



**PSE Kinsale Energy Limited**

**Kinsale Area Decommissioning Project**

**Kinsale Area Installations:  
End of Operations Seabed Survey**

**Environmental Impact Assessment  
Screening/Environmental Risk Report**

**November 2022**

Rev 0

## Contents

Abbreviations .....	ii
<b>1 Introduction.....</b>	<b>1</b>
1.1 Background and Document Purpose .....	1
1.2 Legislative Background and EIA Process.....	3
<b>2 Project Description.....</b>	<b>6</b>
2.1 Survey Background and Purpose.....	6
2.2 Survey Activity and Equipment .....	6
2.3 Vessel.....	7
<b>3 Environmental Characteristics of the Area .....</b>	<b>9</b>
3.1 Physical Environment.....	9
3.2 Biological Environment .....	11
3.3 Other Users.....	32
<b>4 Identification of Potentially Significant Effects and EIA Screening .....</b>	<b>42</b>
4.1 Introduction .....	42
4.2 Approach to Screening for Potential Effects .....	42
<b>5 Consideration of Potential Effects .....</b>	<b>48</b>
5.1 Introduction .....	48
5.2 Underwater Noise.....	48
5.3 Accidental Events .....	53
5.4 Cumulative Effects .....	53
5.5 Transboundary Effects .....	54
<b>6 Conclusion .....</b>	<b>55</b>
6.1 EIA Screening Conclusion .....	55
6.2 Screening Checklist.....	56
<b>7 References .....</b>	<b>61</b>

## **ABBREVIATIONS**

<b>Term</b>	<b>Definition</b>
AA	Appropriate Assessment
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas 1991
CSHAS	Celtic Sea Herring Acoustic Survey
DCENR	Department of Communications, Energy and Natural Resources
DECC	Department of Environment, Climate and Communications
DECC	Department of Energy and Climate Change (UK)
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EUNIS	European Nature Information System
IBA	Important Bird Areas
IMO	International Maritime Organisation
MARPOL	The International Convention for the Prevention of Pollution from Ships
MSFD	Marine Strategy Framework Directive
Natura 2000	Natura 2000 is a network of nature protection areas in the territory of the European Union. It is made up of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated respectively under the Habitats Directive and Birds Directive.
NHA/pNHA	Natural Heritage Area/proposed Natural Heritage Area
NPWS	National Parks and Wildlife Service
PEXA	Military Practice and Exercise Areas
PTS	Permanent Threshold Shift
RAMSAR	Intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources
SAC	Special Area of Conservation: established under the Habitats Directive
SFPA	Sea Fisheries Protection Authority
SPA	Special Protection Area: established under the Birds Directive
USBL	Ultra-Short Baseline (acoustic positioning system)

## **1 INTRODUCTION**

### **1.1 Background and Document Purpose**

PSE Kinsale Energy Limited (Kinsale Energy) is applying for consent to undertake a survey at sites associated with the Kinsale Head, Ballycotton and Southwest Kinsale fields (Petroleum Lease area No.1), and the Seven Heads field (Seven Heads Petroleum Lease) in the North Celtic Sea Basin. The survey will be undertaken in offshore waters, at a distance of at least 33km from the nearest coast (Figure 1.1).

Kinsale Energy has progressed with the decommissioning of the Kinsale Area gas fields and facilities (incorporating the Kinsale Head gas fields and facilities and the Seven Heads gas field and facilities) as the fields have come to the end of their productive life. In keeping with lease obligations, Decommissioning Plans and related Environmental Impact Assessment Report (EIAR) and Appropriate Assessment (AA) screening reports were prepared and were submitted to the Department of Environment, Climate and Communications (formerly the Department of Communications, Climate Action & Environment). Application no. 3 has been submitted to cover the remaining works to be consented as part of the decommissioning programme, the decommissioning of the Kinsale Head and Seven Heads pipelines. Together the decommissioning of the entirety of the Kinsale Area gas fields and facilities is collectively referred to as the Kinsale Area Decommissioning Project (KADP).

Following completion of the decommissioning activities it is proposed that an end of operations seabed survey is undertaken. The survey is intended to fulfil the obligations of a number of permits for use and discharge of added chemicals (PUDACs)<sup>1</sup> and to provide a post-decommissioning baseline by revisiting those stations sampled during the pre-decommissioning survey in 2017.

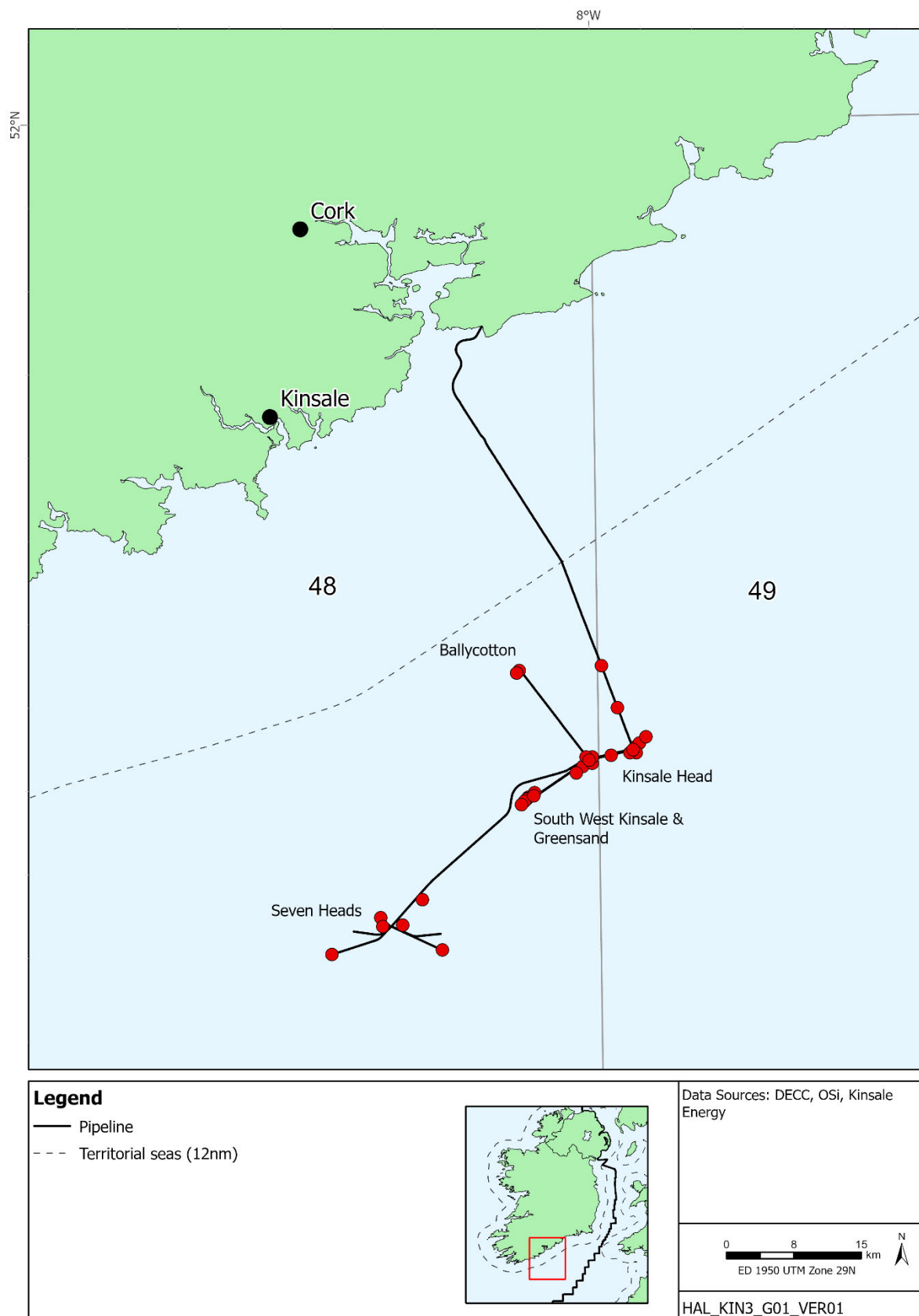
An application for consent has been made, accompanied by this EIA screening report and a Screening for Appropriate Assessment report. The survey will include the use of equipment (e.g. grab sampler, drop down camera) to characterise the fauna and seabed sediment character and chemistry at selected seabed stations (more detail is provided in Section 2). The survey will take approximately two to three days and is planned for Q1/Q2 2023 following the completion of decommissioning works.

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<sup>1</sup> PUDACs covering the disconnection of subsea infrastructure including pipelines and umbilicals, Kinsale Alpha and Bravo well plug and abandonment, Kinsale platforms removal, and the plug and abandonment of wells associated with the other Kinsale Head and Seven Heads fields.



Figure 1.1: Location of the end of operations sample stations in relation to the decommissioned Kinsale Area infrastructure



## **1.2 Legislative Background and EIA Process**

There are mandatory requirements where an Environmental Impact Assessment Report (EIAR) is to be prepared (as outlined in Annex I of the EIA Directive 2011/92/EU<sup>2</sup>), also see Schedule 1 of the *European Communities (Environmental Impact Assessment) Regulations 1989* (as amended). Additionally, provisions relating to EIA for exploratory activities relating to oil & gas activity in Ireland are contained in the *European Union (Environmental Impact Assessment) (Petroleum Exploration) Regulations 2013*, amended by the *European Union (Environmental Impact Assessment) (Petroleum Exploration) (Amendment) Regulations 2019*. For projects listed in Annex II of the Directive, the approach in Ireland has been to set certain thresholds/criteria whereby an Environmental Impact Assessment Report (EIAR) would be prepared, and the competent authorities may request an EIAR be prepared with reference to those criteria set out in Annex III of the Directive, if in their opinion, the proposed activities are likely to have significant effects on the environment “by virtue, *inter alia*, of their nature, size and location.” The *Licensing Terms and the Rules and Procedures for Offshore Petroleum Exploration and Appraisal Operations* specify various relevant standards and provisions for the offshore industry relevant to this application.

In view of the nature of the proposed survey campaign, it is not considered that there is a statutory requirement to complete an EIAR. This EIA screening report has been prepared to fulfil the requirements of the EIA Directive by providing an environmental appraisal of the potential for direct and indirect significant effects of the proposed survey programme as outlined in Section 2, in order to provide the relevant information to allow the Competent Authority to make a screening decision on whether an Environmental Impact Assessment (EIA) is required, and whether consent for the activities can be granted.

### **1.2.1 Other Relevant Legislation**

Ireland is a contracting party to the *Convention on the Prevention of Marine Pollution by Dumping from Ships 1972*, and to the *Paris Convention on the Prevention of Marine Pollution from Land-based Sources 1974* (the “Oslo” and “Paris” Conventions respectively, both of which include offshore installations), and has adopted as a minimum requirement the international standards set by PARCOM and OSPAR. Ireland has ratified the *International Convention for the Prevention of Pollution from Ships 1973* as modified by the *Protocol of 1978* relating thereto (MARPOL 73/78) and implements requirements through regulations under the *Sea Pollution Act 1991 (as amended)*. Any vessel used in the survey campaign would therefore be subject to relevant controls under MARPOL.

There is a range of international and national legislation aimed at protecting fauna, flora and habitats. The *UNESCO Convention on wetlands of international importance especially as waterfowl habitat* (Ramsar Convention) has been ratified by Ireland. The requirements of EU nature conservation directives *EC Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* (the “Habitats and Species Directive”); and *EC Council Directive 2009/147/EC* (the “Bird Directive”) have been implemented through the *European Communities (Conservation of Wild Birds) Regulations 1985* (as amended) and the *European Communities (Birds and Natural Habitats) Regulations 2011* both under the *Wildlife Act 1976 (as amended)*. Ireland is also a signatory to the *Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas 1991* (ASCOBANS). ASCOBANS requires governments to undertake habitat management, conduct surveys and research and to enforce legislation to protect small cetaceans.

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<sup>2</sup> Amended by Directive 2014/52/EU, and transposed by *The European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018*

[illegible]

[illegible]

## 2 PROJECT DESCRIPTION

### 2.1 Survey Background and Purpose

As noted in Section 1, Kinsale Energy is progressing the decommissioning of the Kinsale area gas fields and facilities. Two applications have been made and approved in relation to the decommissioning of the Kinsale area facilities which were each accompanied by an Environmental Impact Assessment Report and Appropriate Assessment screening. These applications covered; facilities preparation, well plug and abandonment, platform topsides and subsea structure removal (application no. 1); and jacket removal (application no. 2). A third application was submitted in October 2021<sup>3</sup> which covers the remaining works associated with the overall KADP, which are the decommissioning of all Kinsale Head and Seven Heads pipelines and umbilicals by leaving them *in situ*, and the use of engineering materials (rock placement) to protect the pipelines and umbilicals. Decommissioning activities associated with the first two consent applications has already commenced or has been completed, and includes platform and subsea well decommissioning, the removal of pipeline spoolpieces and umbilical jumpers, which connected these to infrastructure subsea, and platform removal.

Following the decommissioning of the pipelines, subject to approval, and surveys to chart the final locations of the umbilicals and pipelines, it is proposed that the end of operations survey associated with this application will be undertaken. The objective of this survey is to fulfil the monitoring requirements set out in PUDACs which were granted for various aspects of the KADP. The sample stations have been selected to fulfil those requirements, and also to revisit stations sampled in the 2017 pre-decommissioning survey (Table 2.2).

### 2.2 Survey Activity and Equipment

The survey will be undertaken over approximately two to three days and involve a Day grab or equivalent seabed sampling equipment and a drop down camera. The grab sampler collects sediment samples with a surface area of 0.1m<sup>2</sup> for faunal analysis and sediment particle size and chemical analyses. The approach to sample collection and analysis will be consistent with OSPAR Agreement 2017-02.

It is proposed that the survey will revisit the 31 sample stations surveyed in 2017, and collect an additional two samples from stations at the former Kinsale Alpha and Bravo platform locations (Figure 2.1, Table 2.2). Two replicates will be collected at each sample station. A drop down camera will also be used at each station to collect seabed imagery.

Table 2.1: Summary of survey equipment

Survey component	Potential equipment	Operating frequency	Objectives
Seabed sampling	Day grab (or equivalent)  Drop down camera	-	To characterise seabed fauna, sediment type and chemistry (metals and hydrocarbons).

