sites from the proposed plan. Cetaceans must be considered.	NIS prepared. Cetaceans are considered in this NIS.
Joint Nature Conservation Committee (JNCC)	26/04/2022	Table A-2 and Table A-3 incorrectly titled.	Updated in Revised Screening for AA report.
Scottish Natural Heritage (NatureScot)	16/05/2022	No requirement to screen in any Scottish Special Areas of Conservation (SACs) due to distances. Atlantic salmon migrate northwards from their natal rivers, therefore, unlikely to encounter the proposed area of exploration and associated activities. Brook lamprey do not leave freshwater habitats, therefore, can be screened out. Refer to agreed foraging ranges to screen in species and identify from which breeding colony SPA. Key species to be considered are gannet, fulmar, shearwaters and petrels.	Scottish sites included for Atlantic salmon as feature were removed from consideration in the NIS. Brook lamprey removed from consideration. It was not considered appropriate to consider foraging ranges as a means of screening sites. This will be undertaken at the project level.
Natural England	25/04/2022	Table A-2 and Table A-3 incorrectly titled. River based SACs with Annex 1 habitats and Annex II fish as protected features not identified. For example, River Derwent and Bassenthwaite Lake SAC and River Ehen SAC are not listed (note this is not an exhaustive list). We advise that these sites, and others with Annex II fish (and fish assemblage features) in particular are considered within the screening assessment for completeness. Ramsars sites not includes ,however, understand HRA is being undertaken in line with Irish Law. Consideration of MCZs required.	Tables were incorrectly duplicated, correct tables resent to consultees. These sites were added to the Revised Screening for AA report. No action needed. MCZ will be considered in the SEA Environmental Report.
Northern Ireland Environment Agency (NIEA) - Marine and Fisheries Division	28/04/2022	Table A-2, Table A-3 and Table A-4 incorrectly titled. East Coast Marine proposed SPA and the Carlingford Marine proposed SPA to be included.	Updated in Revised Screening for AA report. These sites were added to the Revised Screening for AA report. This pressure was screened out of the assessment.

Consultee	Date Received	Issue Raised	Summary of Action Taken
		Consideration of INNS introduced through drill rig ballast water and INNS to be added as a pressure in the conclusion. Section 3.2.3.1 underwater noise can also lead to death of marine mammals.	Updated in Revised Screening for AA report.
Natural Resources Wales (NRW)	13/04/2022	Unclear about the outcome of screening for sites in Wales that have marine mammals as a feature. Sites which have been correctly identified for screening in Table 3-2, the outcome of screening has not been recorded in Appendix A-4. All Welsh sites that host harbour porpoise and bottlenose dolphin as features should be screened in to the appropriate assessment on the basis that a likely significant effect from those pressures that have been scoped in to further assessment cannot be excluded. There is no screening record for Mynydd Cilan, Trwyn y Wylfa ac Ynysoedd Sant Tudwal SPA, although we agree this can be screened out.	Marine Mammal Management units (MMMU) were considered when screening the sites. No action needed.
DHLGH	29/07/2022	The Department has reviewed the amendments and these changes don't alter the previous comments requesting that the application should proceed to further environmental evaluation. The Department has no additional comments at this point.	NIS prepared.
JNCC	26/07/2022	We note the screening document now contains details of UK SPAs and SACs to be screened into appropriate assessment. We agree with the sites identified to be screened in and have no further comments at this stage.	No action needed.
Scottish Natural Heritage (NatureScot)	01/08/2022	Having reviewed the revised draft, NatureScot still disagree with many of the conclusions reached for our SACS. There are three SACs, scoped out for further consideration and the rest remain in (Appendix A-3). A number of the sites being taken forward into the LSE stage are sites with a mixture of habitats and mobile species as qualifying interests. Many are at a great distance from any of the proposed exploration or drilling sites. It is unclear on the rationale for excluding some and leaving the rest in. Either all should be in or out. There is a mixture of Scottish SPA screened out and others screened in and again it appears not to be related to the impact pathway from an accident. We advise all should be screened in or out. Accidental event impact pathway – this appears to be the key impact pathway for screening in Scottish sites. We advise if these are all screened in at this stage, the measure identified to manage such an event should be outlined in the Plan. Additionally you may want to consider tidal modelling etc. for different pollution scenarios on how far any such pollution will reach to determine hypothetically if there will be an adverse effect on site on integrity or not.	GIS was used to determine how connected areas were to the IOSEA6 Study Areas. Where sites were sheltered by headlands or islands it was determined that if an accidental oil spill occurred these areas (and other shorelines prior to this) would receive the initial beaching of oil and, therefore, ensure these sites were not directly impacted. As above. Oil spill modelling is utilised within the NIS and mitigation measures to manage an accidental event if one occurred.
Natural England	20/07/2022	We welcome the updated documents. Natural England notes that amendments have been made in line with our previous advice and we have no further comments at this time.	No action needed.

Consultee	Date Received	Issue Raised	Summary of Action Taken
NIEA - Marine and Fisheries Division	28/07/2022	Confirm they are content with revision in the revised Screening for AA report. Reiterate comment on ballast water discharges and ask that ballast water is treated prior to drilling commencing in line with the Ballast Water Management Convention.	No action needed. Ballast Water Management Convection is included as part of the embedded mitigation and best practice measures (Table 6-1).
NRW	20/07/2022	The only observation we would make is that D grade SAC features have been included for some of the screened-in sites, such as Cardigan Bay SAC includes Harbour porpoise which is categorised as a 'D grade feature'. It is not normally a requirement to screen these features into HRA in the UK.	Noted. We have assessed all sites with interest features no matter what the grade.

5. ASSESSMENT OF POTENTIAL LIKELY SIGNIFICANT EFFECTS

As described in Section 1 above, a Natura 2000 site is progressed to the AA Stage (Stage 2 of the AA) where it is not possible to exclude an LSE on one or more of its qualifying features in view of the Conservation Objectives. Relevant information to help inform the AA is provided in the sections below, including a description of the Natura 2000 sites under consideration and their interest features, as well as an assessment of potential effects on site integrity in light of the Conservation Objectives of each site.

5.1 Seismic Survey Aspects

5.1.1 Underwater noise changes

5.1.1.1 Fish

The ability of fish to hear noise is dependent on their hearing structures, which indicate their sensitivity to sound. Sound pressure is only detected by those species possessing a swim bladder; the otolith organ acts as a particle motion detector and where linked to the swim bladder, converts sound pressure into particle motion, which is detected by the inner ear. Generally, species with specialisations for sound pressure detection (e.g. a swim bladder) can hear higher frequencies (between 200Hz – 3kHz) than fishes lacking morphological adaptations, which can detect sound at lower frequencies between 100Hz to 1kHz (Carroll *et al*. 2017). High sensitivity hearing species such as clupeids (e.g. Atlantic herring, sprat, twaite shad and allis shad) have specialisations of the auditory apparatus where the swim bladder and inner ear are intimately connected and are able to detect frequencies up to 3kHz; with optimum sensitivity between 300Hz-1kHz (Nedwell *et al.* 2007).

Most of the proposed seismic survey activities operate at frequencies below the audible range for hearing specialist fish, with incidental sounds above their hearing range, however disturbance and injurious effects can occur from the sudden change in pressure generated by activities. The greater the sound pulse the greater the likely effects to hearing specialist fish. There is also potential for some fish and shellfish species to be vulnerable to impulsive activities during sensitive life stages, for example during the egg and larvae development stages.

All SACs within 40km of the IOSEA6 Study Area have been screened for the presence of Annex II migratory fish species as QIs. In reality sound propagation is likely to be limited to a much smaller distance however this distance allows recognition that migratory fish from SACs may transit the area during seismic activity.

Slaney River Valley SAC was the only Irish Natura 2000 site within the area of search of 40 km (actual distance 25.7km) of the IOSES6 Study Area with fish species; namely, Atlantic salmon *Salmo salar,* sea lamprey *Petromyzon marinus,* European river lampry *Lampetra fluviatilis* and twait shad *Alosa fallax listed* as QIs. Of these species, only twaite shad are known to be sensitive to underwater noise associated with seismic surveys. Pembrokeshire Marine/ Sir Benfro Forol SAC was the only Natura 2000 site in the UK with relevant species. Table 5-1 presents the Natura 2000 sites information.

Table 5-1 Ireland & UK Natura 2000 sites with fish as a feature within the Area of Search (40 km)

Natura 2000 Site	Distance (km)	Relevant Annex II Species
Slaney River Valley SAC (IE0000781)	25.7	▪ Twaite shad *Alosa fallax*
Pembrokeshire Marine/ Sir Benfro Forol SAC (UK0013116)	20.1	▪ Twaite shad *Alosa fallax* ▪ Allis shad *Alosa alosa*

Continuous sound

Existing environmental conditions of background sound are considered when assessing anthropogenic activities that produce additional sound. Sources of background sound come from shipping, interaction of waves and currents with the seabed, seabed development and operation, fishing industry and recreational activities. Fish are likely to become habituated to levels of background sound (Carroll *et al.* 2017). A decreased responsiveness over time could arise through a change in tolerance, through habituation (Radford *et al*. 2016). Therefore, effects are only expected if sound produced during the proposed activities is significantly above the background sound levels. Popper *et al*. (2014) identified that there is no direct evidence of permanent injury to fish species from shipping and other continuous noise. The typical behavioural response to sound might range from no change in behaviour, to a mild awareness (startle response) to larger movements of temporary displacement for the duration of the sound (Popper and Hastings 2009). Twaite shad and Allis shad (Clupidae family) are the only hearing specialist fish present within the IOSEA6 Study Area that is a QI of a Natura 2000 site.

Clupeids are expected to show strong avoidance behaviour (i.e. reaction by virtually all individuals) within 8m of the works, whilst significant avoidance (85% of individuals will react to noise) is expected within 66m (Nedwell *et al*. 2012) .

As any disturbance effects from noise associated with seismic survey activities will be localised, temporary and transient and outside of the SAC, the proposed activities will not undermine the conservation objectives of any SAC. There will be no long-term effect on the distribution of the species and migration to and from rivers will not be impeded.

Disturbance effects to fish resulting from continuous noise during seismic surveys will be temporary and have been assessed as Not Significant.