<sup>3</sup> <https://www.gov.ie/en/publication/58f06-decommissioning-of-certain-facilities-within-the-kinsale-area-gas-fields/>



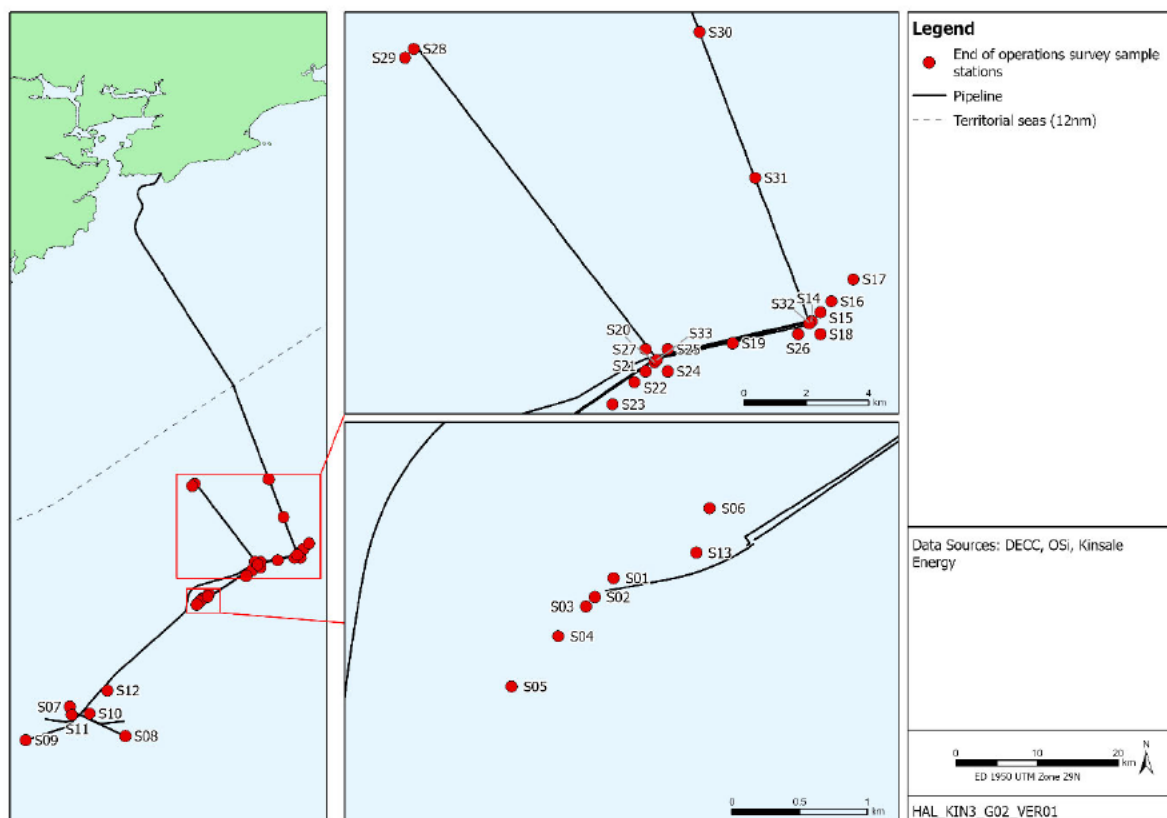
Survey component	Potential equipment	Operating frequency	Objectives
<b>Other acoustic equipment used for safe vessel operation, or operation of survey equipment deployed from the vessel</b>			
USBL	Representative equipment, e.g. Sonardyne Wideband Sub-Mini 6 Plus (WSM6+) with Sonardyne ranger USBL hull unit	20-40kHz	Required for acoustic positioning of survey equipment.

## 2.3 Vessel

The vessel to complete the survey programme has not yet been confirmed. For the purposes of this assessment, a representative vessel has been assumed e.g. RV Tom Crean or equivalent.

There will be no significant discharges from the survey vessel, and any discharge would be consistent with obligations under MARPOL<sup>4</sup> as implemented in Ireland, which effectively prevent pollution from such sources. In view of the scale and duration of the survey these are not considered to be significant and are not considered further

Figure 2.1: Proposed end of operations survey sampling locations



<sup>4</sup> Following the guidance set out in EC (2021), compliance with MARPOL is a statutory requirement and forms a generic component of the project and is not a specific form of mitigation.

**Table 2.2: Proposed Sample Stations**

<b>Station</b>	<b>Easting (m)</b>	<b>Northing (m)</b>
S01	561790.00	5686385.00
S02	561650.00	5686243.00
S03	561586.00	5686175.00
S04	561380.00	5685953.00
S05	561035.00	5685583.00
S06	562500.00	5686900.00
S07	545376.00	5673015.00
S08	552230.00	5669410.00
S09	539935.00	5668899.00
S10	547809.00	5672163.00
S11	545610.00	5672000.00
S12	550000.00	5675000.00
S13	562402.10	5686572.00
S14	573515.10	5691779.00
S15	573797.60	5692061.00
S16	574151.50	5692415.00
S17	574856.90	5693120.00
S18	573798.10	5691355.00
S19	570985.90	5691069.00
S20	568478.10	5690456.00
S21	568194.40	5690172.00
S22	567840.40	5689819.00
S23	567133.50	5689112.00
S24	568901.60	5690173.00
S25	568903.50	5690880.00
S26	573087.90	5691355.00
S27	568194.70	5690877.00
S28	560761.80	5700494.00
S29	560480.00	5700213.00
S30	569927.00	5701037.00
S31	571707.70	5696366.00
S32	573444.00	5691708.00
S33	568548.00	5690527.00

*Notes: all coordinates in ED50 (UTM zone 29N), all sample stations have the same location as those sampled in 2017, other than S32 and S33*

### **3 ENVIRONMENTAL CHARACTERISTICS OF THE AREA**

#### **3.1 Physical Environment**

##### **3.1.1 Seabed topography, geology and sediments**

The seafloor is generally flat in the area encompassing the Kinsale Area fields and related pipelines/umbilicals with gentle slopes across the region. Rig site and pipeline route surveys undertaken around the Seven Heads, SW Kinsale and Greensand developments all showed mosaics of high and low reflectivity (AquaFact 2003, 2004). The high reflectivity was interpreted as gravelly sands with megaripples of up to 0.3m height and 1.5m wavelength. The low reflectivity areas comprised muddy sand. At the prevailing water depths of 90-100m, the megaripples are indicative of a high energy environment. Ribbons of mobile sands lie in a southwest to northeast orientation. Outcrops of hard substrate – the underlying Cretaceous chalk bedrock – are also exposed intermittently with a variable covering of muddy sands. A distinctive feature of the sediments in the Kinsale Area is the apparent frequent juxtaposition of clean sand with mud. The bathymetry of the area is shown in Figure 3.1.

##### **3.1.2 Climate, oceanography and hydrography**

The area has a mild maritime climate with mean air temperatures varying between approximately 6-9°C in winter to 15-16°C in summer (seasonal mean temperatures for 1981-2010, Walsh 2012 and M5 Wexford Coast buoy observations 2004-2016, Met Eireann website). The predominant winds over the open waters south and west of Ireland are from the west and southwest (DCENR 2011). In the open ocean, winds of greater than 8m/s are experienced on 70-80% of occasions in winter (October to March) and 30-35% in summer (April to September) (Irish Coast Pilot 2006). Gales (17-20m/s) occur on approximately 20-30% of winter days and less than 2% of summer days (Irish Coast Pilot 2006). Sea fog is most frequent in summer, and most commonly associated with warm moist air blowing over a relatively cold sea with winds between southeast and southwest.

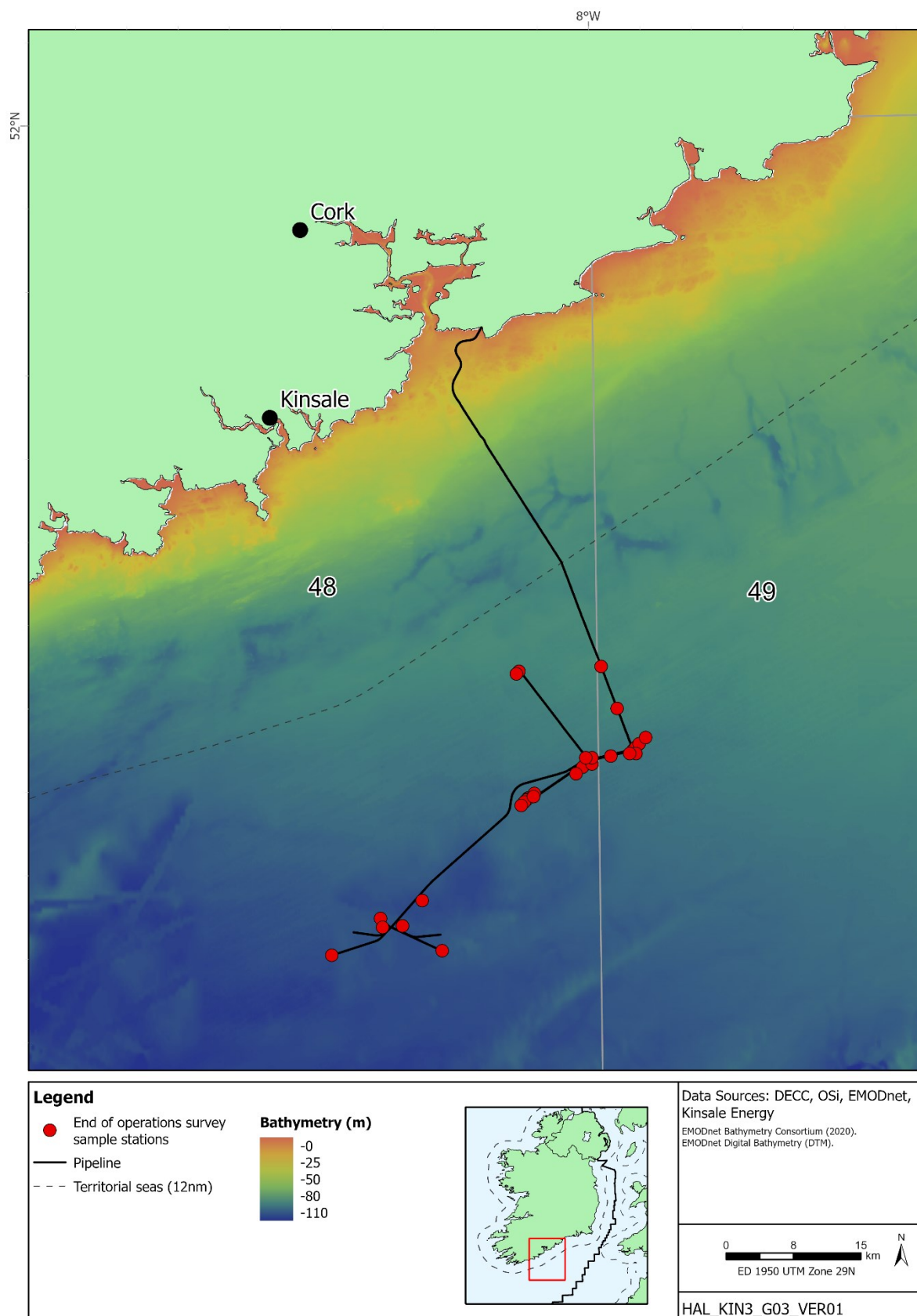
Swell distributions are dominated by swells from a south-west and west direction throughout the year, with mean significant wave heights varying between 1-1.5m in summer to 3m in winter (data for 15 July 2016 and 15 January 2016 respectively from Marine Institute monthly model means). Estimates of 100 year extreme metocean conditions indicate a significant wave height of up to 13.8m, a maximum wave height of 24.7m, and a current speed of 1.13m/s, all from a southwesterly direction (Fugro 2015).

The general pattern of transport of water into the Celtic Sea was reviewed by Pingree & Le Cann (1989), who identified a weak, variable but persistent flow, with typical mean speeds of 0.03m/s, moving northwards along the Brittany coast and across the mouth of the English Channel. North of the Scilly Isles, part of this flow diverges to the west and is deflected southwards around the south coast of Ireland, and there is generally a strong clockwise flow around the Irish coast caused by easterly winds and the Irish Coastal Current (Fernand *et al.* 2006).

Surface water temperatures range from 8-10°C in winter to 15-16°C in summer, while bottom temperatures show less variation and remain at around 8-10°C throughout the year (Connor *et al.* 2006). Thermal stratification of the water column develops in spring, with a thermocline between warm surface waters and colder deeper waters. Stratification breaks down to an extent through autumn, although the area remains frontal throughout winter (Connor *et al.* 2006). Mean sea surface salinity during the summer is 34.75‰ increasing in winter to 35.10‰, reflecting stratified and mixed conditions respectively (BODC 1998).



Figure 3.1: Bathymetry



## 3.2 Biological Environment

### 3.2.1 Plankton

The waters of the Celtic Sea are seasonally stratified, with greater mixing in shallower areas. There is a heavy terrestrial influence, but also an important oceanic influence from the Atlantic. In waters off the south of Ireland a phytoplankton bloom typically occurs every spring, usually from mid-April, as increasing light levels and the development of the thermocline in the stratified water column lead to an increase in phytoplankton biomass (O'Boyle & Silke 2010). Early in the season, the phytoplankton community largely comprises diatoms such as *Thalassiosira* spp. (the most frequently recorded phytoplankton taxa), *Skeletonema* spp. and *Chaetoceros* spp., with *Rhizosolenia* spp. and *Ceratulina* spp. increasing in abundance as the bloom develops (Pybus 1996, Johns & Wootton 2003). As stratification increases into the summer months, opportunistic diatom species decline, and dinoflagellate species such as *Ceratium* spp., *Prorocentrum* spp. and *Dinophysis* spp. become dominant within the community. The bloom declines as summer progresses and nutrients deplete, although occasional, smaller autumn blooms may occur. There has been an increase in the numerical abundance of both diatoms and dinoflagellates in Irish waters since 1998 (Marine Institute 2009).

Zooplankton communities in the Celtic Sea are dominated by copepods. Small copepods such as *Acartia* spp., *Oithona* spp., *Centropages typicus*, *Paracalanus* spp. and *Pseudocalanus* spp. are abundant in the region, along with euphausiids, cladocerans and meroplankton such as echinoderm larvae. Amongst the calanoid copepods, the warm-water species *Calanus helgolandicus* is considerably more numerous than *Calanus finmarchicus* (Johns & Wootton 2003), and there has been a general movement north of *C. helgolandicus* and an increase in abundance off the coast of southwest Ireland (Marine Institute 2009). Jellyfish in the area include *Rhizostoma octopus*, *Aurelia aurita*, *Chrysaora hysoscella* and *Cyanea lamarckii*, as well as the hydrozoans *Physalia physalis* (the Portuguese man-o-war) and *Velella velella* (Pikesley *et al.* 2014). The zooplankton acts as a trophic link between the producers (phytoplankton) and the higher predators within the ecosystem. *Pelagia noctiluca*, an oceanic water-water species, may be carried into Irish waters by the shelf edge current (Marine Institute 2009).