Impulsive Sound

The sound source from seismic survey air guns are high intensity and low frequency broadband noise, under 200Hz frequency band with a broad peak around 20-120Hz and incidental sounds up to 22kHz and emitted at a source depth of around 5-10m. The auditory capacity of fish is generally between 0.2Hz to 1kHz, transferred through the particle motion pathways of the otolith, swim bladder (where applicable) and lateral line. With seismic sound source's remaining within the auditory capacity of many fish species, these have the potential to adversely impact this group, particularly Osteichthyes (bony fish, with swim bladders). Studies of fish in relation to seismic sources are generally limited and not completely coherent in their results. Threshold sound conditions for physical damage to fish is only available for very few species and it is noted that behavioural effects are more likely than physiological effects at lower sound levels, and therefore may be a more useful indicator for determining seismic effects over a large spatial area (Carroll *et al*., 2017). Some studies have shown that fishes exposed to air gun sound could stop foraging and start swimming down the water column, which can affect catch rates in either a positive or negative manner, depending on the type of fishery. Other surveys have shown relatively stationary fish to exhibit a startle response with that does not necessarily lead to long term changes in behavioural patterns or spatial deterrence (Slabberkoorn *et al*., 2019). Of particular

note to the IOSEA6 Study Area is the Twaite shad and Allis shad, which physiologically share most resemblance to herring, of the fish studied for impacts on seismic activity. Investigations into the influence of seismic surveys on the distribution and abundance of pelagic fish (including herring) revealed insignificant short-term horizontal distribution effects (Carroll *et al*., 2017).

It is, therefore, concluded that hearing specialist fish may experience temporary displacement from the immediate area surrounding the survey, however individuals will return to the area quickly based on the transient and brief nature of the survey activities.

In conclusion, disturbance effects to fish receptors in the IOSEA6 Study Area resulting from impulsive sound sources during seismic surveys will be brief to temporary and have been assessed Not Significant.

Without prejudice to this conclusion, it is relevant to note that the Department of Arts, Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); in particular Section 4.3.4 (ii) applicable to seismic air gun arrays are proposed to mitigate underwater noise effect on marine mammals. Although not directly applicable to fish species, the principles in the guidance, namely use of soft-start and ramp-up procedures, and minimising the duration of noise generating surveys, will be of benefit to hearing sensitive fish species, further reducing the potential for effect.

5.1.1.2 Marine Mammals

Both cetaceans and pinnipeds have evolved to use sound as an important aid in navigation, communication, and hunting (Richardson *et al.* 1995). It is generally accepted that exposure to anthropogenic sound can induce a range of behaviour effects and, in extreme circumstances, lead to permanent injury in marine mammals. Loud and prolonged sound above background levels may be considered noise and may have a negative effect on marine life. In marine mammals, this may mask communicative or hunting vocalisations, inhibiting social interactions and effective hunting. High intensity noises can cause temporary or permanent changes to animals' hearing if the animal is exposed to the sound in proximity and, in some extreme circumstances, can lead to the death of the animal (Richardson *et al.* 1995). Where the threshold of hearing is temporarily damaged, it is considered a temporary threshold shift (TTS), and the animal is expected to recover. If there is permanent damage (permanent threshold shift (PTS)) where the animal does not recover, social isolation and a restricted ability to locate food may occur, potentially leading to the death of the animal (Southall *et al.* 2019). Despite this, there is no direct evidence to link physical injury and geophysical survey to marine mammals, however there is evidence that marine mammals exhibit short-term behavioural responses to geophysical survey (Gordon *et al.* 2004; Stone and Tasker 2006; Southall *et al.* 2007; Thompson *et al.* 2013; Sarnocińska *et al.* 2020). Behavioural disturbance from underwater sound sources is more difficult to assess than injury and is dependent upon many factors related to the circumstances of the exposure (Southall *et al.* 2007, NMFS 2018). An animal's ability to detect sounds produced by anthropogenic activities depends on its hearing sensitivity and the magnitude of the noise compared to the amount of natural ambient and background anthropogenic sound. In simple terms, for a sound to be detected it must be louder than background and above the animal's hearing sensitivity at the relevant sound frequency. The direction of the sound is also important.

Most cetaceans are wide-ranging, and individuals encountered within Irish waters form part of a much larger biological population whose range extends into adjacent jurisdictions. As a result, management units (MUs) have been outlined for seven of the common regularly occurring species following advice from the Sea Mammals Research Unit (DECC 2016) and the International Council for the Exploration of the Sea (ICES). These provide an indication of the spatial scales at which impacts of anthropogenic activities should be taken into consideration.

The European otter is largely a freshwater mammal. Individuals occupying coastal territories tend to remain within a 3 to 4 km area of coastline, where freshwater is also readily available for cleaning their

fur after exposure to saltwater (Chanin, 2003). When diving, an otter closes both its nostrils and ears and is estimated to remain underwater for no more than 20 seconds for each dive.

Chanin (2003) also acknowledges unpublished observations which indicate that otters will rest under roads, in industrial buildings, close to quarries, and at other sites close to high levels of human activity. These observations suggest that otters are reasonably flexible in their behaviour and do not necessarily avoid 'disturbance' in terms of noise (or proximity to human activity). There is no available evidence specifically related to reaction of otters to seismic survey noise. For these reasons, otter can be screened out as a potential receptor.

All SACs designated for Bottlenose dolphin *Tursiops truncatus* and Harbour porpoise *Phocoena phocoena* within the MMMUs which intersect the IOSEA6 Study Area were considered as the cetaceans could potentially enter the study area. For grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina* an area of search of 50 km was used. Harbour seal are not known to make trips greater than 50km from haul-out sides (DECC 2016). Table 5-2 presents the Natura 2000 sites information.

Table 5-2 Ireland and UK Natura 2000 sites with marine mammals/pinnipeds as a feature within the area of search (Marine Management Units/50 km)

Natura 2000 Site	Distance (km)	Relevant Annex II Species
West Wales Marine / Gorllewin Cymru Forol (UK0030397)	19.8	▪ Harbour porpoise
Pembrokeshire Marine/ Sir Benfro Forol (UK0013116)	20.1	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Slaney River Valley SAC (IE0000781)	25.7	▪ Harbour seal
Saltee Islands SAC (IE0000707)	29.1	▪ Grey seal
West Connacht Coast SAC (IE0002998)	30.1	▪ Bottlenose dolphin
Inishkea Islands SAC (IE0000507)	32.2	▪ Grey seal
Duvillaun Islands SAC (IE0000495)	39	▪ Bottlenose dolphin ▪ Grey seal
Roaringwater Bay and Islands SAC (IE0000101)	53.3	▪ Harbour porpoise ▪ Grey seal
Cardigan Bay/ Bae Ceredigion (UK0012712)	59.4	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Inishbofin and Inishshark SAC (IE0000278)	72.8	▪ Grey seal
Slyne Head Islands SAC (IE0000328)	76.6	▪ Bottlenose dolphin ▪ Grey seal
Bristol Channel Approaches / Dynesfeydd Môr Hafren	77.8	▪ Harbour porpoise

Natura 2000 Site	Distance (km)	Relevant Annex II Species
(UK0030396)		
Blasket Islands SAC (IE0002172)	80.6	▪ Harbour porpoise ▪ Grey seal
Slyne Head Peninsula SAC (IE0000328)	80.9	▪ Bottlenose dolphin
Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau (UK0013117)	88.7	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Lower River Shannon SAC (IE0002165)	106.8	▪ Bottlenose dolphin
Rockabill to Dalkey Island SAC (IE0003000)	115.9	▪ Harbour porpoise
Lundy (UK0013114) SAC	117.2	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
North Anglesey Marine / Gogledd Môn Forol (UK0030398)	134.0	▪ Harbour porpoise
Croker Carbonate Slabs (UK0030381)	139.4	▪ Harbour porpoise ▪ Grey seal
Isles of Scilly Complex (UK0013694)	152.7	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Fal and Helford (UK0013112)	182.3	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Plymouth Sound and Estuaries (UK0013111)	198.9	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal
Pisces Reef Complex (UK0030379)	212.0	▪ Harbour porpoise ▪ Grey seal ▪ Harbour seal
North Channel (UK0030399)	220.8	▪ Harbour porpoise
Skerries and Causeway (UK0030383)	237.8	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal ▪ Harbour seal
The Maidens (UK0030384)	295.2	▪ Harbour porpoise ▪ Grey seal ▪ Harbour seal

Natura 2000 Site	Distance (km)	Relevant Annex II Species
Sound of Barra (UK0012705)	303.1	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Harbour seal
Solway Firth (UK0013025)	325.6	▪ Harbour porpoise
St Kilda (UK0013695)	334.3	▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Grey seal

Continuous Sound

The estimated unweighted source level for sound from survey vessels is approximately 184dB re 1 µPa @ 1m. Survey vessels will use thrusters sporadically throughout survey activities; therefore, the source level will fluctuate throughout the duration of survey activities and will only peak at approximately 184 dB re 1 µPa @ 1m for short periods.

The estimated sound levels exceed the thresholds for the onset of a temporary threshold shift, indicating that there is the potential for temporary auditory injury in cetaceans. However, the likelihood of potential injury has been assessed as low and limited to discrete windows during survey activities and only in close vicinity (<10m) to the works. It is assumed that all marine mammals will move away at a speed of 1.5m/s (Otani *et al*. 2000, Lepper *et al*. 2012) from a sound source level. This is considered conservative as there is data (McGarry *et al*. 2017, Kastelein *et al*. 2019, van Beest *et al.* 2018) to suggest that animals will, at least initially, move away at much higher speeds (e.g. harbour porpoise at 1.9m/s, Kastelein *et al*. 2019). During survey activities, survey vessels will be operating at lower speeds, therefore it is expected that any individuals in proximity to survey vessels will be able to move away from the area affected to avoid injurious noise levels. However, the action of moving away from a sound level is a behavioural response. Whether this can be considered disturbance relates to whether the animal(s) is significantly affected by the response e.g. whether the sound will lead to a change in the animals' condition. Immediately following either the vessels transit through the area or the survey activities overall, individuals will be able to return to the area.

There are no published guidelines available on disturbance thresholds due to the complexity and variability of the responses of marine mammals to anthropogenic disturbance. For the purposes of this assessment, the threshold for behavioural disturbance is 120dB re 1 µPa-2s (RMS) (Gomez *et al.* 2016, BOEM 2017, NMFS 2018) and has been used for continuous sound for all cetacean species. The likelihood of disturbance from continuous noise will depend on the types of vessel and cumulative effect of several vessels operating in the area.

Survey activities should be considered in the context of the existing baseline sound environment. There is relatively high shipping density, particularly in the coastal regions, suggesting that marine mammals in the area will be habituated to higher levels of underwater sound. The change in underwater sound caused by the addition of the survey vessels for the seismic survey activities will not be noticeable above natural and anthropogenic noise in the region.

Overall, effects of continuous underwater sound changes as part of the seismic surveys will be temporary and has been assessed as not significant.

Impulsive Sound

Air Guns

Offshore seismic surveys are conducted by a vessel towing acoustic sound sources (air guns) 5m to 10m below the sea surface along pre-determined survey lines. The air guns emit high intensity (usually

around 226 dB re 1 µPa for a single air gun or 242 to 252dB re 1 µPa for an array) and low frequency noise (under 200Hz frequency band with a broad peak around 20-120Hz and incidental sounds up to 22kHz) into the surrounding water by the release of bubbles of compressed air, which produces a primary energy pulse and an oscillating bubble. The air guns contain different chamber volumes designed to generate an optimal tuned energy output of specific frequencies.

Underwater noise generated from air guns during seismic surveys have the potential to impact marine mammals. Of particular note to the Natura 2000 sites identified in this assessment the harbour porpoise is a very high frequency (VHF) hearing group cetacean with an auditory bandwidth of 200 Hz – 180kHz, whereas the bottlenose dolphin is a mid/high frequency (HF) cetacean with a hearing range of 150Hz – 160 kHz. Seals have an auditory bandwidth of 75Hz – 75kHz in water (PCW) and 75Hz - 30 Hz in air (Southall *et al*., 2007). Therefore the sound source frequencies are outside of the hearing range of identified cetacean in the Natura 2000 sites, with Pinnipeds still within these hearing ranges. Despite this injury and disturbance can still occur due to the zero-to-peak sound pressure level (SPL) and cumulative sound exposure level (SEL) thresholds from such seismic sources. The impulsive SPL levels for different cetaceans are presented in Table 5-3. This presents the thresholds for onset of permanent threshold shift (PTS) and temporary threshold shifts (TTS) for marine mammal hearing groups (Southall *et al.,* 2019).

Table 5-3 Marine Mammal Threshold Levels To Noise

Auditory Group	Impulsive noise (Air gun)		- Non-impulsive noise (vessels, Chirper)	
	SPL (unweighted) - dB re 1 µPa (peak)		SEL (24 hr, weighted) - dB re 1 $\mu Pa^{-2}s$	
	PTS onset	TTS onset	PTS onset	TTS onset
LF	219	213	199	179
HF	230	224	198	178
VHF	202	196	173	153
PCW	218	212	201	181

LF – Low frequency; HF – high frequency; VHF – very high frequency, PCW – Pinniped carnivores in water.

Of these the most sensitive to high sound intensity over distance are those in the VHF group including harbour porpoises (Southall *et al.,* 2019). A 2013 study by Thompson *et al*. tested the harbour propose response to a seismic source. The results used a 2D seismic source of 242-253dB re 1 µPa, which recorded a SPL of 165 to 172 dB re 1 µPa at a distance in the region of 5-10 km from the source and a SEL 145-151dB re 1 µPa. A behavioural response was recorded with decrease in porpoise distribution in this 5-10km region, however results indicated that this decrease was temporary with activity resuming after several hours. Further analyses of the data did not observe large scale displacement of this cetacean species due to the seismic survey. This was further supported by studies of 3D seismic surveys on harbour porpoise in the North Sea undertaken by Sarnocinska *et al*., 2020, which recorded a reduction in activity 8-12km, but no general displacement from reference stations. Dolphins are thought to be less sensitive to this source, however have been recorded to show avoidance to seismic sources (Stone, 2003; Hastie *et al*., 2019 & Gurjão *et al*., 2004)

There have been few specific studies of pinniped responses to marine seismic surveys. Vessel-based monitoring has demonstrated tolerance to such sources with only slight avoidance and behavioural responses by pinnipeds. In contrast, initial telemetry-based work indicates that disturbance effects sometimes are stronger with temporary avoidance behaviour exhibited (Thompson *et al*., 1998).

The zone of ensonification based on the above seismic survey methods are dependent on the water properties and bathymetry. Research has shown that marine mammals can swim away from a sound source level at a speed of 1.5m/s (Otani *et al.* 2000, Lepper *et al.* 2012). This is considered conservative

as there is research to suggest that animals will move away at much higher speeds (e.g. harbour porpoise at 1.9m/s (McGarry *et al.* 2017, van Beest *et al*. 2018; Kastelein *et al.* 2019)), at least initially, and such avoidance behaviour has been recorded for such species in presence of seismic vessel. During survey activities, vessels will be operating at low speeds, therefore, it is expected that any individuals in proximity of survey vessels will be able to move outside of the zone of ensonification to avoid injurious noise levels. By employing a 1km mitigation zone from the seismic source and use of soft start procedures (DAHG, 2014), this will further allow marine mammals to avoid sound source before injury can occur.

In relation to seismic surveys, the UK JNCC have established an effective deterrent range (EDR) of 12km for seismic surveys (JNCC 2020). The EDR represents the limit range at which disturbance effects have been detected (for example avoidance behaviour) specifically for harbour porpoise (Crocker & Fratantonio 2016, Crocker *et al.* 2019). On this basis there is the potential for the seismic survey activities to induce a disturbance response in marine mammals, such as very high and high frequency cetacean species.

Evidence suggests that avoidance behaviour will be temporary, with individuals returning to the area affected once the sound has ceased (Bowles *et al.* 1994; Morton and Symonds 2002; Stone and Tasker 2006; Gailey *et al.* 2007; Stone *et al.* 2017). The species examined in this report are those offered protection by Natura 2000 sites. Other cetaceans including those with low frequency hearing ranges may be impacted differently.

The implementation of marine mammal mitigation measures while the use of air guns are ongoing will therefore reduce the injurious or disturbance effects to marine mammals.

As best practice certain mitigation can be adopted into the design of the seismic surveys to reduce the potential for a significant effect on the marine mammals. It is appropriate to follow the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014) to ensure disturbance to European Protected Species is minimised as far as possible.

5.1.2 Visual and above water noise disturbance

This pressure is defined as any disturbance caused by the survey activities that could have a significant effect on any qualifying species. This could be visual (the vessel transiting or stationary in the area), physical (the vessel is located in an area used by a qualifying species that may cause them to move elsewhere) or related to noise (from either the vessel or the survey equipment).

There is the potential that seabirds and marine mammals may be physically disturbed by the presence of survey vessels and equipment. Both visual and noise disturbance may result from the presence of the vessels and equipment whilst noise disturbance is likely to be the most significant cause of disturbance during borehole operations (considered in Section 5.2.2 below).

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

5.1.2.1 Marine mammals

Pinnipeds hauled out on land can be disturbed by the presence of vessels. In general, ships more than 1,500m away from hauled out grey or common seals are unlikely to evoke any reactions, between 900m and 1,500m seals could be expected to detect the presence of vessels and at closer than 900m a flight reaction could be expected (Brasseur & Reijnders,1994). The nearest SAC with pinniped as a QI is Slaney River Valley SAC, 25.7km distant. The flushing effect from the presence of vessels is therefore not considered to be an LSE.

Marine mammal presence and feeding behaviour reduces in response to increasing number of vessels (Roberts *et al.* 2019), however, vessel type and speed are important factors in the level of disturbance – the majority of negative reactions to vessels were caused by high-speed planing-hulled vessels (Oakley *et al.* 2017). Survey's will last for approximately four weeks and vessels will be travelling at a consistent slower speed through the site than the majority of vessels (operating at speeds of up to 4 knots) and will not be stationary in one area for longer than approximately one day.

It is therefore concluded that any disturbance to marine mammals from seismic survey activities will be temporary and will not have a significant effect.

5.1.2.2 Seabirds

Disturbance is predicted to be limited to that initiated by the movement of the survey vessels. Seabirds may take evasive action, but a single disturbance event does not have any immediate effect on the survival or productivity of an individual bird. Repeated disturbance, or disturbance over an extended period of time, can affect survival and productivity.

Although there is potential for underwater noise to impact on seabirds that forage at sea most birds spend the majority of time at or above the surface. Considering the proximity of the Site to the IOSEA6 Study Area, some noise related disturbance to coastal birds may occur, however it would be short-lived and unlikely to affect a species at a population level.

Physical presence of vessels may cause short term disturbance to birds that spend time offshore, however this is unlikely to affect species at a population level. In general, it is unlikely that the effects of seismic activities would significantly affect the conservation objectives of the qualifying features of the Site.

For these reasons it is not expected that the seismic survey activities will cause significant disturbance to the qualifying bird species. No specific mitigation has been proposed.

5.1.3 Collision above and below water with static or moving objects not naturally found in the marine environment

Shipping collision is a recognised cause of marine mammal mortality worldwide, the key factor influencing the injury or mortality caused by collisions is ship size and speed. Ships travelling at 14knots or faster are most likely to cause lethal or serious injuries. Reduction of speeds to less than 10knots was observed to reduce the risk of lethal injury to marine animals by 50% (Vancerlaan and Taggart, 2007 within Schoeman *et al.*, 2020). Although the presence of the survey vessels will marginally increase the level of vessel activity within the area for the duration of the marine survey works, none of the project vessels will be travelling at speeds exceeding 10knots.

Given that vessels will be operating at less than 10 knots, the risk of collision during seismic surveys is neither likely nor significant.

5.1.4 Temporary habitat disturbance including penetration and abrasion

All seismic surveys will be undertaken by a survey vessel with dynamic positioning and, therefore, no impacts from anchoring are anticipated.

The use of OBNs and OBC surveys could cause localised areas of seabed, and associated benthos, to be disturbed. Potential effects on the benthos include localised direct disturbance. Any immobile eggs, juveniles and shellfish present on the seabed around the operation area will be subject to direct seabed disturbance.

This pressure would only have the potential to result in adverse effects on SACs designated for benthic habitats within the IOSEA6 Study Area (IAOGP, 2016).

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 Study Area, habitat disturbance during seismic surveys is not likely.

5.1.5 Smothering and siltation rate changes

All seismic surveys will be undertaken by a survey vessel with dynamic positioning and, therefore, no impacts from anchoring are anticipated.

The use of OBN and OBC surveys could cause localised areas of seabed, and associated benthos, to be disturbed. Potential effects on the benthos include localised direct disturbance. Any immobile eggs, juveniles and shellfish present on the seabed around the operation area will be subject to direct seabed disturbance.

This pressure would only have the potential to result in adverse effects on SACs designated for benthic habitats within the IOSEA6 Study Area (IAOGP, 2016).

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 Study Area, significant rates of smothering and siltation during seismic surveys is not likely.

5.1.6 Hydrocarbon & PAH contamination

The likelihood of a large oil spill occurring from a survey vessel is extremely low and the risk is no greater than that for any other vessel in the IOSEA6 Study Area.

All survey vessels will have control measures and shipboard oil pollution emergency plans (SOPEP) in place and will adhere to the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements.

For these reasons it is not expected that there is a significant risk of hydrocarbon & PAH contamination from seismic survey activities.

5.2 Drilling Activity Aspects

5.2.1 Underwater noise changes

There is limited publicly available data on noise generated by borehole drilling. Therefore, examples of comparable projects have been used to estimate the impact of underwater noise from borehole drilling.