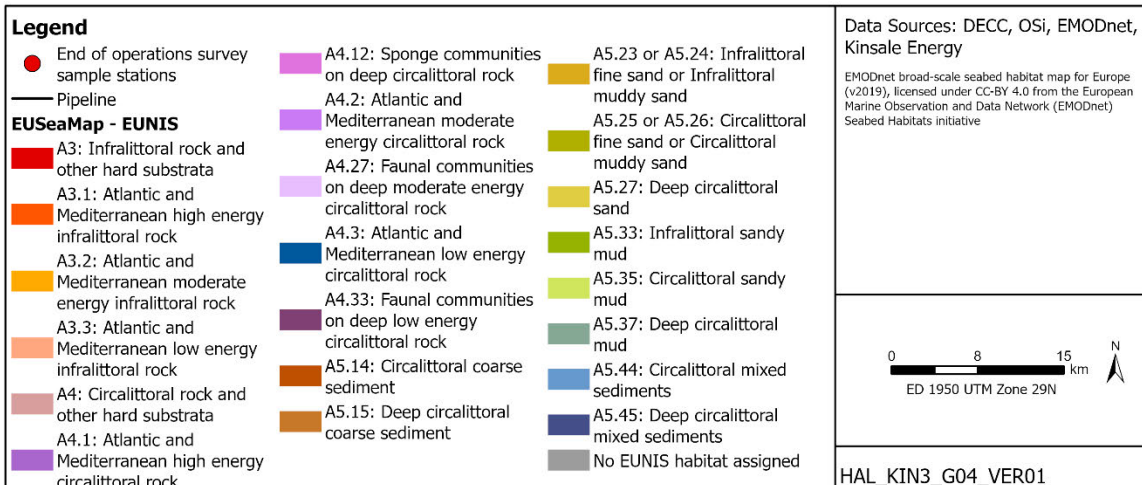
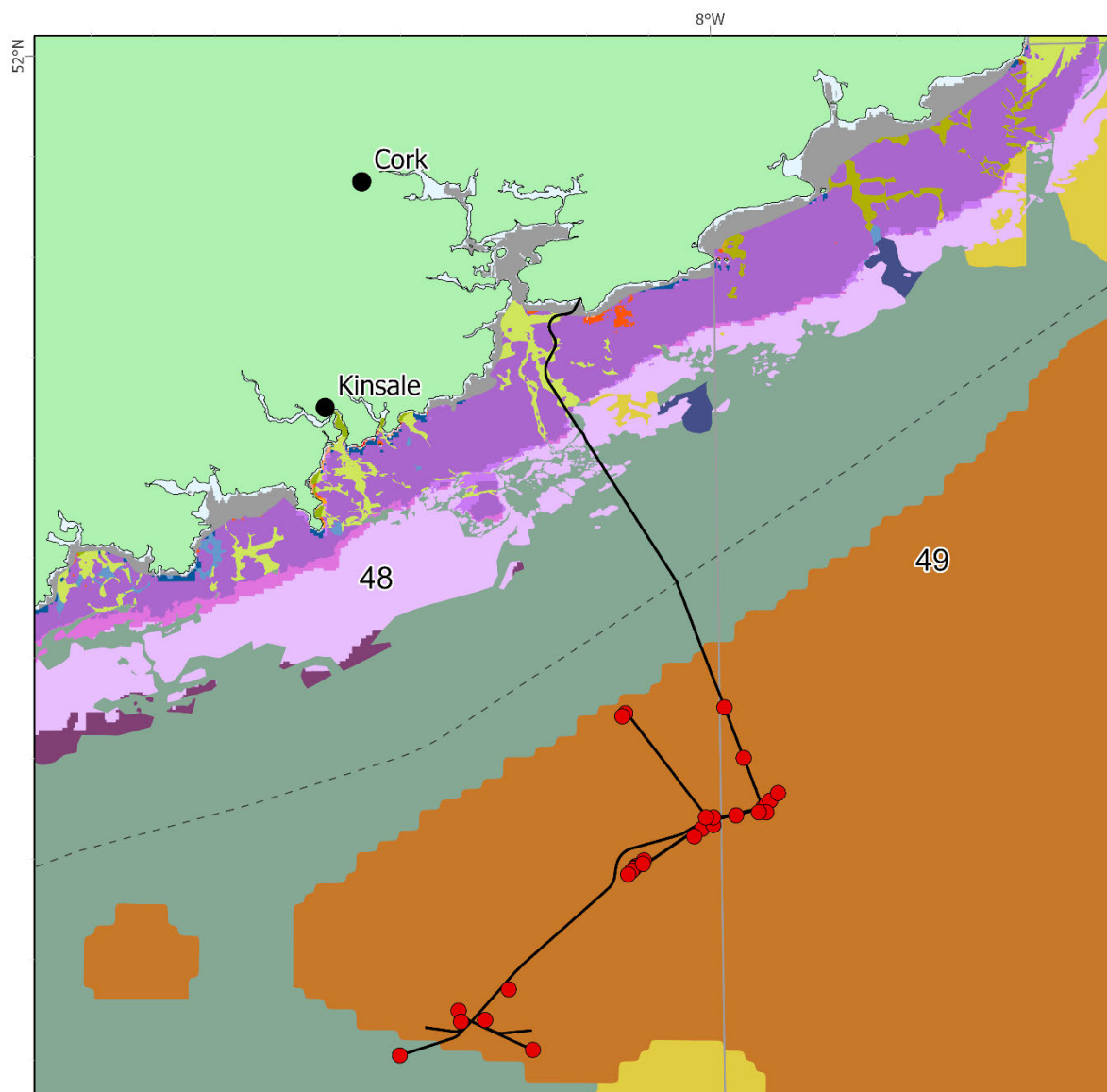
### 3.2.2 Benthos

Benthic communities are traditionally considered as two groups: infauna and epifauna. The infauna live within the seabed sediment, and represent the most commonly surveyed and well-known benthic community. Epifauna live on the surface of the sediment, are generally larger than infauna, and may be sessile, such as sponges and hydroids; or mobile, such as echinoderms and crustaceans.

The dynamic nature of the sedimentary environment of the Seven Heads and Kinsale Head gas fields presents a range of relatively impoverished heterogeneous benthic habitats. According to the EUNIS habitat classification, the underlying habitat is circalittoral coarse sediment (Figure 3.2). This habitat, as with shallower coarse sediments, can be characterized by robust infaunal polychaetes, mobile crustaceans and bivalves (Connor *et al.* 2004).

Extensive survey work has been undertaken in the wider Kinsale Area since the discovery of the Kinsale Head field in 1971, with the most recent survey information covering the period 2002-2017 (Aquafact 2002, 2004, 2005, Hartley Anderson 2003, 2007, Marine Institute 2010, 2011, 2017, Ecoserve 2011, Fugro 2012, 2017, Gardline 2015).

Figure 3.2: Predicted seabed habitats



In the Seven Heads field and along the pipeline route to the Kinsale Head field, Hartley Anderson (2003) described the seabed as a mosaic of rippled gravelly sands interspersed with areas of muddy sand; and the benthic epifauna as consisting of common and widely distributed species consistent with previous academic surveys in the region (Hartley & Dicks 1977, see Boelens *et al.* 1999). They noted a well-developed fauna on all hard substrates which ranged through cobbles, boulders and larger rock outcrops, with particular emphasis on two identified rock outcrops. The infauna of this same area was investigated by AquaFact (2003) and found to be low in species and individuals; it was ascribed to an *Ophelia*-type grouping. When comparing the species data with the expected *Amphiura/Chamelea* grouping identified in the area by Boelens *et al.* (1999), AquaFact found only small numbers of amphiuroids at a few stations and no *Chamelea* were found. Other faunal elements of the *Amphiura/Chamelea* grouping such as *Notomastus*, *Melinna*, *Thyasira* and *Abra* sp., were either absent from some samples or were only rarely recorded. The dominant species throughout the Seven Heads area was found to be *Spiophanes kroyeri* with other characteristic taxa being *Magelona alleni*, *Ophelia rathkei* and *Echinocyamus pusillus*. Hence the faunal grouping was considered to be of the *Ophelia*-type.

The Marine Institute (2017) KADP pre-decommissioning survey sampled 31 stations with the sediments found being predominantly very coarse sand and very fine gravel, with typically little mud (silt and clay particles) present. However, at a few stations an appreciable proportion (up to 27%) of mud was present in addition to the coarse sands. The benthic fauna (sampled at 28 of the 31 stations) had a low to moderate abundance and species richness, with many species being found across the surveyed area. Multivariate analyses of the faunal data indicated three relatively weak clusters of stations which were geographically spread across the survey area and with some overlapping characteristic species. The characteristic species from the clusters included the polychaetes *Spiophanes kroyeri*, *Lumbrineris aniana*, *Mediomastus fragilis*, *Goniadella gracilis*, *Glycera lapidum*, and *Amphitrite cirrata*, the anemone *Edwardsia* sp., unidentified Nematoda and Nemertea, and the echinoderms *Amphiura filiformis* and *Echinocyamus pusillus*. This suite of species is similar to those recorded in previous surveys and is believed to reflect the nature of the sediments on the area; no species indicative of contamination or organic enrichment were recorded.

All recent benthic sampling and photographic surveys in the Kinsale Area have been consistent in reporting no indication of sensitive species or habitats which would be subject to protection under the EU Habitats Directive (92/43/EEC) i.e. Annex I habitats. Ramboll (2017a & b) noted the possible presence of the cold water coral *Lophelia* on some of the Kinsale Area subsea infrastructure (note that all subsea manifolds have now been removed). As such colonies would be of conservation interest, various areas with possible *Lophelia* were investigated by ROV during the 2017 pre-decommissioning surveys. All colonies of possible *Lophelia* inspected proved to be colonies of the serpulid polychaete *Filograna implexa*, a common and widespread species.

### 3.2.3 Fish and shellfish

The waters of southern Ireland support a diversity of fish and shellfish, including a number of commercially valuable species. Fish assemblages tend to be closely associated with particular physical environments, with temperature, depth and sediment type all influencing the community composition. The southern Irish coast acts as a gateway to the wider Atlantic from the enclosed waters of the Bristol Channel and Irish Sea. Pelagic species, including herring (*Clupea harengus*), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*) and horse mackerel (*Trachurus trachurus*) are abundant in the region, and move widely between feeding and spawning grounds (Heessen *et al.* 2015). The most abundant species in the

region are haddock (*Melanogrammus aeglefinus*), poor cod (*Trisopterus minutus*), Norway pout (*Trisopterus esmarkii*) and whiting (*Merlangius merlangus*) (Marine Institute 2012), while cod (*Gadus morhua*), monkfish (*Lophius piscatorius*), hake (*Merluccius merluccius*), plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*) are also abundant (Heessen *et al.* 2015). The areas of sandy sediment tend to support flatfish and sandeels, while gobies, blennies, wrasse and large gadoids are more abundant over rockier regions (Boelens *et al.* 1999). There are important *Nephrops norvegicus* (Norway lobster, scampi) grounds to the south of Cork (Lordan *et al.* 2015).

The survey area includes stations within ICES Rectangles 31E1 and 31E2. Table 3.1 shows that the proposed survey location overlaps known spawning grounds and nursery areas for certain fish species. Rectangles 31E1 and 31E2 are partly or entirely within the spawning areas for herring, sprat, cod, lemon sole and *Nephrops* (Coull *et al.* 1998), as well as haddock, megrim (*Lepidorhombus whiffiagonis*) and horse mackerel (Marine Institute data – see Figure 3.3). In addition, Ellis *et al.* (2012) identified low spawning activity for mackerel in the area. Monkfish, whiting, lemon sole, blue whiting (*Micromesistius poutassou*), ling (*Molva molva*), European hake, sandeels (*Ammodytes spp.*) and *Nephrops* all use the area as a nursery area at low intensity, while the area is a high intensity nursery area for mackerel (Ellis *et al.* 2012). The Marine Institute have also identified nursery grounds for haddock, hake, horse mackerel, mackerel, megrim and anglerfish, which are relevant to the survey (Figure 3.4). The survey is not located within any known elasmobranch spawning grounds, but was identified within a low intensity nursery ground for spurdog (*Squalus acanthias*) (Ellis *et al.* 2012). Fish spawning can vary temporally and spatially; spawning areas are not rigidly fixed and fish may spawn earlier or later in the season.

A number of elasmobranch species are present in the region, including the spurdog (*Squalus acanthias*) and the lesser spotted dogfish (*Scyliorhinus canicula*) (Marine Institute 2012). Aerial surveys from 2015-2016 for the ObSERVE project reported multiple sightings of blue sharks in the offshore Celtic Sea region in summer (Rogan *et al.* 2018). Other oceanic sharks such as thresher (*Alopias vulpinus*) and mako (*Isurus oxyrinchus*) sharks may make occasional, seasonal visits to the region. The southern Irish coast is an area where basking sharks are particularly common, with numerous sightings reported annually in the summer months (Solandt & Chassin 2014).

Aerial surveys from 2015-2016 in the ObSERVE project reported ocean sunfish (*Mola mola*) to be frequently observed in most offshore waters around Ireland, including off the south coast where most sightings were recorded in summer (Breen *et al.* 2017, Rogan *et al.* 2018). For offshore waters of the Celtic Sea, design-based estimates of 4,625 (95% CI 2,679-7,987) and 2,068 (95% CI 1,398-3061) were produced for the two summer surveys, and 1,044 (95% CI 606-1,799) and 73 (95% CI 14-375) for the two winter surveys (Rogan *et al.* 2018).

The River Lee, contains populations of the diadromous species Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*), which migrate from the sea to spawning locations up-river. Salmon runs take place through the summer, with June to September particularly fruitful for anglers.



Table 3.1: Spawning and nursery grounds relevant to the survey

Species	Spawning grounds	Nursery grounds	Spawning period
Herring (a, c)	✓	✓	January - March
Sprat (a)	✓	-	May - August
Mackerel (b, c)	✓	✓ (high)	March - July
Horse mackerel (b, c)	✓	✓	March - August
Blue whiting (b)	-	✓ (low)	-
Haddock (c)	✓	✓	February – May
Whiting (a, b, c)	✓	✓ (low)	February - June
Hake (b, c)	-	✓ (low)	-
Ling (b)	-	✓ (low)	-
Plaice (a)	✓	-	December - March
Lemon sole (a)	✓	✓	April - September
Megrim (c)	✓	✓	January - March
Monkfish (b, c)	-	✓ (low)	-
Spurdog (b)	-	✓ (low)	-
Common skate (b)	-	✓ (low)	-
Nephrops (a)	✓	✓	January - December

Sources: a = Coull et al. (1998), b = Ellis et al. (2012), c = Marine Institute (2012) – spawning period detail taken from Coull et al. (1998) and Ellis et al. (2012)

### 3.2.4 Marine reptiles

There are seven species of marine turtle, of which five species have been recorded in the seas around Ireland and the UK: leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), Kemp's ridley turtle (*Lepidochelys kempii*), green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*). The leatherback turtle is the largest of the marine turtles and is the only species of turtle to have developed adaptations to cold water (Goff & Stenson 1988). The species is covered under Annex IV of the Habitats Directive (see Section 3.2.7).

A significant majority of turtle sightings recorded in Irish waters are of the leatherback turtle (King & Berrow 2009), which migrates into the waters of the Celtic and Irish Seas in response to the distribution of the gelatinous zooplankton which make up their favoured diet (Doyle et al. 2008, Fossette et al. 2010). Tagging studies show that they migrate across the Atlantic from the eastern American mainland and the Caribbean (Hays et al. 2004, Doyle et al. 2008). Sightings in the wider region are concentrated off the south and west of Ireland, the southwest of England and the west coast of Wales. Most sightings occur in the summer, peaking in August (Penrose & Gander 2016). The 2014 Celtic Sea Herring Acoustic Survey (Cronin & Barton 2014) made four sightings of leatherback turtle, three of them approximately 70km south of Cork Harbour, although no confirmed sightings of this species were made in subsequent surveys (O'Donnell et al. 2016, 2017, 2018, 2019, 2020). Aerial surveys for the ObSERVE project from 2015-2016 recorded a handful of leatherback turtle sightings at the southern limits of Irish offshore waters in summer; none were observed in the area relevant to the survey (Rogan et al. 2018).