Underwater noise measurements were recorded from a jack-up barge (JUB) undertaking geotechnical boreholes in Swansea Bay, Wales. This activity involved a percussion corer used to take soft sediment samples and rotary coring used for hard rock samples. Sediment varied through the site from soft muds to coarse sand. Sediments were typically 20m thick overlying sedimentary mud rock or shale. These conditions are similar to those within the IOSEA6 Study Area (EMODnet, 2022), and therefore the noise measurements provided below have been used as an analogy. During soft sediment coring, in the Swansea survey, the highest SPL recorded (at 23m from the JUB) was 107 db re 1µPa (peak) at 10Hz. For hard rock drilling the highest SPL was also 107dB re 1µPa (peak) at 10Hz but it was recorded at 7.5m from the JUB (Willis *et al.,* 2010).

Noise generated by borehole drilling from a JUB were also measured in Western Australia. During geotechnical survey activities involving shallow core drilling to 16-17m in sand and mudstone source levels of 142–145 dB re 1 µPa rms @ 1 m (30–2000 Hz) were recorded (Erbe and McPherson, 2017).

5.2.1.1 Marine Mammals

Evidence reported in Nedwell and Brooker (2008) from a drilling operation with a comparable SPL of 162dB dB re 1 µPa concluded that avoidance ranges for cetaceans were <100m from the activity.

Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) (2011) use a reference value of 140 dB re. 1µPa (peak) for disturbance of harbour porpoise within European waters. A threshold of 145 dB re. 1µPa (peak) is used for pinnipeds in water based on research cited in Heinis and de Jong (2015).

The threshold for disturbance is lower than for injury, but activity will be short in duration at each location (12 hours for geotechnical boreholes). Marine mammals are therefore unlikely to be disturbed by noise from the geotechnical survey, unless they are in close proximity to the work. This is unlikely given that the presence of the survey vessel will likely lead to small-scale temporary displacement of marine mammals.

Implementation of the best practice measures, combined with the localised zone of influence and temporary nature of the seismic survey activities, will mean that disturbance effects to marine mammals will be temporary and not significant. There will be no long-term effect on the distribution of the species.

As best practice certain mitigation can be adopted into the design of the seismic surveys to reduce the potential for a significant effect on the marine mammals. It is appropriate to follow the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014) to ensure disturbance to European Protected Species is minimised as far as possible.

5.2.1.2 Fish

The source level frequency for borehole drilling may be within the auditory range of hearing specialist fish, and so may cause disturbance. However, borehole drilling is below the Sound Exposure Level (SEL) for a TTS or injury to hearing fish (Popper *et al.,* 2014). Therefore, borehole drilling will not cause a TTS or injury to fish during the seismic surveys. However, in the context of the baseline sound environment, the low frequency noise associated with borehole drilling for the seismic survey activities will not be distinct above natural and anthropogenic noise in the region. Any disturbance effects on fish from noise associated with operations will be localised, temporary and transient. There will be no long-term effect on the distribution of the species.

Without prejudice to this conclusion, it is relevant to note that the Department of Arts, Heritage and the Gaeltacht (DAHG) 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014); is proposed to mitigate underwater noise effect on marine mammals. Although not directly applicable to fish species, the principles in the guidance, namely use of soft-start and ramp-up procedures, and minimising the duration of noise generating surveys, will be of benefit to hearing sensitive fish species, further reducing the potential for effect.

5.2.2 Visual and above water noise disturbance

When considering noise generation associated with drilling activities the requirement for VSP/check-shot surveys is much less than for either 2D or 3D survey. Due to smaller air guns used, the small number and short duration of such surveys, and their point-source nature, the potential disturbance from these is vastly outweighed by the larger seismic surveys. Furthermore, stationary noises, such as drilling and production noises, outwith an immediate zone of discomfort to the animal, are believed to have a lesser effect in disturbing migration patterns and animal feeding, although data and observations are limited (Davis *et al*, 1990).

It is assumed; however, that there will be more activity associated with drilling than with seismic surveys and a resulted increase in disturbance. This could be visual (the vessels and support vessels/helicopters transiting or stationary in the area), physical (if the vessel is located in an area used by a qualifying species that may cause them to move elsewhere) or related to noise (from either the vessels or drilling equipment).

There is the potential that seabirds and marine mammals may be physically disturbed by the presence of drilling vessels and equipment and by support vessels. Disturbance can lead to physiological and behavioural responses which can affect demographic characteristics of the population. Responses to disturbance can result in loss of energy, impaired breeding, unrest through increased vigilance; and for seabirds, disruption to incubation, increased nest failures due to predation and nest abandonment (Valente *et al.,* 2011).

5.2.2.1 Marine Mammals

A maximum of two vessels (acquisition vessel and a guard vessel) is expected to be used during a typical seismic survey. During exploration drilling the maximum number vessels predicted is five (drill rig, support vessels and transport vessels). Impacts are predicted to be reversible except in the case of a vessel strike in which case the impact would be irreversible (i.e. could lead to mortality). However due to the likelihood of animals showing some degree of habituation to vessel noise, the potential for more than a minor shift from baseline is considered unlikely.

It is assumed that all marine mammals will move away at a speed of 1.5m/s (Otani *et al*. 2000, Lepper *et al*. 2012) from a sound source level. This is considered conservative as there is data (McGarry *et al.* 2017, Kastelein *et al.* 2019, van Beest *et al.* 2018) to suggest that animals will, at least initially, move away at much higher speeds (e.g. harbour porpoise at 1.9m/s, Kastelein *et al.* 2019). In addition, vessels will be operating at lower speeds, therefore it is expected that any individuals in proximity to the survey vessel will be able to move away from the area affected to avoid injurious noise levels. Whilst the action of moving away from a sound level is a behavioural response, animals will be able to return to the area immediately following the vessels transit through the area.

The impact is predicted to be of local spatial extent, medium term duration (two month drilling period), intermittent, and both reversible (in the case of increased noise), and irreversible (in the case of a collision).

For these reasons it is not expected that the proposed drilling activities will cause significant disturbance to the marine mammals. No specific mitigation has been proposed; however, measures proposed in Section 6 will also mitigate against visual and above water disturbance.

5.2.2.2 Seabirds

Seabird species vary in their reactions to ship and helicopter traffic such as occurs during maintenance of offshore wind farm turbines. Some diving birds, such as Greater scaup, dive or hide when low-flying helicopters approach (Austin *et al.* 2000) and are disturbed by passing ships up to 400m away (Platteeuw and Beekman 1994), whilst some seabirds such as fulmars and shearwaters, appear to show little or no disturbance response to boats, and little response to aircraft.

For these reasons it is not expected that the proposed drilling activities will cause significant disturbance to the qualifying bird species. No specific mitigation has been proposed.

5.2.3 Collision above and below water with static or moving objects not naturally found in the marine environment

The current level of vessel activity within the IOSEA6 Study Area is low (<0.5 – 0.5 vessel hours per km), other than Celtic Sea Basin which is higher (2 – 5 vessel hours per km). The increased vessel movements associated with seismic and exploration drilling activities will be negligible.

The risk of collision with marine mammals is likely to be affected by vessel type, speed, and ambient noise levels. Laist et al. (2001) predicted the most severe injuries from collision with vessels when travelling at over 14 knots.

Marine mammals may be more vulnerable to collision risk if they are not able to detect the approach of a vessel. For example, sound produced during piling operations may mask the presence of vessels,

leading to reduced detection and avoidance by marine mammals which could lead to increased potential for vessel strikes to occur.

It is considered that there is a high likelihood of avoidance from both increased vessel noise and collision risk, with both a high potential for recovery (< 1 year) for increased noise, and medium potential for recovery for collision risk reflecting the low likelihood of collision and potential for non-lethal collision to occur.

For these reasons it is not expected that the proposed drilling activities will cause significant risk of collision. No specific mitigation has been proposed.

5.2.4 Temporary habitat disturbance including penetration and abrasion

Small areas of habitat will be disturbed by the placement of drilling rigs on the seabed and the deposition of drill risings from the geotechnical boreholes; approximately 16m^2 per borehole.

This pressure would only have the potential to result in adverse effects on SACs designated for benthic habitats within the IOSEA6 study area (IAOGP, 2016).

Best practice should be followed in order to limit dragging of anchors and chains. This could include detailed best-fit anchor planning around protected features, minimisation of anchor wire/chain touchdown using flotation or heavier chain or anchors and pre-laying anchors using ROV. Where possible, the use of a DP mobile offshore drilling unit is recommended. This means no anchoring required and physical interaction with the seabed limited to a small area around the wellhead.

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 study area, significant habitat disturbance during drilling activities is not likely.

5.2.5 Smothering and siltation rate changes

A small volume of sediment (the exact amount is dependent on the sediment type) will be dispersed and subsequently re-deposited below the drilling rig and over an area of 1 m^3. This small area is due to the sonic drilling action used by the selected drilling rig. This may result in smothering of fauna (Dijkstra et al. 2020), however due to the small amount of sediment dispersed from the borehole, recovery is expected. Due to the small volume of sediment expected to be dispersed is not expected to alter siltation rates in the area beyond the initial redistribution at the time of the drilling activity.

Best practice should be followed to minimise the amount of excess cement deposited on the seabed and mud recovery systems should be used to minimise the amount of drill fluids eventually discharged.

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 study area, significant rates of smothering during drilling activities are not likely.

5.2.6 Physical change (to another sediment type)

Depositions on the seabed will result in a physical change to the seabed characteristics. Routine discharges of OBMs from cuttings or centrifuges are not permitted in Irish waters. The Department of Communications, Energy and Natural Resources (DCENR) (now DECC) rules and procedures manual (DCENR, 2010) states that such material must be circulated back up from the wellbore to the drilling deck and stored for shipment ashore to appropriate treatment and disposal facilities.

Best practice should be followed to minimise the amount of excess cement deposited on the seabed.

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 study area, significant physical change as a result of drilling activities is not likely.

5.2.7 Sediment contamination / potential for bioaccumulation in food chain

Impacts of chemicals are a result of a combination of persistence, bioaccumulation and toxicity (PBT). While the majority of chemicals used during offshore oil and gas operations are relatively benign, there is the potential for localised contamination of sediments through chemical discharges.

OSPAR have issued various Decisions, Agreements, Strategies and Recommendations relating to the use of chemicals and additives in Oil and Gas exploration, including the OSPAR Decision on the Harmonised Mandatory Control Scheme (HMCS) which includes a list of chemicals considered to pose little or no risk to the environment (PLONOR List), a List of Chemicals for Priority Action (LCPA) and list of Substances of Possible Concern. All chemicals used are regulated under the OSPAR HOCNF scheme and approved by use of a permits for use and discharge of added chemicals (PUDAC). Selection of all chemicals that may be used in drilling the proposed wells should be based upon both their technical specifications and their environmental performance, and the use of all chemicals minimised where practicable.

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 study area, significant rates of sediment contamination during drilling activities are not likely.

5.2.8 Deterioration of water quality / toxic effects on species

Marine water column organisms are at a low risk of harm from chemical discharges because of rapid dilution and dispersal of chemicals. Impacts of chemicals are a result of a combination of persistence, bioaccumulation and toxicity (PBT). While the majority of chemicals used during offshore oil and gas operations are relatively benign, there is the potential for localised contamination of sediments through chemical discharges.

Biological effects on seabed communities from the discharge of WBM and associated cuttings are usually subtle or undetectable. Monitoring studies around well sites drilled with WBMs have rarely shown any effects to benthic infauna (at a community level) detectable beyond 50 m. Subtle impacts to the benthos were identified at up to 750 m from a production site developed using WBMs, but these were associated with hydrocarbon contamination (Hartley & Bishop, 1986).

As no Natura 2000 sites are located either entirely or partly within the IOSEA6 Study Area, significant deterioration of water quality during drilling activities is not likely.

5.2.9 Hydrocarbon & PAH contamination

The likelihood of a large oil spill occurring from vessels is extremely low and the risk is no greater than that for any other vessel activity in the area. All drilling and support vessels will have control measures and shipboard oil pollution emergency plans (SOPEP) in place and will adhere to the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements.

During drilling activities, there is a risk of spillage of oil (fuel/crude), and spillage or leakage of chemicals. Additionally, there is the risk of shallow gas blowouts which could have major direct and indirect impacts on Natura 2000 site and associated features.

The Irish Shelf Petroleum Studies Group (ISPSG) of the Petroleum Infrastructure Programme (PIP) commissioned a modelling study to understand the effects of oil spill from currently authorised blocks in Irish Waters, as part of the West & South Coast Oil Spill Response Environmental Sensitivity Mapping Study (ERM, 2019). The modelling study identifies high risk areas in the context of offshore drilling activities from accidental oil spill events. The oil spill modelling was conducted from the following basins and from each basin a centralised location was used:

1. Porcupine Basin (North);
2. Porcupine Basin (South);

3. North Celtic Sea Basin (West);
4. North Celtic Sea Basin (Central);
5. North Celtic Sea Basin (East); and
6. Central Irish Sea Basin.

The Slyne basin, relevant to this IOSEA6 Study Area was not modelled as the basin is known to contain gas/condensate and poses very little risk to the shoreline. For this investigation, stochastic modelling methods were employed. A historical record of ocean currents and winds spanning several years is used in stochastic modelling. Throughout the dataset, identical spill scenarios are released at regular intervals, subjecting each release to various ocean currents and winds. This method illustrates the variety of events that could result from that spill scenario.

The findings of stochastic modelling are frequently used to determine the "worst" case scenario, such as the lowest arrival time or the highest amount of oil on the shoreline. This is helpful for planning, but it could give the impression that a spill situation is much worse than it actually is. Therefore, care should be taken while interpreting the findings. Finding of the modelling were as follows (ERM, 2019):

1. Porcupine Basin (North): Impact to the west coast of Ireland, from County Mayo to Cork. The probability of impact to shoreline locations is less than 10 %, apart from County Kerry where 21% of the simulations impacted.
2. Porcupine Basin (South): There was no impact above the threshold value of the threshold value of 0.1l/m2.
3. North Celtic Sea Basin (West): Impact to the counties of Clare, Kerry and Cork in the south-west of Ireland. The majority of the impact is across Kerry and the western side of Cork where up to 47% of the simulations impacted County Cork. The IOSEA6 Study Area does not permit authorisations from this area, therefore results from this scenario are not considered further.
4. North Celtic Sea Basin (Central): impact to the west and southern coast from County Mayo to County Wexford. The highest probability of impact occurs within County Cork where 93% of simulations resulted in shoreline impact to the county.
5. North Celtic Sea Basin (East): Impact to the southern coast from County Kerry to County Wexford. The highest probability of impact occurs within County Cork where 71% of simulations resulted in shoreline impact to the county. This scenario also impacts the coast of Cornwall, England and Pembrokeshire, Wales, with less than 25% of simulations impacting these shorelines.
6. Central Irish Sea Basin: Impact to the south and east coast from County Cork to County Dublin. The highest probability of impact occurs within County Wexford where 81% of simulations resulted in shoreline impact. This scenario also impacts the west coastline of Wales, with shoreline impacts from up to 95% of simulations. Lower probability of impact to shoreline locations is also identified along the coastline of County Down, Northern Ireland; Isle of Man; Lancashire and Cumbria, England and County of Wigtownshire, Dumfries and Galloway; Scotland.

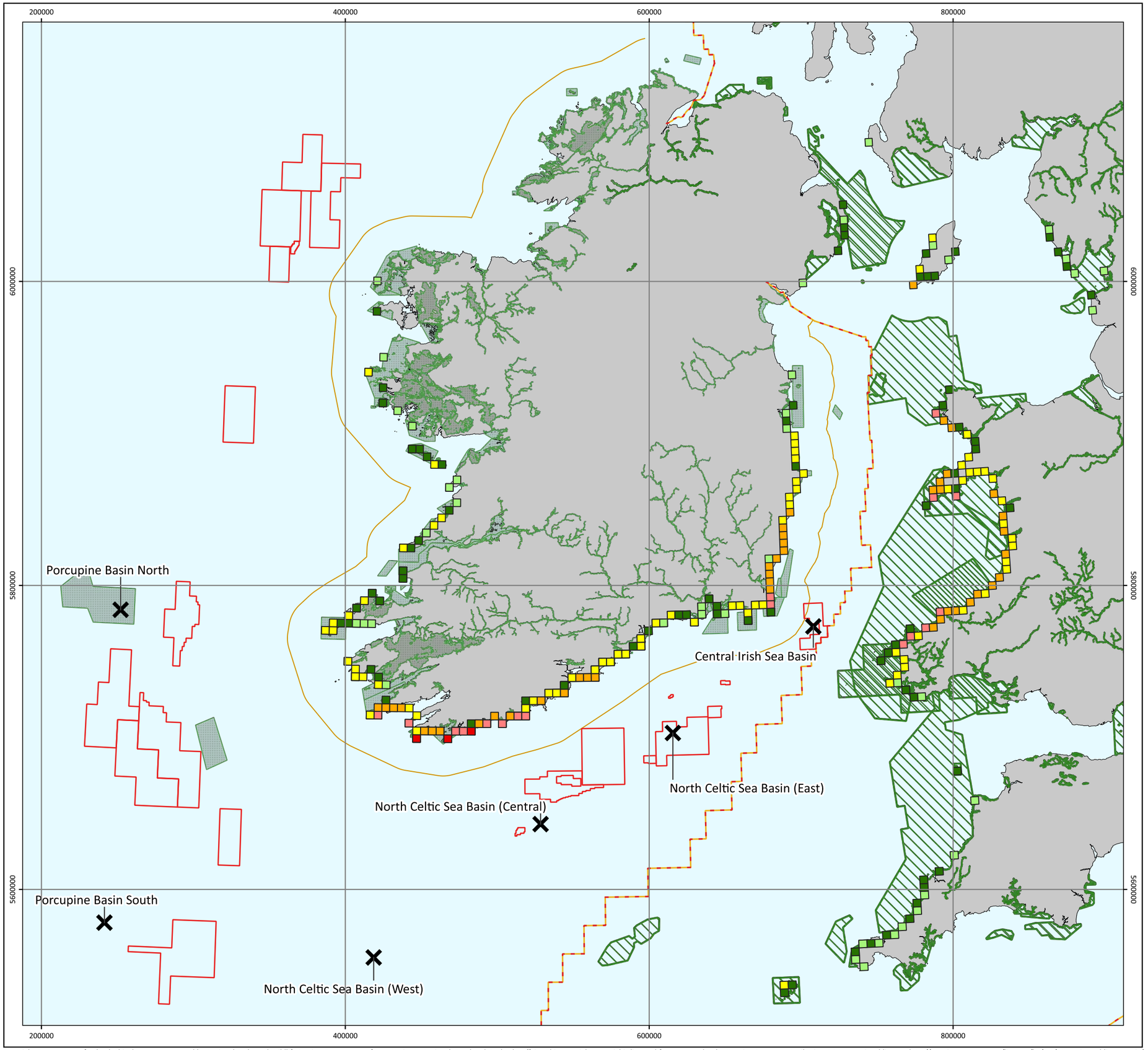
The probability of potential oil spill shoreline impacts on Irish and UK Natura 2000 sites from Scenarios 1, 4, 5 and 6 is shown in Figure 5-1 (Drawing Reference P2510-OIL-001-A) and Figure 5-2 (Drawing Reference P2510-OIL-002-A), for SACs and SPAs respectively. Probability helps to estimate how likely an area is to being impacted from a realistic case simulation. Releases were modelled under stochastic conditions for a 30 day release duration of Group 2 crude oil. A duration of 30 days is considered to be the typical time to install a capping stack (ERM, 2019).

IOSEA6 – Natura Impact Statement

PROTECTED SITES

Potential Oil Spill Shoreline Impact on SACs

Drawing No: P2510-OIL-001-A	A



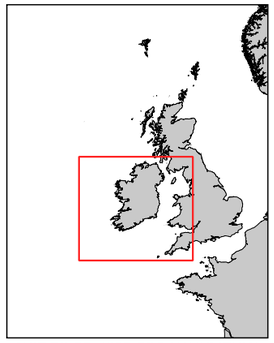
Legend

- IOSEA6 Study Area
- Modelled Spill Location
- 12 NM Limit
- EEZ Boundary
- ROI SAC
- UK SAC

Probability

- < 1 %
- 1 - 5 %
- 5 - 25 %
- 25 - 50 %
- 50 - 75 %
- 75 - 95 %
- > 95 %

N



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Created By	Lewis Castle
Reviewed By	Emma Kilbane
Approved By	Emma Langley