Figure 3.3: Fish spawning areas

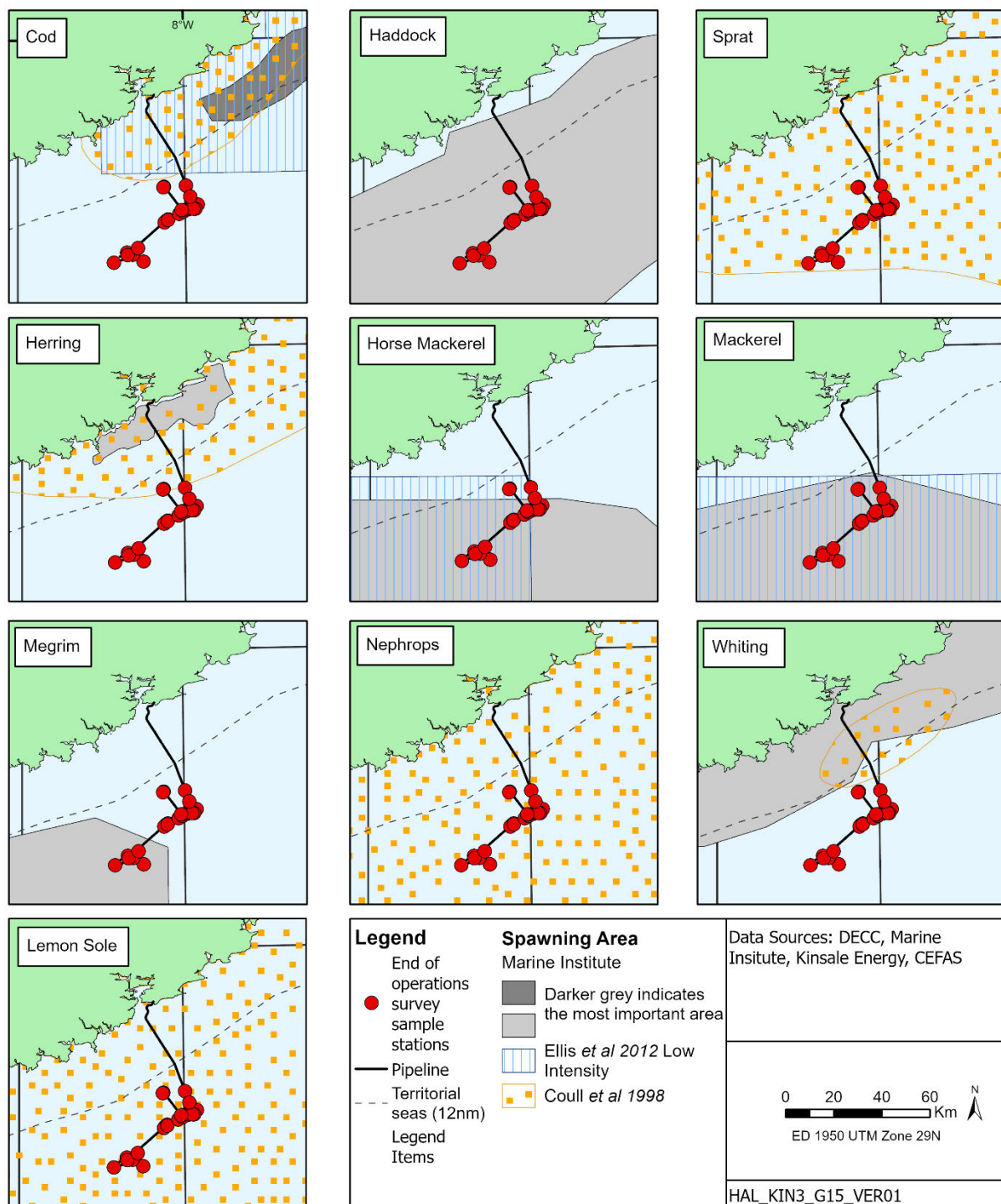
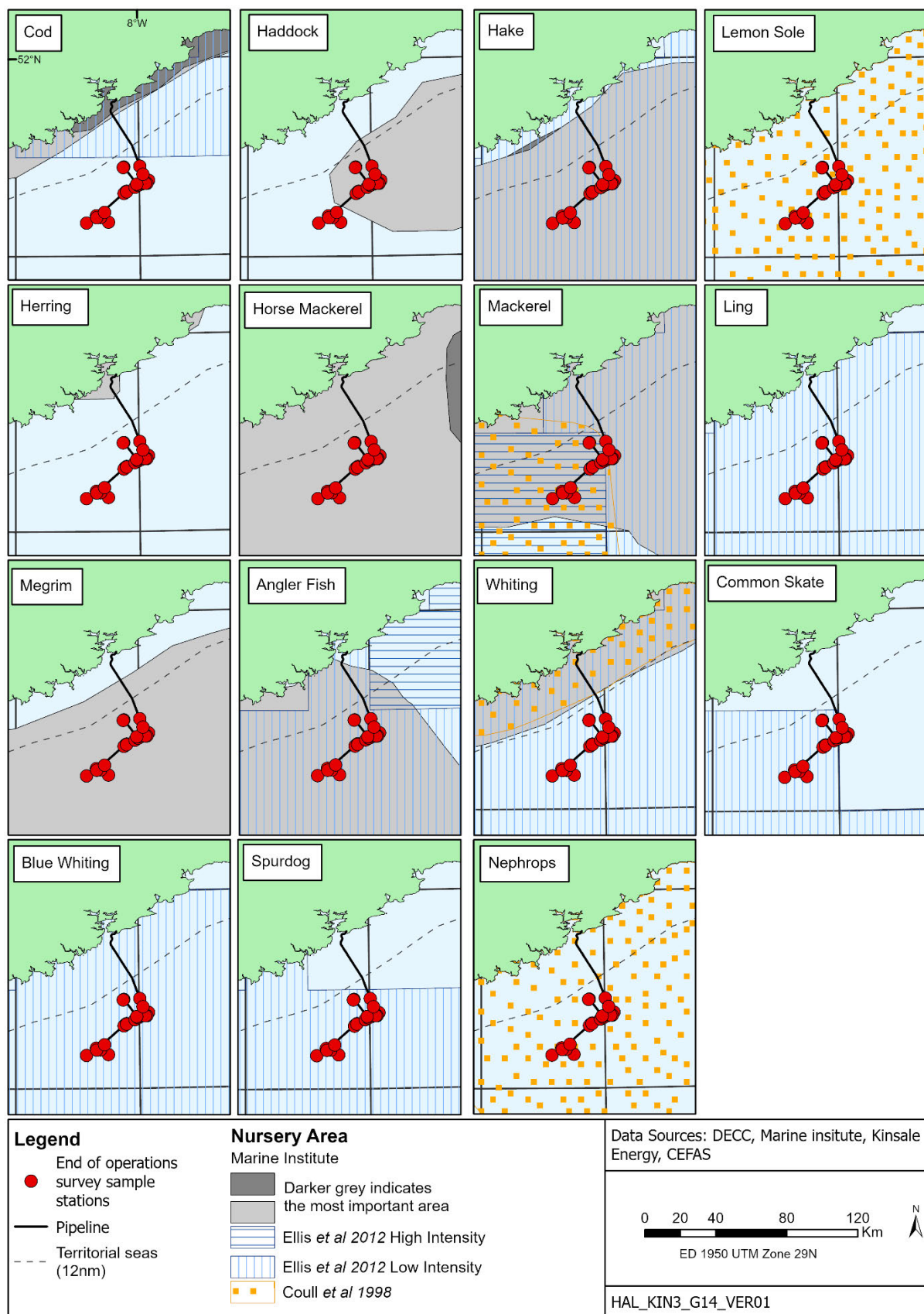


Figure 3.4: Fish nursery areas





### 3.2.5 Birds

The south coast of Ireland provides numerous habitats for seabirds, with rocky cliffs and productive seas supporting a variety of gulls, auks, terns and shearwaters. Seabird distribution is influenced by the distribution of prey species, which in turn is affected by a range of physical factors. Sandeels, herring, sprat and small gadoids are among the prey items favoured by most seabirds, and there are several spawning and nursery areas for these in the area. Each summer, over half a million seabirds, from 24 species, search for suitable breeding sites on the cliffs and islands of the south coast of Ireland. In addition, over 50 species of waterbirds arrive on migration either on passage or to over-winter<sup>5</sup>. There are numerous SPAs (Special Protection Areas) along the coast which offer protection to species or aggregations of seabirds and waterbirds (see Section 3.2.7). Key sources of information on the distribution of birds in the Celtic and Irish seas include Webb *et al.* (1990) and Stone *et al.* (1995). In addition, various surveys, including the Celtic Sea Herring Acoustic Surveys (O'Donnell *et al.* 2016, 2017, 2018, 2019, 2020) and the ObSERVE programme (Rogan *et al.* 2018) have recorded seabird sightings around the survey area.

#### Seabirds

Gulls commonly found in the survey area include herring gull (*Larus argentatus*), lesser black-backed gull (*Larus fuscus*), great black-backed gull (*Larus marinus*), black-headed gull (*Chroicocephalus ridibundus*) and black-legged kittiwake (*Rissa tridactyla*). Most gulls are resident to the area, and are frequently recorded along the coast throughout the year. Also resident along the south coast of Ireland are a number of auks, including guillemot (*Uria aalge*), razorbill (*Alca torda*), Atlantic puffin (*Fratercula arctica*) and the black guillemot (*Cepphus grylle*). Razorbill, guillemot and black guillemot are generally found in coastal waters, although Atlantic puffin is more of an oceanic species, often found offshore off the Porcupine Seabight, or around small islands off the south coast or in the Irish Sea. The Old Head of Kinsale is the largest seabird colony on the south coast, between the Saltee Islands on the southeastern point and the Bull Rock on the southwestern point. The colony it supports has nationally important populations of black-legged kittiwake and guillemot, as well as significant populations of herring gull, razorbill, Northern fulmar (*Fulmarus glacialis*) and European shag (*Phalacrocorax aristotelis*)<sup>6</sup>. Great Cormorants (*Phalacrocorax carbo*) and European shag also tend to remain closely associated with the coast, largely as a result of their plumage which is less water resistant than many other seabirds. Key sites for Great cormorants and European shags include Helvick Head, the Keeragh Islands, the Saltee Islands and the Sovereign Islands (see Figure 3.8 for locations).

Northern Gannets (*Morus bassanus*) are found in large colonies, from which they forage up to 480km offshore, along the shelf edge (DCENR 2015). Highest densities occur off the south coast in spring and summer, with the breeding season starting in April and May. Great Saltee Island, to the east of the area to be surveyed, is the site of one of the largest gannetries in Ireland, with 2,446 pairs recorded there in 2004 (NPWS website).

Seasonal visitors to the area include various terns, skuas and shearwaters. Terns arrive in the summer months at inshore areas to breed. Tern species regularly sighted in the survey area include the common tern (*Sterna hirundo*), the Arctic tern (*Sterna paradisaea*), the Sandwich tern (*Sterna sandvicensis*) and the little tern (*Sternula albifrons*). Predatory Arctic skuas (*Stercorarius parasiticus*) also tend to be summer visitors, with high densities recorded along the Celtic Sea coast from July to September although the great skua (*Catharacta skua*) is a resident which breeds in the west of Ireland (DCENR 2015), and is

<sup>5</sup> <https://www.npws.ie/research-projects/animal-species/birds/wintering-waterbirds>

<sup>6</sup> <https://www.npws.ie/research-projects/animal-species/birds/seabirds>

occasionally recorded in the Celtic Sea. The highly pelagic petrels and shearwaters, including the fulmar (*Fulmarus glacialis*), the storm petrel (*Hydrobates pelagicus*) and the Manx shearwater (*Puffinus puffinus*), a species of which the Celtic and Irish Seas have particularly high densities, are all most abundant in spring and summer.

Many seabirds forage considerable distances from their breeding habitats. Thaxter *et al.* (2012) presented a review of representative foraging ranges during the breeding season, based on surveys conducted over breeding colonies across Europe (including Northern gannets on Saltee Island), which has been updated by Woodward *et al.* (2019). Species such as northern fulmar, northern gannet, guillemot, lesser black-backed gull and black-legged kittiwake, which have maximum foraging ranges in excess of 100km, may be present in the survey area. The Celtic Sea Herring Acoustic Surveys (O'Donnell *et al.* 2016, 2017, 2018, 2019, 2020) surveyed coastal and offshore waters from Mizen Head eastwards to the Irish Sea, each taking place over 2-3 weeks in October. The 2016 survey sighted a total of 26,429 individual seabirds representing 27 species. The most commonly recorded species were northern gannet (15,147 individuals), guillemot (3,293), lesser black-backed gull (1,901), black-legged kittiwake (928) and razorbill (763). The 2017 and 2018 surveys observed a similar species composition but the total number of individuals recorded on each survey (10,628 and 5,097 respectively) was less than in 2016, however the 2019 and 2020 surveys recorded more individuals (28,110 and 35,636 respectively).

As part of the ObSERVE programme, widespread aerial surveys of Ireland's offshore waters were conducted in both summer and winter in 2015 and 2016 to investigate the occurrence, distribution and abundance of seabirds, cetaceans and other marine megafauna (Rogan *et al.* 2018). Offshore waters off the south coast, including the survey area, are in Stratum 4, a large area of 62,510km<sup>2</sup> extending from approximately 15-20km off the coast to the RoI/UK median line and shelf waters, west to longitude 11°W. Density and abundance estimates for the most commonly sighted species and species groups in this area are presented in Table 3.2. These indicate that gannet, Manx shearwater and petrel are consistently the most abundant species/group in summer.