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0 30 60 90 120 km

IOSEA6 – Natura Impact Statement

PROTECTED SITES

Potential Oil Spill Shoreline Impact on SPAs

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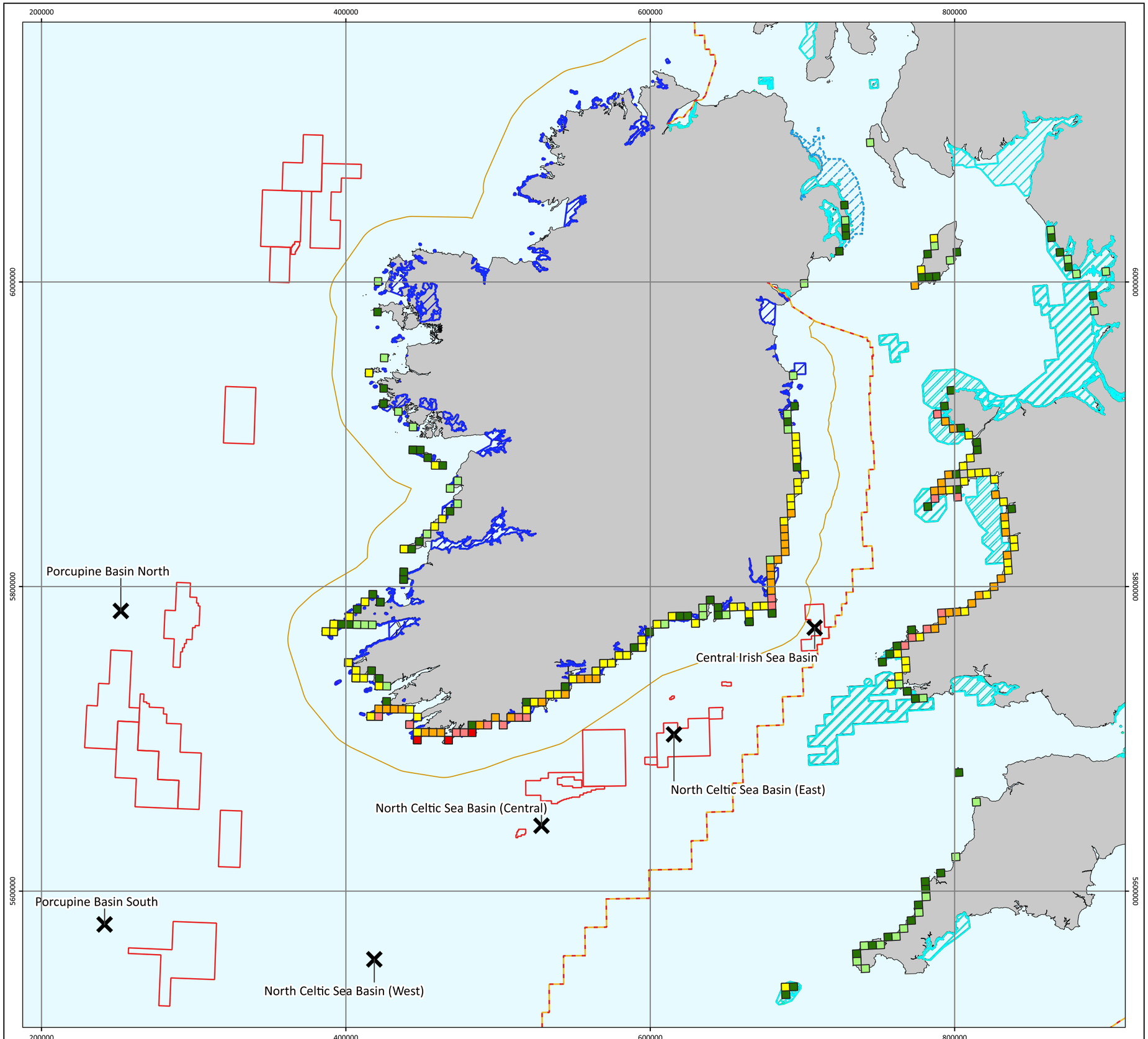


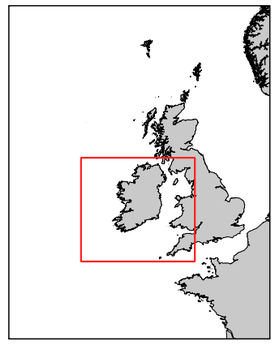
Legend

- IOSEA6 Study Area
- Modelled Spill Location
- 12 NM Limit
- EEZ Boundary
- ROI SPA
- UK SPA
- UK pSPA

Probability

- < 1 %
- 1 - 5 %
- 5 - 25 %
- 25 - 50 %
- 50 - 75 %
- 75 - 95 %
- > 95 %

N



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File Reference	J:\P2510\Mxd\15_OIL \P2510-OIL-001.qgz
Created By	Lewis Castle
Reviewed By	Emma Kilbane
Approved By	Emma Langley

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intertek

0 30 60 90 120 km

The Natura 2000 sites with the higher probability (75-95%) of shoreline impact from potential oil spills are listed in Table 5-3 for Irish sites and Table 5-4 for UK sites.

Table 5-4 Irish Natura 2000 sites with higher probability of shoreline impact from potential spill

Natura 2000 Site	Distance (km)	Protected species	Basin Modelled producing high shoreline impact (75-95%)
Barley Cove to Ballyrisode Point SAC	72.5	▪ *Petalophyllum ralfsii* ▪ Mudflats and sandflats not covered by seawater at low tide ▪ Perennial vegetation of stony banks ▪ Salicornia and other annuals colonizing mud and sand Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) ▪ Mediterranean salt meadows (*Juncetalia maritimi*) ▪ Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) ▪ Fixed coastal dunes with herbaceous vegetation (grey dunes) ▪ European dry heaths	▪ North Celtic Sea Basin (Central)
Roaringwater Bay SAC	53.3	▪ Harbour porpoise ▪ Otter ▪ Grey seal ▪ Large shallow inlets and bays ▪ Reefs ▪ Vegetated sea cliffs of the Atlantic and Baltic Coasts ▪ European dry heaths ▪ Submerged or partially submerged sea caves	▪ North Celtic Sea Basin (Central)
Lough Hyne Nature Reserve and Environs SAC	48.2	▪ Large shallow inlets and bays ▪ Reefs ▪ Submerged or partially submerged sea caves	▪ North Celtic Sea Basin (Central)
Sheeps Head to Toe Head SPA	45.5	▪ Peregrine falcon (*Falco peregrinus)* ▪ Red-billed chough (*Pyrrhocorax pyrrhocorax*)	▪ North Celtic Sea Basin (Central)

Table 5-5 UK Natura 2000 sites with higher probability of shoreline impact from potential spill

Natura 2000 Site	Distance (km)	Protected species	Basin Modelled producing high shoreline impact (75-95%)
Pembrokeshire Marine/ Sir Benfro Forol SAC	20.1	▪ Sandbanks which are slightly covered by sea water all the time ▪ Estuaries ▪ Mudflats and sandflats not covered by seawater at low tide ▪ Coastal lagoons ▪ Large shallow inlets and bays ▪ Reefs ▪ Atlantic salt meadows ▪ Submerged or partially submerged sea caves ▪ Sea lamprey ▪ River lamprey. ▪ Allis shad ▪ Twaite shad ▪ Bottlenose dolphin. ▪ Harbour porpoise ▪ Otter ▪ Grey seal ▪ Shore dock (*Rumex rupestris*)	▪ Central Irish Sea Basin
West Wales Marine / Gorllewin Cymru Forol SAC	19.8	▪ Harbour porpoise	▪ Central Irish Sea Basin
Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC	88.7	▪ Sandbanks which are slightly covered by sea water all the time ▪ Estuaries ▪ Mudflats and sandflats not covered by seawater at low tide ▪ Coastal lagoons ▪ Large shallow inlets and bays ▪ Reefs ▪ Salicornia and other annuals colonizing mud and sand	▪ Central Irish Sea Basin

Natura 2000 Site	Distance (km)	Protected species	Basin Modelled producing high shoreline impact (75-95%)
		▪ Spartina swards (*Spartinion maritimae*) ▪ Atlantic salt meadows ▪ Submerged or partially submerged sea cave ▪ Sea lamprey ▪ River lamprey ▪ Allis shad ▪ Twaite shad ▪ Bottlenose dolphin ▪ Harbour porpoise ▪ Otter ▪ Grey seal	
Glannau Aberdaron ac Ynys Enlli/ Aberdaron Coast and Bardsey Island SPA	85.5	▪ Manx shearwater (*Puffinus puffinus*) ▪ Red-billed chough	▪ Central Irish Sea Basin
Ramsey and St David`s Peninsula Coast	36.1	▪ Red-billed chough	▪ Central Irish Sea Basin

5.2.9.2 Marine mammals

The higher risk Irish Natura 2000 sites based with marine mammals as a feature is Roaringwater Bay SAC (53.3km from IOSEA6 Study Area) designated for, harbour porpoise, otter and grey seal. Transboundary sites are Pembrokeshire Marine SAC (20.3 km) designated for bottlenose dolphin, harbour porpoise, otter and grey seal; West Wales Marine SAC (19.8 km), designated for harbour porpoise; and Pen Llŷn a`r Sarnau SAC (88.7 km) designated for bottlenose dolphin, harbour porpoise, otter and grey seal.

It has been rare for cetaceans to be affected following a spill; they may be able to avoid affected areas and are not believed to be susceptible to the physical impacts of oil and oil emulsion lowering their resistance to the cold. Contact with oil may cause irritation of the skin and mucus membranes. Volatile hydrocarbon fractions may also cause respiratory problems. Chronic ingestion of sub-toxic quantities of oil may have subtle effects which would only become apparent through long-term monitoring. The transfer of hydrocarbons through the mother's milk to suckling young is another way oil affects cetaceans. It is also possible that oil pollution impairs cetacean immune systems and causes secondary bacterial and fungal infections.

The grey seal and harbour seal are native to Irish waters. Both species have established themselves in terrestrial colonies (or haul-outs) along all coastlines of Ireland and the UK. Seals are susceptible to oiling and the contamination of food sources, particularly in the coastal areas around their colonies, where their density is highest. While they come ashore throughout the year, the majority of grey seals remain close to shore during the breeding and moulting seasons; September to April. Harbour seals undergo a similar cycle between June and September, although they continue to forage at sea throughout their breeding season. New-born pups are considered most at risk from oil coming ashore.

The potential for significant impact of hydrocarbon spills on seal populations is expected to be seasonal and limited to those periods of time when the population is close to shore, during breeding and moulting.

Otters are found on the shores of Ireland where the numerous rivers and estuaries that flow into the Atlantic, Celtic and Irish Seas provide a suitable habitat for them. There is little evidence of impact on European otters by oil spills, although food sources may be contaminated. However, thermoregulatory abilities of otters (and seals) can be impaired when their fur comes into contact with oil.

5.2.9.3 Fish

There are no Irish Natura 2000 sites within the higher risk probability range which have fish as a qualifying feature. Transboundary sites are Pembrokeshire Marine SAC (20.3 km) and Pen Llŷn a`r Sarnau SAC (88.7 km) both designated for sea lamprey, river lamprey, allis shad, and twaite shad. Fish populations remain relatively unaffected by oil pollution in the offshore environment, as oil concentrations below the slick are generally low. There is also evidence that fish are able to detect and avoid oil-contaminated waters. This avoidance may cause disruption to migration or spawning patterns. Heavily contaminated sediments may have an adverse effect on local populations of demersal fish species, due to the impact it has on the food chain.

Fish eggs and larvae are more vulnerable to oil pollution than adults. In many fish species, these stages float to the surface where contact with spilt oil is more likely. However, as most fish species have extensive spawning grounds and produce large numbers of pelagic young, there is unlikely to be any effect on numbers in the adult populations. Stocks may be at risk from a spill if it is very large, coincides with spawning periods, or enters the grounds of species with restricted spawning areas.

There are increased risks to some species and life stages of fish in shallow nearshore waters. These foreshores are believed to function as essential feeding and "nursery" breeding grounds for many fish.

The potential for significant impact of hydrocarbon spills on designated fish species is therefore expected to be seasonal and limited to those periods of time when these species are in shallow, near-

shore waters. Nursery breeding grounds for these designated fish species are identified in freshwater above the zone of tidal influence and therefore outwith the coastal zone considered most at risk of oil pollution from an oil spill at sea.

5.2.9.4 Seabirds

The higher risk Irish Natura 2000 sites based with seabirds as a feature is Sheeps Head to Toe Head SPA (45.5km from IOSEA6 Study Area) designated for peregrine falcon and red-billed chough. Transboundary sites are Aberdaron Coast and Bardsey Island SPA (85.5 km) designated for manx shearwater and red-billed chough and Ramsey and St David's Peninsula Coast SPA (36.1 km) designated for red-billed chough.

All SPAs along the adjacent Irish and UK Coastline have been identified for further consideration. Notwithstanding the very low likelihood of a hydrocarbon spill event occurring, the bird populations within the SPAs are considered vulnerable both to:

- Direct physical effects of fouling affecting capacity for flight, thermo-regulation etc, impacting potentially large numbers of individual birds; and
- Toxicological impacts of spilled hydrocarbons washing up onto the coastal zone creating a pathway for toxicity to enter the lower trophic levels supporting the designating bird assemblages.

Impact on SPA conservation objectives for many sites could also be expected to be seasonal in nature.

Any seabirds on the water surface would be potentially at risk from any spilled hydrocarbon, whether it is derived from the drilling vessel or fluids in the air gun array. Furthermore, hydrocarbon spills due to shipping accidents could occur inshore in shallow waters, in which case a greater range of physical, biological and socio-economic receptors may be directly impacted thus assuming a greater significance.

Spills far offshore in winter would be less deleterious to seabirds than one occurring near the coast in late spring-early summer when seabirds have returned to land to breed. Any spills that occur would be small and localised and therefore would have at most a minor effect on seabird populations in the IOSEA6 Study Area.

A blowout, loss of hydrocarbons during bunkering or from a leak from a pipeline are by far the worst events that could occur at a drilling rig with respect to seabirds. It is not the quantity of oil that is spilled that is the most important factor, however, but the timing of the spill that is critical (Burger, 1993). Bird density, wind velocity and direction, distance to shore and temperature are important factors with regard to mortality resulting from a slick of spilled oil.

The worst-case scenario for the IOSEA6 Study Area would be a leak of crude oil into the sea in early summer (late June/early July), with a strong onshore breeze. This would lead to oil being blown towards the coast when there are large numbers of breeding seabirds and recently fledged young (mainly auks) present in the area.

5.2.9.5 Benthic habitats

The higher risk Irish Natura 2000 sites based with benthic mammals as a feature are Barley Cove to Ballyrisode Point SAC (72.5 km), Roaringwater Bay SAC (53.3 km), and Lough Hyne Nature Reserve and Environs SAC (48.2 km). All of these sites are designated for marine habitats. Transboundary sites are Pembrokeshire Marine SAC (20.3 km) and Pen Llŷn a`r Sarnau SAC (88.7 km) both designated for sea lamprey, river lamprey, allis shad, and twaite shad also designated for multiple benthic habitats including mudflats and reefs.

Effects on the benthos and coastal habitats include smothering, acute toxicity and possible organic enrichment. However, since oil spills primarily affect the surface water layers, impacts to the seabed

and benthos will be minimal offshore and influenced by water depth and local hydrography. Coastal habitats may be vulnerable to the following impacts/effects:

- Physical smothering of organisms ;
- Penetration of oil into soft sediments potentially causing toxic conditions for resident species (worms, molluscs, crustaceans) with resultant impacts on viability of sediments as feeding grounds, affecting food source for bird and other species;
- Sub-lethal toxicological effects which may be magnified up the trophic levels;
- Direct oil contact affecting a range of species; bird species flight ability, thermoregulation capacity and resulting in potential toxicological and respiratory impacts; and
- Impacts on breeding success of designating species.

Based on data relating to hydrocarbon spill risks from both Irish and the adjacent UK oil and gas sectors, the probability of significant quantities of hydrocarbons reaching the Irish and UK coast and posing a threat to the integrity of Natura 2000 sites is small and is further reduced by mitigation measures in place and by the requirements set out within the Oil Spill Contingency Plan (OSCP) which will be applied to each individual drilling activity.

Taking all reasonable measures to avoid releases to sea is normal practice during such operations. Operations will be planned to minimise any risk of major unplanned releases. However, if such an event occurred, two levels of mitigation will be followed

- Control: In the event of a release occurring, the field OPEP will be put into operation. For any unplanned releases related to the vessel the SOPEP will be followed to minimise any potential impacts.
- Remediation: This would utilise the range of resources available, such as, e.g., aerial surveillance, dispersant spraying capability, natural dispersion, trained staff, etc. Should an unplanned event occur, following immediate containment actions, the operator will contact the regulator and statutory consultees for further advice.

It can be concluded that although unlikely, the residual impact of a worst-case scenario major hydrocarbon spill affecting any or many Natura 2000 sites remains potentially significant. Mitigation measures are provided in Section 6.3 to reduce the likelihood of LSE; however, mitigation must be reassessed at Project level to determine appropriateness and effectiveness.

5.3 In-combination Effects

The Habitats Directive requires that plans or projects are assessed alone and in-combination with other plans or projects to determine whether an LSE to Natura 2000 sites could occur. Only plans or projects that would increase the likelihood of significant effects should be considered.

The following foreshore applications, for projects with activities similar to IOSEA6, have been made in 2022:

- FS007354 Site Investigations for the proposed Kinsale Project offshore wind farm, off County Cork (located approximately 14km from Natura 2000 sites screened into this NIS);
- FS007151 Sunrise Wind Ltd., Site Investigations for the proposed Sunrise Offshore Wind Farm, off Counties Dublin and Wicklow (overlaps Natura 2000 sites that have been screened into this NIS);
- FS007161 Fuinneamh Sceirde Teoranta - Site Investigations for the proposed Sceirde Rocks Offshore Wind Farm (located <1km from Natura 2000 sites screened into this NIS);
- FS007543 Fuinneamh Sceirde Teoranta - Site Investigations for the proposed Sceirde Rocks Offshore Wind Farm (Export Cable Corridor) (located <1km from Natura 2000 sites screened into this NIS);

- FS007063 Aigean Renewables Ltd., Site Investigations for the proposed Moneypoint Offshore Wind Array, off County Kerry (located adjacent to Natura 2000 sites screened into this NIS);
- FS007392 Lir Offshore Array Ltd., Site Investigations for the proposed Lir Offshore Array, off Counties Louth, Meath and Dublin (overlaps Natura 2000 sites that have been screened into this NIS);
- FS007509 Rosslare Europort Offshore Wind Hub Site Investigations;
- FS007283 Banba Wind Ltd., Site Investigations for proposed Offshore Wind Farm, off Counties Wicklow and Dublin (overlaps Natura 2000 sites that have been screened into this NIS);
- FS007163 Wicklow Sea Wind Ltd., Site Investigations for the proposed Wicklow Project offshore wind farm, off County Wicklow (located approximately 2.6 km from Natura 2000 sites screened into this NIS); and
- FS007546 Codling Wind Park Ltd. Site Investigations for proposed Offshore Wind Farm, off Counties Wicklow and Dublin (overlaps Natura 2000 sites that have been screened into this NIS).

Given the limited scope and short-term, transient nature of the proposed survey works and existing background levels of disturbance, no significant in-combination or cumulative effects on Natura 2000 sites are expected.

The proposed mitigation measures (Section 6) mean IOSEA6 will have no residual LSE; therefore, there can be no in-combination effect with any proposed or existing projects or plans.

5.4 Summary

A summary of the assessment of LSEs during seismic surveys and drilling activities have been provide in Table 5-3 and Table 5-4:

Table 5-6 Summary of Assessment of LSE – Seismic Surveys

Identified Pressure	Qualifying Interests	Assessment Conclusion	Mitigation
Underwater noise changes	Fish	Not significant	No mitigation necessary
	Marine mammals	LSE	Follow the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014)
Visual and above water noise disturbance	Marine mammals	Not significant	No mitigation necessary
	Seabirds	Not significant	No mitigation necessary
Collision above and below water with static or moving objects not naturally found in the marine environment	Marine mammals	Neither likely nor significant	No mitigation necessary
Temporary habitat disturbance including	Benthic habitats	Neither likely nor significant	No mitigation necessary

Identified Pressure	Qualifying Interests	Assessment Conclusion	Mitigation
penetration and abrasion			
Smothering and siltation rate changes	Benthic habitats	Neither likely nor significant	No mitigation necessary
Hydrocarbon & PAH contamination	Marine mammals	Not likely	No mitigation necessary
	Fish	Not likely	No mitigation necessary
	Seabirds	Not likely	No mitigation necessary
	Benthic habitats	Not likely	No mitigation necessary

Table 5-7 Summary of Assessment of LSE – Drilling Activities

Identified Pressure	Qualifying Interests	Assessment Conclusion	Justification
Underwater noise changes	Annex II fish	Not significant	No mitigation necessary
	Marine mammals	Not significant	Follow the DAHG 'Guidance to Manage the Risk to Marine Mammals from Man-made sound sources in Irish Waters' (DAHG 2014)
Visual and above water noise disturbance	Marine mammals	Not significant	No mitigation necessary
	Seabirds	Not significant	No mitigation necessary
Collision above and below water with static or moving objects not naturally found in the marine environment	Marine mammals	Not significant	No mitigation necessary
Temporary habitat disturbance including penetration and abrasion	Benthic habitats	Neither likely nor significant	No mitigation necessary
Smothering and siltation rate changes	Benthic habitats	Neither likely nor significant	No mitigation necessary
Physical change (to another sediment type)	Benthic habitats	Neither likely nor significant	No mitigation necessary

Identified Pressure	Qualifying Interests	Assessment Conclusion	Justification
Sediment contamination / potential for bioaccumulation in food chain	Benthic habitats	Neither likely nor significant	No mitigation necessary
Deterioration of water quality / toxic effects on species	Benthic habitats	Neither likely nor significant	No mitigation necessary
Hydrocarbon & PAH contamination	Marine mammals	LSE	Pollution prevention and control mitigation provided
	Fish	LSE	Pollution prevention and control mitigation provided
	Seabirds	LSE	Pollution prevention and control mitigation provided
	Benthic habitats	LSE	Pollution prevention and control mitigation provided

Mitigation measures are therefore recommended for the following identified pressures assessed as being LSE's:

- Underwater noise changes
- Hydrocarbon & PAH contamination

6. PROPOSED MITIGATION MEASURES

In this section generic mitigation measures are recommended for the identified pressures assessed as having potential for LSE's. Continued and detailed assessment is required at the individual project level to ensure that the Draft Plan will not adversely affect the integrity of any relevant Natura 2000 sites in view of the conservation objectives of these sites.