Table 3.2: Seabird density and abundance estimates for offshore waters south of Ireland (Stratum 4) from the ObSERVE aerial surveys

Species	Density; abundance, (CV) <sup>1</sup>			
	Summer 2015	Winter 2015-16	Summer 2016	Winter 2016-17
Gannet	0.26; 16,549 (14.6)	0.10; 6,487 (92.2)	0.34; 21,584 (16.5)	0.23; 14,169 (24.6)
Fulmar	0.12; 7,471 (42.4)	0.28; 17,225 (27.3)	0.11; 6,979 (31.4)	0.61; 38,320 (58.2)
Black-backed gull*	<0.01; 402 (35.9)	0.03; 1,874 (29.8)	<0.01; 432 (107.4)	0.03; 1,605 (34.3)
Common/herring gull*	<0.01; 142 (36.6)	<0.01; 288 (41.0)	0.03; 1,799 (62.7)	0; 0 (0)
Kittiwake	0.02; 1,044 (37.4)	0.45; 28,469 (33.6)	0.04; 2,590 (30.5)	0.24; 14,798 (15.9)
Manx shearwater	0.32; 19,758 (43.9)	0; 0 (0)	0.89; 55,696 (33.8)	<0.01; 267 (59.5)
Petrel species*	0.21; 13,336 (18.3)	<0.01; 288 (42.9)	0.29; 18,059 (12.5)	<0.01; 140 (55.4)
Auk species*	<0.01; 291 (72.7)	0.58; 36,594 (30.9)	0.23; 14,233 (40.5)	0.34; 21,479 (21.6)

Notes: All estimates presented are design-based. <sup>1</sup> Density estimates (birds/km<sup>2</sup>) rounded to 2 decimal places; individual abundance with coefficient of variation (CV) rounded to one decimal place. \*In these circumstances it was not possible to differentiate between species, and so species are grouped as indicated: black-backed gull (greater and lesser black-backed gull); petrel (believed to be mostly European and Leach's storm petrel); auk (guillemot, razorbill, puffin)

Source: Rogan *et al.* (2018).

## Waterbirds

Waterbirds, a loosely defined category including seaducks, divers, herons, waders, geese and swans, are a major feature of the coastal habitats of Ireland, with resident, migratory and over-wintering populations present in the area. Ireland lies on some of the major migratory flyways of the east Atlantic, with many species not only overwintering in the area, but also using the UK as a stopover during spring and autumn migrations. The rivers, estuaries, bays and other coastal areas of southern Ireland are of great importance to wintering and passage wildfowl, as well as for breeding waders and other waterbirds; several SPA sites are designated for such features in the region (see Section 3.2.7).

### 3.2.6 Marine mammals

Irish waters are among the most important in Europe for cetacean species, with 25 species having been recorded in the region, and, in 1991, the government declared Irish waters a whale and dolphin sanctuary<sup>7</sup>. Eighteen of these species are regularly observed, while the remaining seven might be classed as vagrant species (NPWS 2014). The combination of shallow waters, deep oceanic areas with complex bathymetry and the productive shelf edge provide a range of habitats and feeding opportunities.

There are several key data resources on the species composition and relative abundance of the marine mammal fauna in the survey area and wider Celtic Sea. The annual Celtic Sea Herring Acoustic Surveys (CSHAS) cover waters off the south coast of Ireland, typically over a three week period each October and extends from 2-3km off the coast to over 100km offshore (e.g. O'Donnell *et al.* 2017). Dedicated marine mammal observers recorded sightings when light and environmental conditions permitted; combined data from 12 years of surveys from 2008-2020 are provided in Table 3.3. Table 3.3 also shows data extracted from the Irish Whale and Dolphin Group's (IWDG) Casual Cetacean Sightings database, which includes sightings submitted by IWDG members, researchers and the general public and validated by the IWDG. These extracted data include all sightings from January 2008 to December 2019 (12 years) within an area spanning ~150km off the south coast of Ireland, approximately bounded by Ardmore in the east, Spain Point in the west and south to 51°N (the typical offshore extent of the CSHAS) (Figure 3.5 and Figure 3.6). The IWDG casual sightings data are not effort corrected, and are biased towards busier and more accessible coastal waters, and areas subject to research (e.g. Ryan *et al.* 2010, Whooley *et al.* 2011); but provide useful information on the composition and relative abundance of cetacean species of the area. Data from the IWDG casual database and other sources over the period 2005-2011 were synthesised by Wall *et al.* (2013), which includes an assessment of the seasonal occurrence of the most commonly sighted species.

The harbour porpoise (*Phocoena phocoena*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*) are the most common toothed cetaceans off the south coast of Ireland (Table 3.3), where they are sighted year-round (Table 3.4). Risso's dolphin (*Grampus griseus*) are occasionally seen in this region, primarily in summer, while a small number of killer whale (*Orcinus orca*) sightings have occurred close to the coast. Minke (*Balaenoptera acutorostrata*) and fin (*Balaenoptera physalus*) whales are the most commonly sighted baleen whales in summer and late summer-autumn, respectively. Minke whale are also frequently observed during late summer to autumn, albeit in apparently lower

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<sup>7</sup> The Irish whale and dolphin sanctuary is not a legal entity, rather a statement of political will which has resulted in considerable public awareness and interest towards cetaceans in Irish waters. They are protected by national legislation (Whale Fisheries Act 1937 & 1982; Wildlife Act 1976), the EC Habitats Directive and several international conventions.

abundance. Small numbers of humpback whales also occur in this area, with sightings peaking from late summer through to January. Grey (*Halichoerus grypus*) and harbour (*Phoca vitulina*) seals are native to Irish waters and are found around the coast, although sightings off the south coast of Ireland and in the survey area are few.

Grey and harbour seal, harbour porpoise and bottlenose dolphin are listed on Annex II of the Habitats Directive and all cetaceans are listed on Annex IV, and their conservation status is noted in Section 3.2.7. The indicative seasonal occurrence of cetaceans is given in Table 3.4.

Table 3.3: Cetacean sightings: (i) recorded during the annual Celtic Sea Herring Acoustic Surveys and (ii) extracted from the IWDG Casual Cetacean Sightings database for the Kinsale area and ~150km of adjacent coast

Species	Celtic Sea Herring Acoustic Surveys (CSHAS) 2008-2020		IWDG Casual sightings database 2008-2019
	Number of years observed (of a maximum of 12)	Total number of sightings (individuals)	Total number of sightings (individuals)
<b>Toothed cetaceans</b>			
Common dolphin	12	1,230 (15,877)	1,117 (88,867)
Harbour porpoise	11	48 (263)*	588 (2,626)
Bottlenose dolphin	6	8 (40)	202 (1,469)
Risso's dolphin	4	6 (14)	50 (390)
Killer whale	1	1 (3)	10 (26)
Pilot whale	0	0 (0)	1 (5)
Unidentified dolphin	na	81 (674)	102 (1,101)
<b>Baleen whales</b>			
Fin whale	13	139 (237)	658 (2,530)
Minke whale	12	83 (94)	814 (4,665)
Humpback whale	7	19 (26)	245 (543)
Unidentified whale	11	75 (95)	184 (383)
<b>Total</b>	<b>na</b>	<b>1,690 (17,323)</b>	<b>3,971 (102,605)</b>

Notes: See main text for a description of the two data sources. \* Total harbour porpoise sightings in the CSHASs were heavily influenced by data from the 2016 cruise report where 22 sightings, representing 191 individuals, were reported in the Celtic Deep (>80km east of the Kinsale field); excluding 2016 data yields a total of 19 harbour porpoise sightings totalling 57 individuals.

Source: Nolan et al. (2014), O'Donnell et al. (2008, 2011, 2012, 2013, 2015, 2016, 2017, 2018, 2019, 2020) Saunders et al. (2009, 2010), IWDG (2020).

Table 3.4: Seasonal occurrence of cetaceans in the Kinsale Area

Species	J	F	M	A	M	J	J	A	S	O	N	D
Harbour porpoise	2	2	2	3	3	2	2	2	2	2	2	2
Common dolphin	2	2	2	2	2	2	2	2	1	1	1	1
Bottlenose dolphin	3	3	3	3	3	3	3	3	3	3	3	3
Risso's dolphin	-	-	-	4	4	3	3	3	4	4	4	-
Minke whale	-	-	4	3	3	3	3	3	2	2	2	4



Species	J	F	M	A	M	J	J	A	S	O	N	D
Humpback whale	3	4	-	4	4	4	3	3	3	3	2	3
Fin whale	4	4	-	-	4	4	3	3	3	2	2	3

*Source: Wall et al. (2013) and S. Berrow, IWDG (pers. comm. May 2018) (see additional references provided in text below for additional further information) Notes: Information on seasonal abundance of cetaceans is limited, so this table should be regarded as indicative of general trends. Abundance has been ranked from 1-4, where 1 is "very abundant" and 4 is "low abundance". '-' means no sightings were recorded in that month and/or abundance is considered likely to be extremely low.*

Two strata surveyed for marine mammals as part of the ObSERVE programme are relevant to the survey. These are Stratum 4 (as described above) and Stratum 8, which was only surveyed in summer and winter 2016, and covered 9,506km<sup>2</sup> of coastal waters off the south and south-west coasts. Cetacean sightings and abundance estimates in these two strata are summarised in Table 3.4.

For Stratum 4 (offshore), the abundance of bottlenose, common and unidentified dolphins was considerably higher in winter. The opposite was observed for harbour porpoise, which were by far the most abundant species recorded in Stratum 4 in summer. In Stratum 8 (coastal), both harbour porpoise and all species of dolphin showed higher abundance in summer. Minke whale abundance was estimated to be similar across two summer and one winter surveys, although the number of sightings was low. Within Stratum 8, minke whales were not seen in the winter survey, but observed 20 times in summer, with sightings clustered off the south-west coast. There were very few sightings of pinnipeds off the south coast of Ireland, with those few being clustered in the south-west and south-east, distant to the survey.

Predicted distribution maps suggested the presence of higher densities of harbour porpoise in summer, bottlenose dolphin in winter, and common dolphin in winter (relative to other surveyed areas for each species). Predicted densities of minke whale in the survey area are higher in summer than winter, with waters off the south-west coast appearing to be of higher importance.

The ObSERVE aerial survey data provide a greater level of quantification and seasonal information on cetaceans than was previously available for waters off the south coast of Ireland. These new data confirm the high diversity of cetacean species off the south coast, along with the seasonal patterns for the area which previous data had suggested.

Figure 3.5: Sightings of toothed cetaceans submitted to the IWDG Casual Cetacean Sightings database from 2008-2019

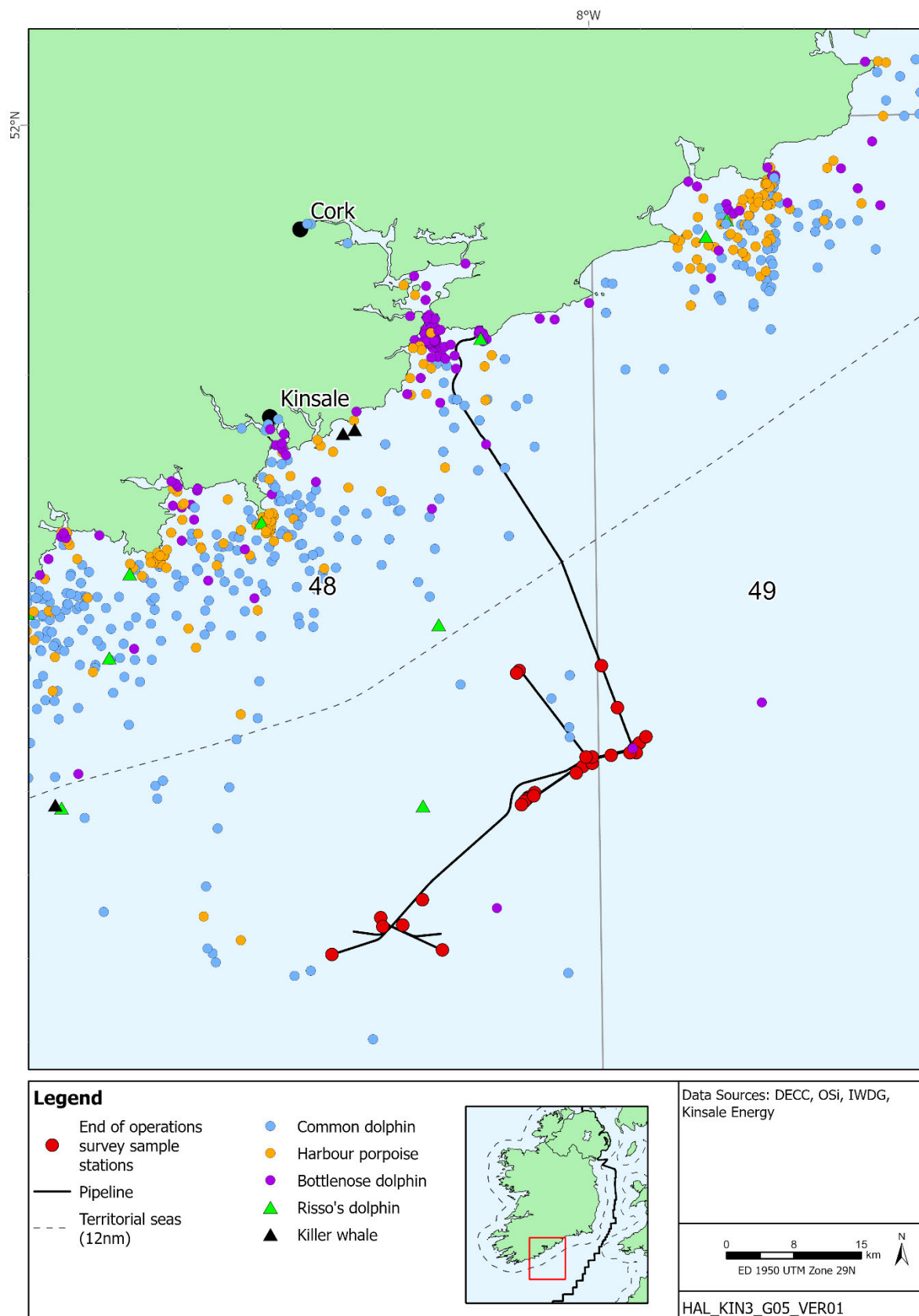


Figure 3.6: Sightings of baleen whales submitted to the IWDG Casual Cetacean Sightings database from 2008-2019

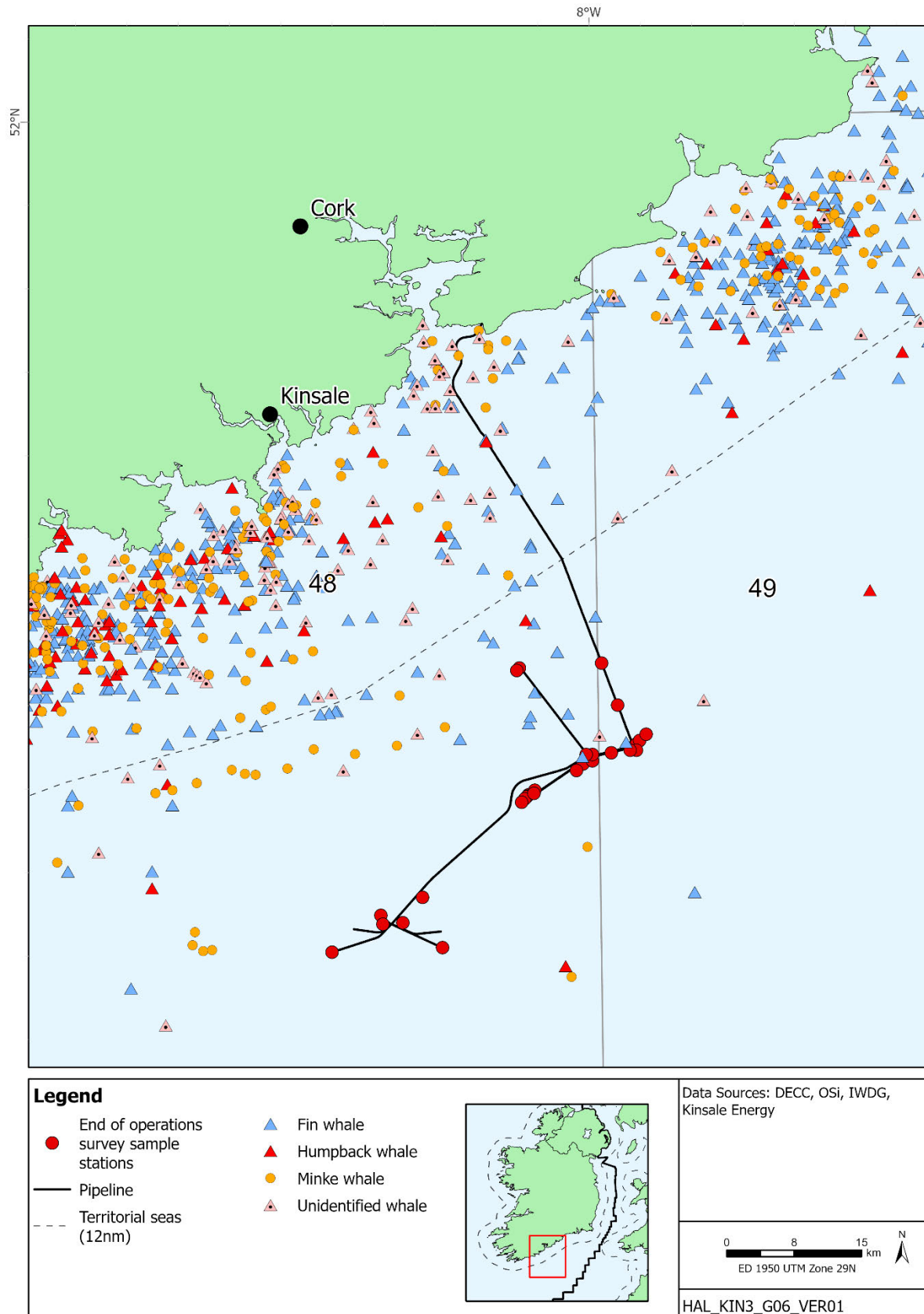


Table 3.5: Cetacean sighting numbers and abundance estimates for waters south of Ireland from the ObSERVE aerial surveys in 2015 and 2016

Species & season	Stratum 4 (offshore)		Stratum 8 (coastal)	
	N groups (mean group size)	Abundance; density (CV)	N groups (mean group size)	Abundance; density (CV)
<b>Harbour porpoise</b>				
Summer 2015	41 (1.2)	14,190; 0.227 (27.4)	-	-
Winter 2015-16	11 (1.3)	3,752; 0.060 (41.3)	-	-
Summer 2016	42 (1.3)	14,196; 0.227 (37.2)	8 (1.6)	1,977; 0.208 (62.6)
Winter 2016-17	0 (na)	na	3 (1)	568; 0.060 (73.2)
<b>Bottlenose dolphin<sup>1</sup></b>				
Summer 2015	7 (6)	3,885; 0.062 (64.3)	-	-
Winter 2015-16	26 (2.9)	6,217; 0.098 (28.4)	-	-
Summer 2016	17 (4)	5,549; 0.088 (47.7)	39 (7.2)	11,266; 1.161 (59.9)
Winter 2016-17	91 (7.8)	58,647; 0.929 (22.3)	17 (3.8)	3,322; 0.342 (47.6)
<b>Common dolphin and common/stripped dolphin<sup>2</sup></b>				
Summer 2015	3 (4.5)	2,554; 0.041 (73.8)	-	-
Winter 2015-16	45 (8.9)	40,027; 0.639 (51.5)	-	-
Summer 2016	0	na	5 (5.2)	1,319; 0.139 (45.5)
Winter 2016-17	0	na	2 (4.0)	779; 0.082 (76.0)
<b>Risso's dolphin<sup>1, 3</sup></b>				
Summer 2015	0	na	-	-
Winter 2015-16	1 (1)	40; 0.001 (101.6)	-	-
Summer 2016	2 (10)	809; 0.013 (94.8)	3 (7.7)	549; 0.057 (50.9)
Winter 2016-17	0	na	0	na
<b>Unidentified dolphin<sup>1</sup></b>				
Summer 2015	19 (4.9)	4,814; 0.076 (43.9)	-	-
Winter 2015-16	92	27,348; 0.433 (39.0)	-	-
Summer 2016	27 (3.3)	4,982; 0.079 (37.2)	57 (6.2)	10,047 (45.0); 1.035
Winter 2016-17	107 (7.1)	38,413; 0.608 (20.9)	28 (3.5)	4,142 (41.4); 0.427
<b>Minke whale</b>				
Summer 2015	4 (1.0)	836 (66.6); 0.013	-	-
Winter 2015-16	4 (1.0)	751 (64.8); 0.012	-	-
Summer 2016	4 (1.0)	761 (63.3); 0.012	20 (1.0)	2,242 (66.1); 0.236
Winter 2016-17	0	na	0	na
<b>Fin whale<sup>1, 3</sup></b>				
Summer 2015	0	na	-	-
Winter 2015-16	0	na	-	-
Summer 2016	0	na	0	na
Winter 2016-17	0	na	1 (2.0)	33 (98.4); 0.003

Notes. <sup>1</sup> Abundance estimates for these species are uncorrected for detection probability and are therefore likely to be underestimates. <sup>2</sup> Includes a small number of sightings where the two species could not be differentiated; as Strata 4 and 8 are restricted to shelf waters and



*striped dolphins favour deeper waters, the values presented here can be assumed to be almost exclusively common dolphins.* <sup>3</sup>*The abundance estimates for Risso's dolphin and fin whale are based on very few sightings, are highly uncertain and should be interpreted with caution. Abundance estimates are rounded to the nearest whole number; CV rounded to 2 decimal places.*

*Source: Rogan et al. (2018).*

## Harbour porpoise

The harbour porpoise is the most abundant and widespread species occurring around the Irish coast, commonly seen in shallow coastal waters in the summer, although surveys suggest highest densities along the south coast occur in autumn (Marine Institute 2013). They move further offshore in the spring; although the details of this migration are uncertain, it may be linked to calving (DCENR 2015). Harbour porpoise are generally less often encountered in the Celtic Sea than in the Irish Sea, although it may be that this is a result of lower survey effort and higher sea states off the south coast (Wall *et al.* 2013). In both the CSHAS and selected IWDG casual sightings data (Table 3.2), harbour porpoise are the second most frequently sighted toothed cetacean, seen both close to shore and in offshore waters (Figure 3.5). A comparison of the results of the broad-scale SCANS and SCANS-II surveys (SCANS-II 2008) indicate there has been a general shift to the southwest and an increase in the harbour porpoise population in the region over the period between the surveys. Harbour porpoise are a designated feature within the Roaringwater Bay and Islands SAC, ~74km to the west of the survey area, with a population that has been consistently estimated at between 150-160 individuals (Berrow *et al.* 2014).

## Common dolphin

The common dolphin is Ireland's most common dolphin species and it is most abundant off the south and southwest coasts, where they are often seen in very large groups. They tend to move east over the winter, with sightings off County Cork at their greatest between September and January (Berrow *et al.* 2010). Common dolphins were, by a large margin, the most frequently observed and numerous species during the recent CSHAS and in the IWDG casual sightings data extract. Sightings were widely distributed throughout the waters off the south coast of Ireland (Figure 3.5). Common dolphins typically move further offshore in the summer and are seen in large groups, moving to inshore waters in autumn, probably linked to the presence of large numbers of schooling pelagic fish (Marine Institute 2013).

## Bottlenose dolphin

Bottlenose dolphins are present in the Celtic Sea and there is a small semi-resident population present at Cork Harbour, where six individuals have been repeatedly sighted (Ryan *et al.* 2010), with larger numbers visiting the area during the summer. The species is more commonly seen off the west coasts of the country, with sightings peaking in summer (Berrow *et al.* 2010). There are few CSHAS records of bottlenose dolphins in offshore waters off the south coast, although there are occasional opportunistic sightings of the species offshore, including around the Kinsale field (Wall *et al.* 2013, IWDG 2020). Photo-identification data from groups of bottlenose dolphins at several locations around the coast of Ireland have revealed movement of animals between sites separated by 130-650km over durations of 26-760 days, providing evidence that many individuals should be considered highly mobile and transient (O'Brien *et al.* 2009).

## Other dolphins

Risso's dolphin are occasionally observed in the wider area, most commonly in the summer months and within a few kilometres of the coast (Wall *et al.* 2013). One Risso's dolphin was recorded outside Cork Harbour during the 2014 CSHAS (Nolan *et al.* 2014), while none were seen off the south coast of Ireland in 2016 or 2017. A small number of killer whales have been recorded off the south coast, primarily during summer (Wall *et al.* 2013). Records of other toothed cetacean species off the south coast (i.e. white-beaked dolphin *Lagenorhynchus albirostris* and long-finned pilot whale *Globicephala melas*) are very rare and these species would be highly unlikely to be present in the survey area.

## Baleen whales

Baleen whales are sighted along the south coast of Ireland primarily from late summer through autumn. Minke whales are observed in most months of the year, but are most frequently seen from April to November (Berrow *et al.* 2010). The larger fin and humpback whales are regularly observed in small numbers both close to the coast and further offshore, primarily in autumn and winter when these waters are a known foraging ground (Marine Institute 2013). Fin whale sightings peak in November (Berrow *et al.* 2010, Whooley *et al.* 2011), and they were the most frequently sighted and most numerous baleen whale in the CSHAS data (Table 3.2). Photo-identification data were collected from whale-watching vessels over 79 trips from 2003-2008, which resulted in the identification of 62 individual fin whales, of which 11 were sighted across multiple years (Whooley *et al.* 2011). Ryan *et al.* (2016) analysed several hundred humpback whale sightings from the IWDG casual database collected from 1999-2013, revealing an annual easterly movement along the southern coast; most sightings in the wider survey area occurred from October-December.

## Grey seals

Grey seals occupy haul-outs along the Irish coast, to which they return to rest, breed and rear young. Breeding in Ireland generally takes place between September and December (Cronin *et al.* 2011). Grey seals favour exposed rocky shores, sand-bars or sea caves, with easy access to deep water for breeding and as such, the largest colonies are found on exposed islands off the west and southwest coasts. The closest major colony to the survey area is at Roaringwater Bay. They are a designated feature of the Roaringwater Bay and Islands SAC, where a permanent population of up to 150 individuals is estimated (NWPS website). The total grey seal population of Ireland has been estimated at between 5,500 and 7,000 individuals (Ó Cadhla *et al.* 2008) and Duck & Morris (2013) estimated that 9% were present along the County Cork coast. Grey seals may forage at distances of up to 100km from their haul-out (Jones *et al.* 2015). Distances travelled by seals tagged on Great Blasket Island in County Kerry by Cronin *et al.* (2011) were variable. It was found that larger seals spent longer foraging at sea but travelled shorter distances, while smaller seals were found to travel as far as the Western Isles of Scotland, utilising haul-out sites along the way. The seals were found to spend more time at sea during the summer.

Marine usage maps for the UK and Ireland based on extensive tagging data suggest a very low occurrence of grey seals in the survey area, with animals present in waters around the south coast of Ireland focused off southwest Cork and southeast Wexford (Jones *et al.* 2015). Grey seals were observed in five of the 11 annual CSHAS from 2008-2018, comprising 14 sightings of single seals, most of which were close to the coast (e.g. O'Donnell *et al.* 2018).

## Harbour seals

Harbour seals are generally found in more sheltered areas, again predominantly along the west coast. Females pup in June or July, and the annual moult takes place in July and August, so harbour seals tend to be at or near haul-outs through the summer (Cronin *et al.* 2008, Rakka & Minto 2015).

Harbour seals rarely forage far from their haul-out, with surveys in southwest Ireland suggesting they generally stay within 20km of their haul-out (Cronin *et al.* 2008), although longer distances do occur and foraging behaviour seems to vary with geographical location. The Irish population of harbour seal was estimated at 3,000-4,150 individuals (DCENR 2015) and Duck & Morris (2013) estimated 13% of the total population were present along the County Cork coast.

Marine usage maps for the UK and Ireland based on extensive tagging data suggest a very low occurrence of harbour seals in the survey area, with animals present in waters around the south coast of Ireland focused off southwest Cork and Kerry (Jones *et al.* 2015).

No confirmed harbour seal sightings occurred off the south coast of Ireland in any of the 12 annual CSHAS.

### 3.2.7 Conservation sites and species

Relevant conservation sites (see Figure 3.7 and Figure 3.8 ) include Natura 2000 sites (SACs and SPAs), some of which are also OSPAR MPAs or coincident with Ramsar designations (e.g. Cork Harbour, Ballycotton Bay and Blackwater Estuary) which are designated as wetlands of international importance. The conservation sites labelled in the figures reflect those considered to be relevant to the survey; for SACs and SPAs, this considers the potential for relevant mobile qualifying features to be present which are some distance from site boundaries based on reported foraging ranges (after Woodward *et al.* 2019).

National designations (Figure 3.9) along the coast include Natural Heritage Areas and proposed Natural Heritage Areas, which were created under the *Wildlife Amendment Act 2000* and are protected from damage, though they have largely terrestrial components and are not considered to be relevant to the proposed survey.