6.1 Imbedded Mitigation

Certain measures are incorporated as adherence to standard industry best practices or embedded mitigation which is fundamental to how the project will be executed. Details of the embedded mitigation which DECC recommend to implementing, and hence has been considered by this NIS are presented in Table 6-1. All embedded mitigation will be included within the Construction Environmental Management Plan (CEMP). Additional mitigation has been suggested on a receptor specific basis informed by the impact assessments. During the assessment of impacts in the receptor specific assessment sections, all proposed mitigation is considered when assessing the significance of an impact.

Table 6-1 Embedded mitigation and best practice measures relevant to the project

Measure	Details
Production of a Construction Environmental Management Plan (CEMP)	Measures will be adopted to ensure environmental impacts are minimised, and to reduce the potential for release of pollutants from installation works.
All project personnel will be trained and informed of their responsibility to implement the environmental and ecological mitigation outlined in the CEMP	Toolbox talks, inductions, and awareness notices will be used to disseminate this information among all relevant project personnel.
Environmental planning.	Positioning of boreholes will be optimised as part of the final engineering design to avoid impacts on sensitive environmental features, including Annex I habitats insofar as possible.
Scottish Marine Wildlife Watching Code (SMWWC)	All vessels will adhere to the provisions of the SMWWC during installation works. NatureScot developed the Code as part of its duties under the Nature Conservation (Scotland) Act 2004. The Code was first published in 2006 and was revised in 2017. The code aims to minimise disturbance to marine wildlife.
Adherence to official guidelines "Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters"	"Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters" published in 2014 by the Department of Arts, Heritage and the Gaeltacht (now the Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media), was provided as official guidelines and codes of practice under Regulation 71 of the European Communities (Birds and Natural Habitats) Regulations 2011.
Lighting on board will be kept to a minimum	Lighting on-board the vessels will be kept to the minimum level required to ensure safe operations. This will minimise disturbance to seabird species.

Measure	Details
Deployment of anchor chains will be kept to a minimum.	Reduces the potential for disturbance to benthic habitats and species including those which utilise the seabed.
Vessels will be travelling at a slow speed during works.	The slow speed of installation vessels will minimise the risk of disturbance and injury impacts to seabird and marine mammal receptors.
Production of an Emergency Spill Response Plan	An Emergency Spill Response Plan will help to ensure that the potential for release of pollutants from vessels and rigs is minimised.
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring and appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ship standards.	Measures will be adopted to ensure that the potential for release of pollutants from installation vessels is minimised.
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Invasive Non-Native Species (INNS) introduction is minimised.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between vessels, personnel, equipment and fishing activity. This will be managed through the Fisheries Liaison Mitigation Action Plan.	Employment of a FLO will ensure all commercial fisheries operators in the vicinity will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.
Compliance with International Regulations for the Prevention of Collision at Sea (IRPCS) (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	IRPCS are the international standards designed to ensure safe navigation of vessels at sea. All installation vessels will adhere to these rules, including displaying appropriate lights and shapes. SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards.

Measure	Details
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk and equipment snagging.

6.2 Underwater Noise Changes

Application of mitigation measures listed in Section 4.3.4 in relation to seismic survey and 4.3.2 in relation to Drilling of Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (DAHG, 2014). The key ones are listed out below:

1. A qualified and experienced Marine Mammal Observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms.
2. Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g., specific sound propagation and/or attenuation data) and a distance modification has been agreed with the Regulatory Authority, acoustic surveying using the above equipment shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

Pre-Start Monitoring:

3. Sound-producing activities shall 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.
4. 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.
5. In waters up to 200m deep, the MMO shall conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.
6. This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

Ramp-Up Procedure:

7. In commencing an acoustic survey operation using the above equipment, the following Ramp up Procedure (i.e., “soft-start”) 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. 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.

8. In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment.
9. Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone

Breaks in sound output:

10. 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.
11. For higher output survey operations which have the potential to produce injurious levels of underwater sound 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 PreStart Monitoring) shall recommence as for start-up.

Reporting:

12. Full reporting on MMO operations and mitigation undertaken must be provided to the Regulatory Authority.

6.3 Hydrocarbon & PAH contamination

The following measures are already in place, either integral with good practice, or with regulatory systems, or both:

- Implementation of an Oil Pollution Emergency Plan (OPEP). The OPEP is designed to assist the decision-making process during an oil spill, indicate what resources are required to combat the spill, minimise any further discharges and mitigate its effects. An OSCP is required under the Sea Pollution (Amendment) Act 1999, and this requirement is re-stated in the Rules and Procedures Manual (DCENR 2014). The OSCP is designed to assist the decision-making process during an oil spill, indicate what resources are required to combat the spill, minimise any further discharges and mitigate its effects. The OSCP must be submitted to the Irish Coastguard for approval.
- Notification to fishing vessels and the Sea Fisheries Protection Authority and DECC of the location and timing of seismic surveys.
- Avoid travelling along inshore routes where the potential for vessel accidents is higher
- Location data for all drilling infrastructure to be added to FishSAFE to reduce the likelihood of fishing vessel collision with installations
- Installation of Automatic Identification System (AIS) or radar systems on platforms to enable early detection of potential collisions. This is recommended by the International Association of Oil and Gas Producers (OGP, 2010).
- Compliance with all OSPAR Agreements, Recommendations, Strategies, Decisions and Guidelines and MARPOL legislation relating to protection of the marine environment from the potential effects of discharges.
- To use best practice technologies to reduce the concentrations of chemicals discharged.
- Use and discharge of least harmful chemicals to the marine environment, including those on the OSPAR list of Substances/Preparations Used and Discharged Offshore which are Considered

to Pose Little or No Risk to the Environment (PLONOR) in all drilling operations [whenever possible].

- Zero discharge of chemicals on the OSPAR List of Chemicals for Priority Action (LCPA).
- To reduce usage by the best means practicable of chemicals on the OSPAR List of Substance of Possible Concern.
- Implementation of OSPAR Recommendation 2006/3 to phase out discharge of offshore chemicals that are, or which contain substances identified as candidates for substitution and phasing towards the cessation of these discharges from offshore installations.
- Ensure compliance with Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).
- Utilisation of OBM or SBM to be kept to a minimum and all OBM or SBM to be collected through closed system and brought ashore for re-use, recycling or disposal.
- All operations where appropriate, shall apply best available technologies, best environmental practice and clean technology.
- Any oil spill must be reported immediately, however small. The level and manner of the required oil spill response will be overseen by the Irish Coast Guard, and determined by the volume and type of oil spilled, and the weather and sea conditions at the time.
- Any oil spill likely to have impacts in UK waters will be reported by the Irish Coast Guard to the relevant UK authorities. The Irish Coast Guard has a close working relationship with the UK Maritime and Coast Guard Agency (MCA) and the two have a draft Service Level Agreement for co-operation on search and rescue and oil spill response in place. The Irish Coast Guard and the UK MCA also regularly conduct joint search and rescue and oil spill response exercises.
- The crew of the drilling rig/ship should undergo environmental awareness and safety training. All equipment used on the rig/ship should have safety measures built in to minimise the risks of any oil spillage. All operations where appropriate, shall apply best available technologies, best environmental practice and clean technology. This is the aim of the requirement of DECC (DCENR, 2014) for operators to have accredited and verified environmental management systems.
- A two-barrier well control policy should be implemented at all times as a minimum. Primary well control (i.e. mud hydrostatic) and secondary well control (blow-out preventers or BOPs) should be maintained throughout the drilling of a well. A full risk assessment should be performed as part of the planning phase of the well.
- As the highest risk of diesel spillage occurs during re-fuelling (bunkering) operations at sea, all bunkering should take place during suitable weather conditions, preferably in daylight hours, and a continuous watch should be posted during the operations. The bunkering hoses should be segmented and have pressure valves that, in the event of a drop in pressure within the line as a result of loss of diesel, will close, preventing the further release of diesel.
- The potential for shallow gas should be identified and minimised by site assessment prior to drilling.
- The BOP is installed to prevent gas blowout once drilling has progressed beyond the riserless stage.
- Gas detection systems are installed on mud shakers to give early indication of any potential for gas blowout.

- Training in safety awareness and response procedures for drilling crews will ensure that the risk of a blowout will be minimised, and that the appropriate responses will be made should one occur.
- All chemicals used on drilling units must have prior approval according to a system in which chemical formulation is continually reviewed and revised to eliminate or minimise harm to the environment through factors such as toxicity and bioaccumulation.

Whilst it is considered that the risk of a major hydrocarbon spill as a result of the Plan activities is considered to be very low, given the close proximity of the IOSEA6 Study Area to the sensitive coastlines, not only of Ireland but also to the UK western coastline, the consequence of a spill is unpredictable at this stage and should be subject to further specific oil spill risk assessment at individual project level. Taking into account all the matters discussed, and provided that the above measures are implemented, it can be concluded that although unlikely, the residual impact of a worst case scenario major hydrocarbon spill affecting any or many Natura 2000 sites remains potentially significant, regardless of mitigation and continued assessment is required at individual project level to ensure that the Draft Plan will not adversely affect the integrity of any relevant Natura 2000 sites in view of the conservation objectives of these sites.

7. CONCLUSION

Intertek carried out a Stage 1: Screening for AA of the Plan in March 2022. The assessment identified four potential aspects of the seismic survey activities and five potential aspects of the drilling activities with associated pressures that could have an LSE on the QIs and SCIs of relevant Natura 2000 sites.

The more detailed assessment of the potential LSEs conducted in Section 5 of this NIS concluded that of the nine potential LSEs, underwater noise changes and hydrocarbon & PAH contamination would result in an LSE to the Conservation Objectives of Natura 2000 sites.

Consideration of mitigation measures detailed in Section 6 for the identified pressures assessed should be carried out at Project level to avoid LSE. Detailed assessment is required at the individual project level, to ensure that the draft Plan and consented activities will not adversely affect the integrity of any relevant Natura 2000 sites in view of the conservation objectives of these sites. With the implementation of the proposed mitigation measures (if necessary at Project level) there is no residual effect; therefore, no in-combination effect is possible.

Continued assessment is required at individual project level to ensure that the Draft Plan will not adversely affect the integrity of any relevant Natura 2000 sites in view of the conservation objectives of these sites.

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