Figure 3.7: SACs

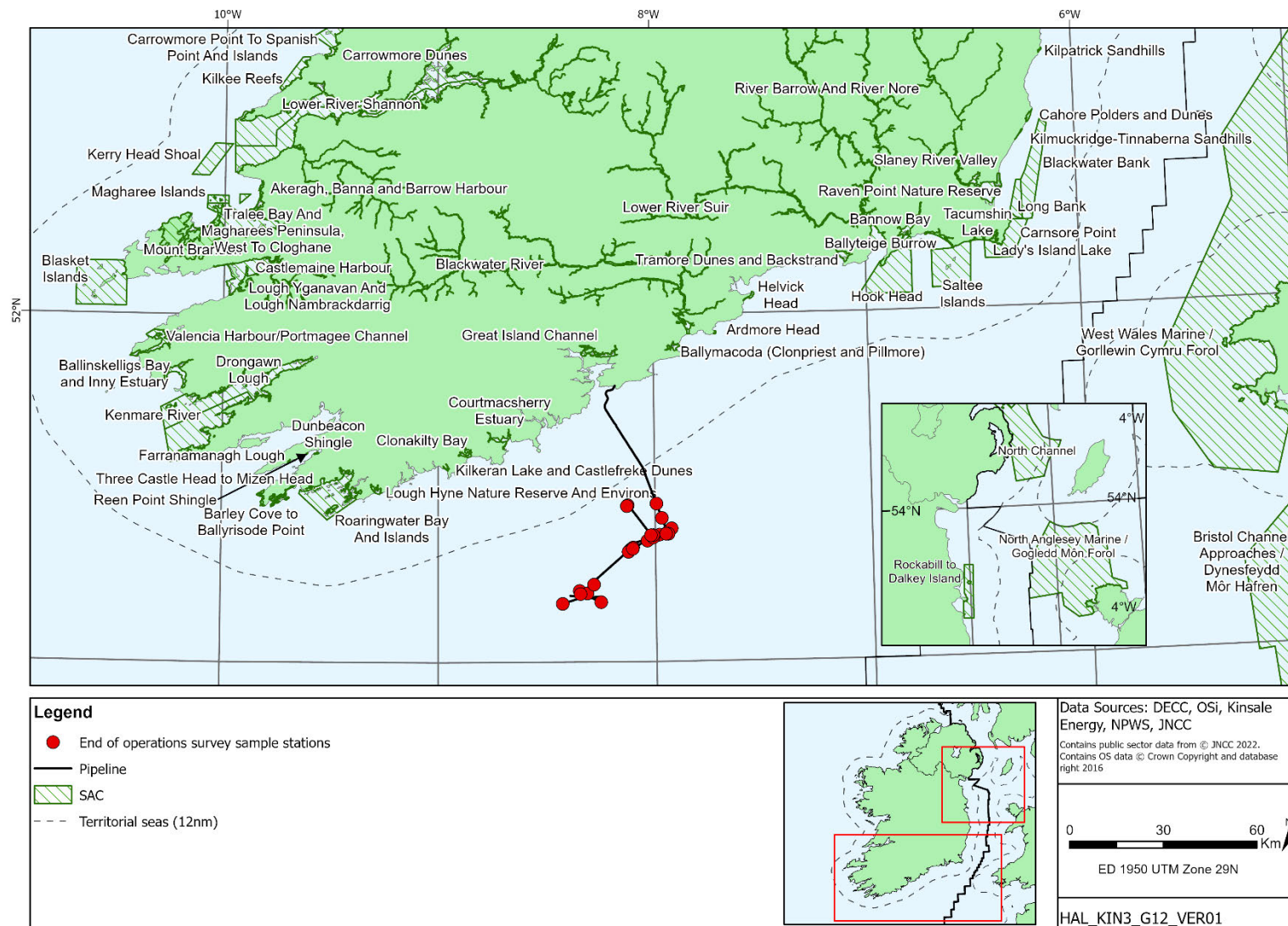


Figure 3.8: SPAs

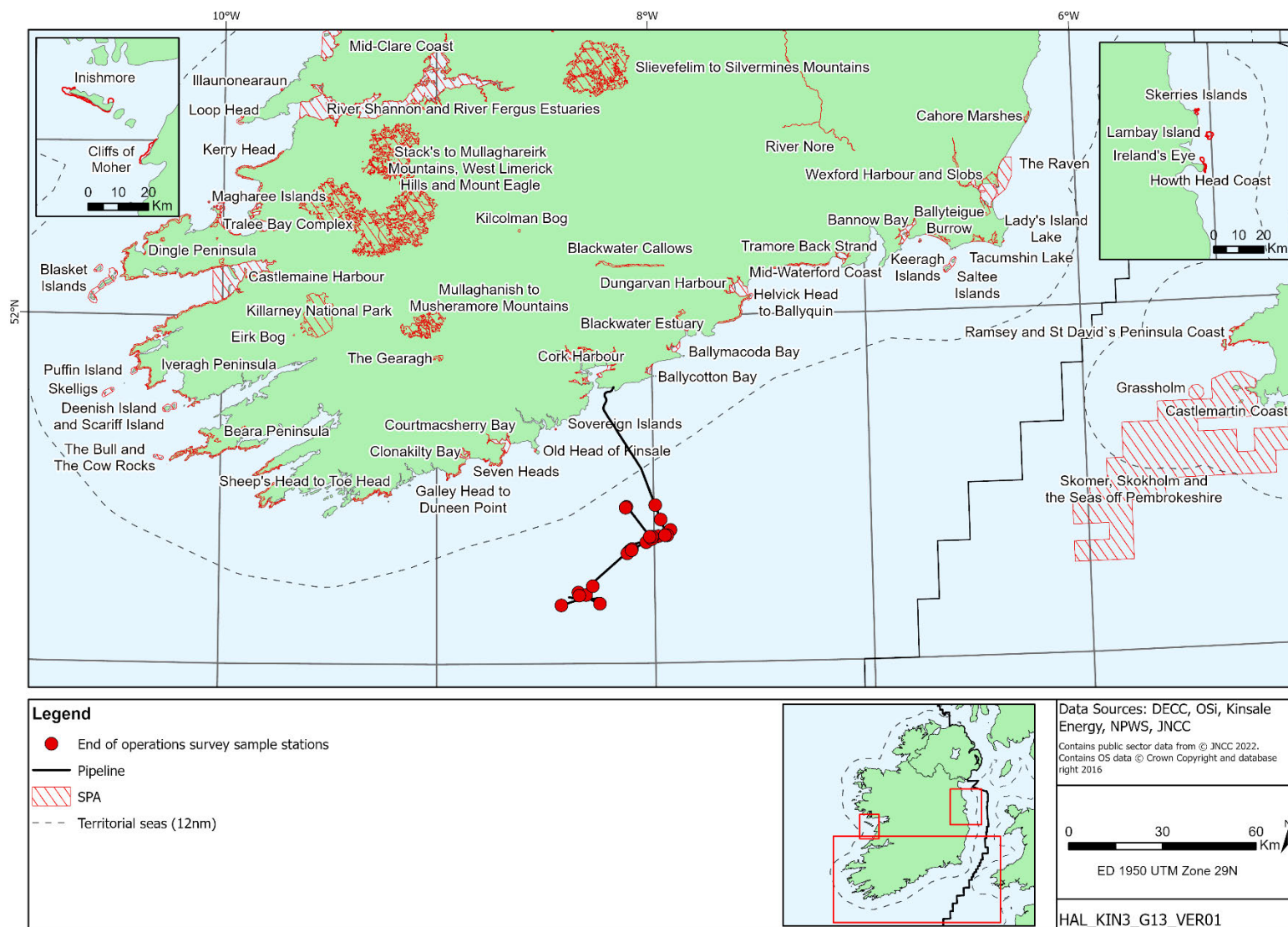
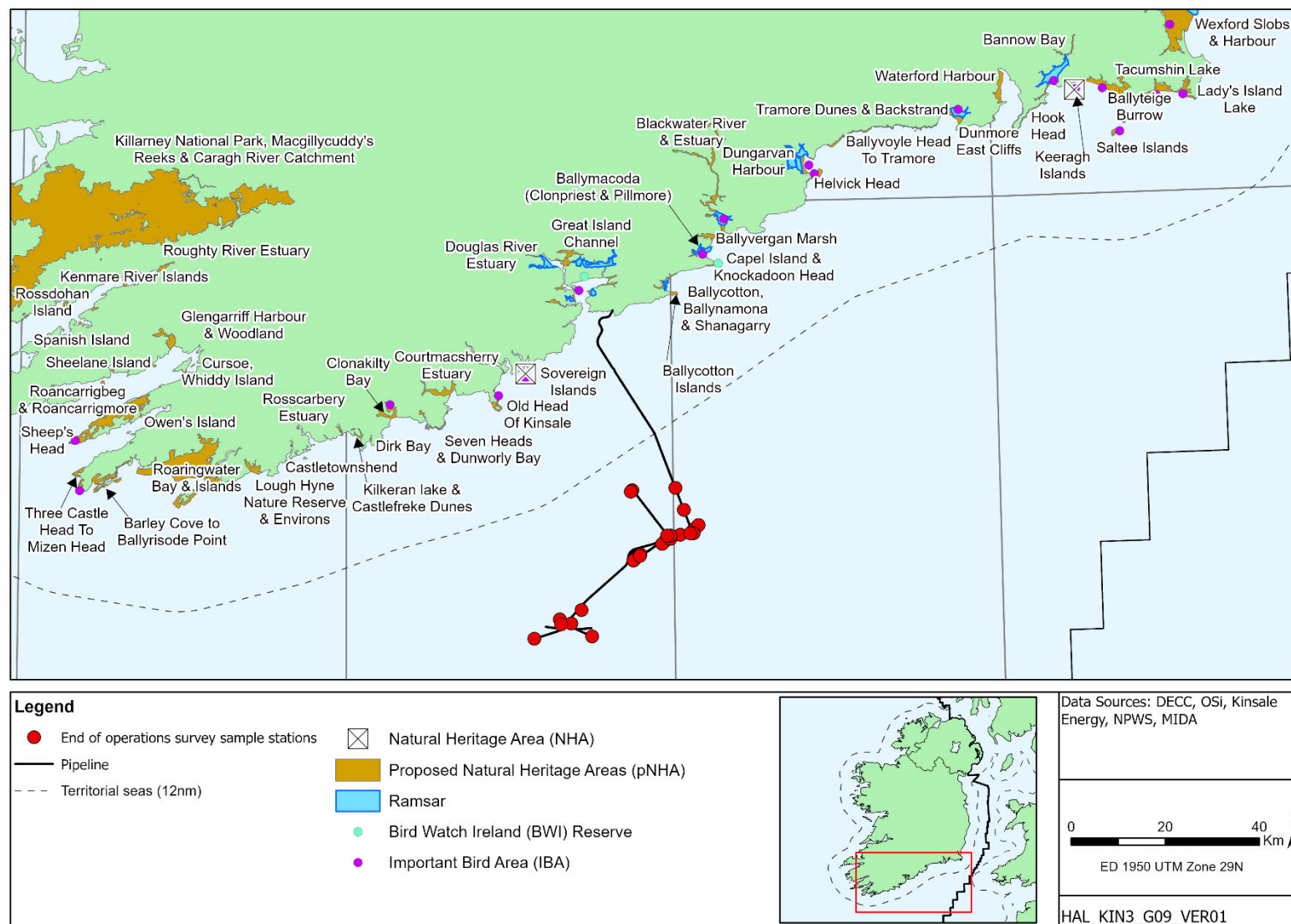




Figure 3.9: Other conservation sites



Habitats Directive Annex IV species that could potentially occur in the survey area are listed in Table 3.6. The known abundance and distribution of these species in the Celtic Sea, and of relevance to the survey, is described in Section 3.2.4 and 3.2.6.

Table 3.6: Annex IV species relevant to the survey and wider Kinsale area

Group	Common Name	Scientific Name	Habitats Directive Annex (es)
Cetaceans	Harbour porpoise	<i>Phocoena phocoena</i>	II and IV
	Common dolphin	<i>Delphinus delphis</i>	IV
	Bottlenose dolphin	<i>Tursiops truncatus</i>	II and IV
	Risso's dolphin	<i>Grampus griseus</i>	IV
	Killer whale	<i>Orcinus orca</i>	IV
	Striped dolphin	<i>Stenella coeruleoalba</i>	IV
	Northern right whale	<i>Eubalaena glacialis</i>	IV
	Blue whale	<i>Balaenoptera musculus</i>	IV
	Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	IV
	White-beaked dolphin	<i>Lagenorhynchus albirostris</i>	IV
	Long-finned pilot whale	<i>Globicephala melas</i>	IV
	Northern bottlenose whale	<i>Hyperoodon ampullatus</i>	IV
	Minke whale	<i>Balaenoptera acutorostrata</i>	IV
	Humpback whale	<i>Megaptera novaeangliae</i>	IV
	Fin whale	<i>Balaenoptera physalus</i>	IV
	Sei whale	<i>Balaenoptera borealis</i>	IV
Marine Reptiles - Turtles	Leatherback turtle	<i>Dermochelys coriacea</i>	IV
	Loggerhead turtle	<i>Caretta caretta</i>	IV
	Kemp's Ridley turtle	<i>Lepidochelys kempii</i>	IV
	Hawksbill turtle	<i>Eretmochelys imbricata</i>	IV
	Green turtle	<i>Chelonia mydas</i>	IV

### 3.3 Other Users

#### 3.3.1 Offshore energy: renewables and oil & gas

No offshore energy developments are located within or in close proximity to the proposed survey, however, there have been a number of recent Foreshore Licence applications for site investigations relating to potential projects in the territorial and offshore waters of Ireland, these include several areas offshore of Co. Cork (Figure 3.10). The site investigations include those for the Emerald project, led by Simply Blue Energy, and Inis Ealga Marine Energy Park, led by DP Energy Ireland Ltd and Iberdrola. To date, the investigations concentrate on territorial waters, however, it is the intention of the applicants

to submit further applications which would cover offshore waters, and for the Emerald project, this would include the Kinsale Area<sup>8</sup>.

Applications have not been made in relation to the development phases of these projects, which are both at an early/conceptual stage, but may feature as Phase 2 Maritime Area Consent applications. The Emerald project is intended to be a 1.3GW floating offshore wind farm constructed in two phases, located approximately 35-60km offshore. The Inis Ealga Marine Energy Park is similarly proposed to be a floating offshore wind farm, with a capacity of 1GW. The proposed array areas for both wind farms are located in offshore waters (i.e. seaward of 12nm from the coast).

There is the potential for future development associated with the Barryroe oil discovery, located within licence area EL 1/11, which overlaps the Seven Heads field area. While there has been recent survey activity, the latest being in August 2019 in relation to a proposed appraisal well, neither the appraisal well or any subsequent development proposals have been forthcoming to date.

### 3.3.2 Shipping

Vessel traffic in the coastal regions of the Celtic Sea is generally moderate, and higher along routes connecting major ports in the south including Cork and Waterford; higher traffic around the Kinsale Alpha and Kinsale Bravo platforms (now removed) reflects that associated with decommissioning activity as part of the wider KADP. A shipping study based on AIS data completed for IOSEA4 (DCENR 2011) indicated that generally up to 300-750 vessels per year were present in waters off the south coast of Ireland and in the vicinity of the survey (see other data sources including MMO 2014 and subsequent data updates, and EMODnet 2019<sup>9</sup>, Figure 3.11).

No IMO routeing measures or designated anchorages are located in or close to the proposed survey.

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<sup>8</sup>Emerald Project: <https://www.gov.ie/en/foreshore-notice/61ccf-simply-blue-emerald-site-investigations-for-possible-floating-offshore-wind-project-off-kinsale/>, Inis Ealga: <https://www.gov.ie/en/foreshore-notice/c9ea6-dp-energy-site-investigations-at-inis-ealga/>

<sup>9</sup> <https://www.emodnet-humanactivities.eu/search-results.php?dataname=Vessel+Density+> and <https://www.emodnet-humanactivities.eu/search-results.php?dataname=Route+density+%28source%3A+EMSA%29>



Figure 3.10: Relevant Foreshore Licence applications related to offshore wind site investigations

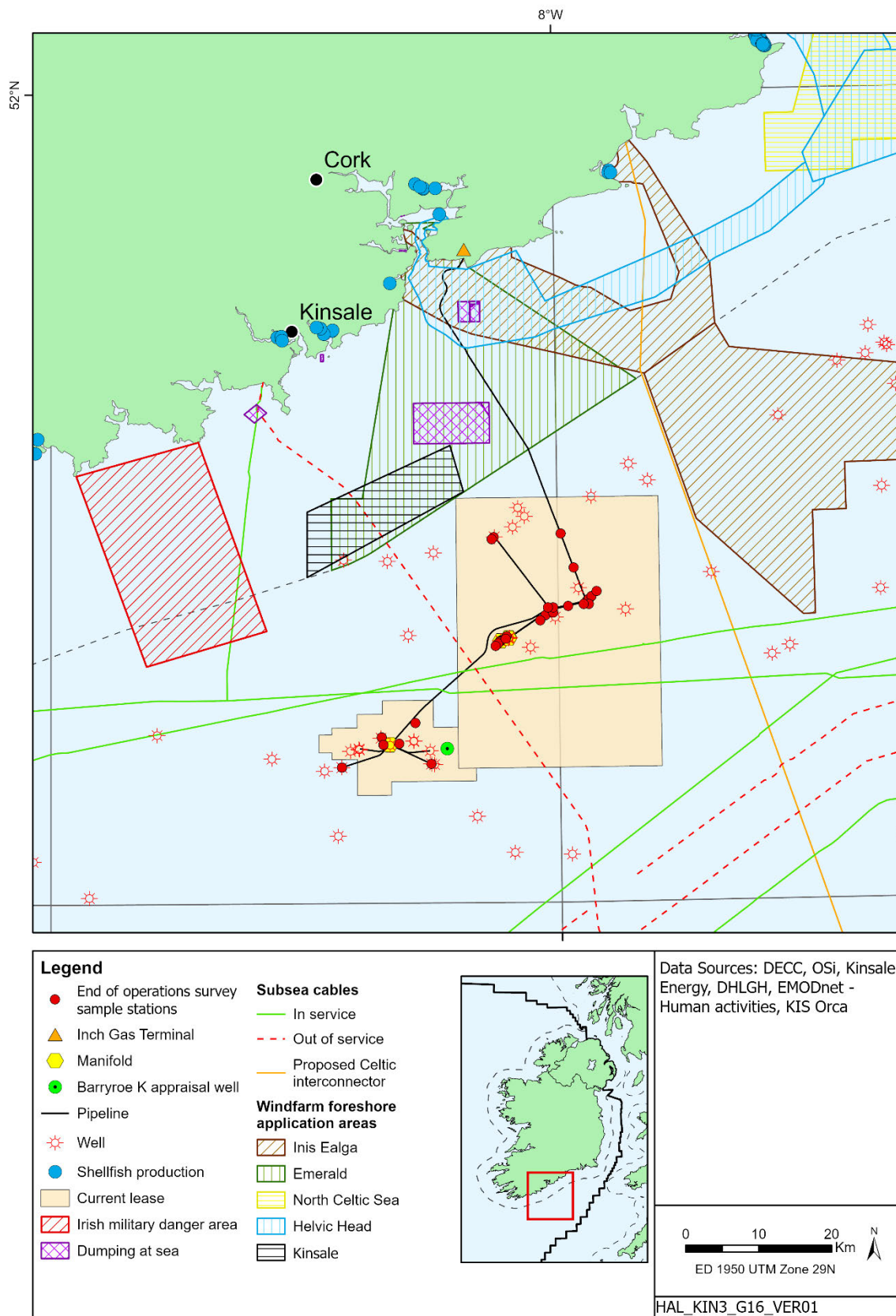
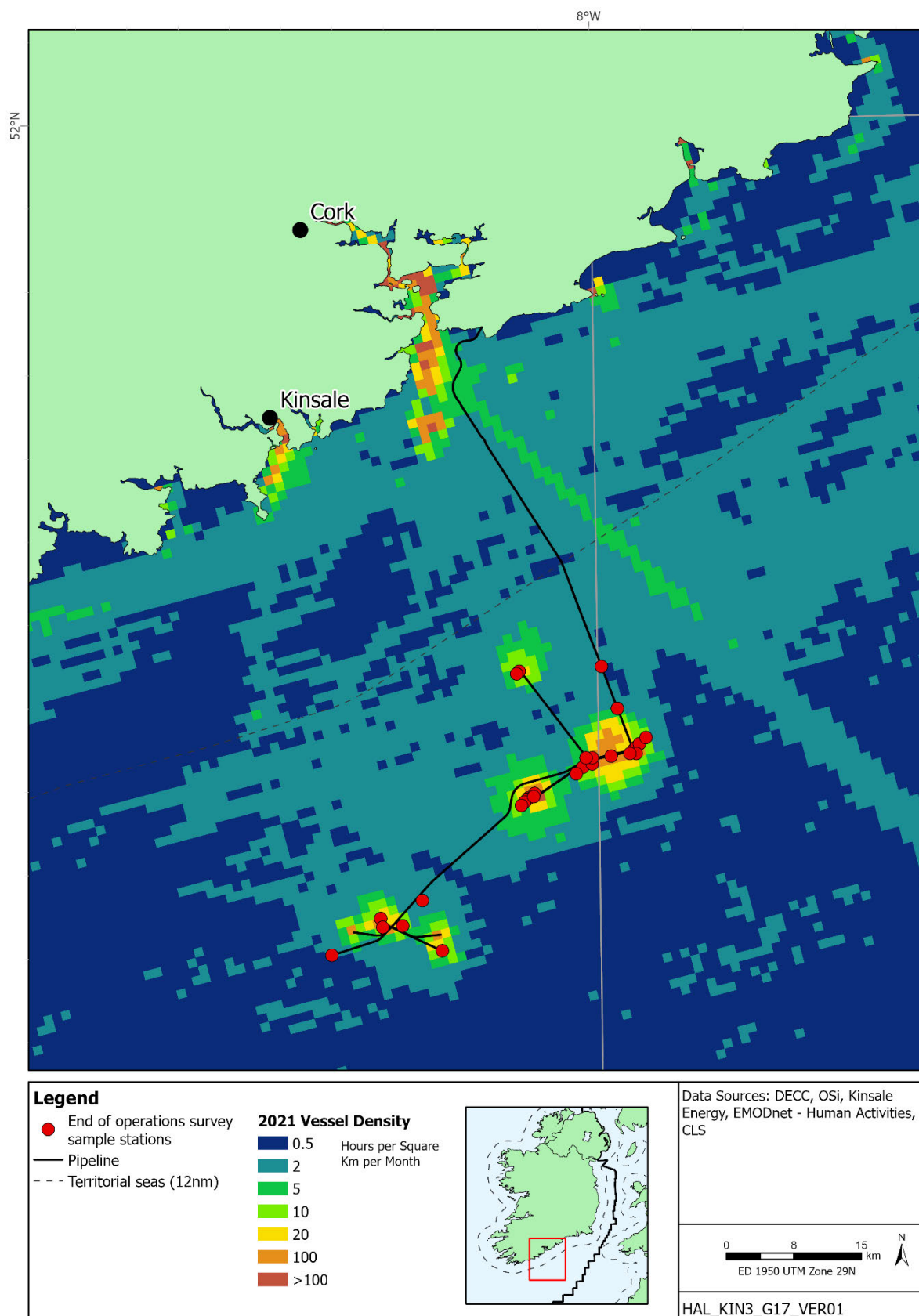


Figure 3.11: Shipping in the survey area



### 3.3.3 Fisheries

The seas around Ireland are among the most productive in EU waters and most fisheries resources come under the remit of the Common Fisheries Policy (CFP). In 2020, the Irish fleet had access to 3.7 million tonnes of fish, with Ireland's share of the Total Allowable Catch (TAC) being 172,132 tonnes. Irish vessels landed 188,994 tonnes of fish into Irish ports in 2020 with an estimated value of €220.5 million<sup>10</sup> (Marine Institute 2021). The largest ports near the survey are Castletownbere and Dunmore East, which are both among the top four ports (by landings) in Ireland (SFPA website<sup>11</sup>). Of the more local ports, the most significant in 2020 were Union Hall (1,845 tonnes, €5.9 million), Kinsale (1,270 tonnes, €2.9 million) and Kilmore Quay (3,793 tonnes, €16.9 million) (SFPA website).

The dominant fishing method in the area is demersal (otter) trawling (Figure 3.12), which is, in the waters around the survey, mainly used to catch *Nephrops*, haddock and whiting (Gerritsen & Kelly 2019). Other gears in use in the area include pelagic trawls (predominantly targeting herring in the area), seine nets (targeting haddock and whiting) and gill nets (targeting pollack and hake) (Gerritsen & Kelly 2019). Anatec (2017) conducted a survey of fishing activity within the Kinsale Area. A monthly count of fishing vessels over 2014 and 2015/16 (also see Figure 3.13) showed the busiest month to be February 2016, with 540 vessel-days recorded by 77 different vessels within the study area. The most common gear types were single demersal trawlers (30%), single pelagic trawlers (20%), gill netters (19%), beam trawlers (8%) and long liners (7%). Purse seines, twin trawlers (which may be demersal or pelagic) and dredgers all contributed 4%, while potters/whelkers contributed 2%, primarily in coastal waters. Over 90% of all vessels were Irish-registered, and 70% were registered to ports on the south coast.

The south coast of Ireland is of particular importance for smaller vessels (<12m), which tend to be local, fishing from, and landing at home ports. Fishing is restricted within the Irish Conservation Box (or Biologically Sensitive Area), within which vessels >10m must report their movements into and out of the zone, and record their catch every two hours. ICES rectangles are used for fisheries data recording and management. Table 3.6 lists the weight and value of landings from ICES rectangles relevant to the survey over the period 2019-2021.

Table 3.7: Weight and value of landings from ICES rectangles 31E1 and 31E2, 2019-2021

Species type	2019		2020		2021	
	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)
<b>31E1</b>						
Pelagic	3	2,098	0	0	0	0
Demersal	1,433	3,722,299	1,534	3,843,644	1,830	4,284,365
Shellfish	71	456,143	67	428,284	115	739,479
<b>Total</b>	<b>1,507</b>	<b>4,180,540</b>	<b>1,601</b>	<b>4,271,929</b>	<b>1,945</b>	<b>5,023,844</b>

<sup>10</sup> These values do not include the valuable inshore fisheries (e.g. lobster, whelk) which are not managed using internationally agreed TACs but do come within the remit of the CFP. These inshore fisheries resources represent a very important resource base for the coastal communities around Ireland. These shellfish fisheries are worth approximately €53 million annually.

<sup>11</sup> <https://www.sfpa.ie/Statistics/Annual-statistics/Annual-Statistics/2018-Statistics>



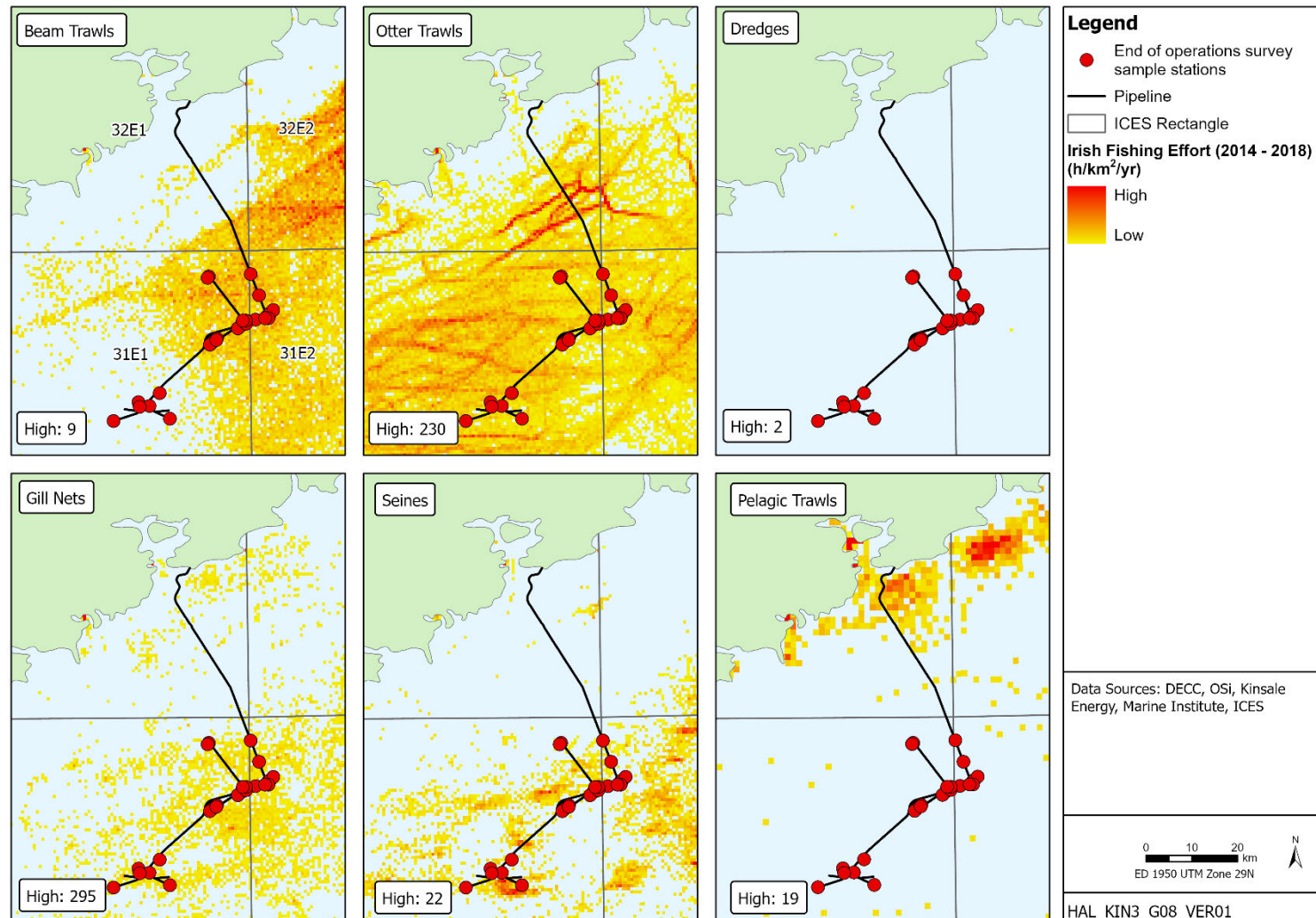
Species type	2019		2020		2021	
	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)
<b>31E2</b>						
Pelagic	0	0	0	0	0	0
Demersal	2,148	5,329,030	2,264	5,356,694	2,148	5,064,046
Shellfish	77	746,926	101	1,018,001	76	760,480
<b>Total</b>	<b>2,225</b>	<b>6,075,957</b>	<b>2,365</b>	<b>6,374,694</b>	<b>2,224</b>	<b>5,824,526</b>

Notes: Landings from each statistical rectangle are for all nationalities. There were few disclosive data covering the rectangles in 2019, 2020 and 2021, totalling 679 tonnes and 650 tonnes respectively. Sources: Compiled from landings data provided by the Sea Fisheries Protection Authority and average fish prices of landings into Irish ports in 2020 available from the SFPA website: <https://www.sfpa.ie/Statistics/Annual-statistics/Annual-Statistics/2020-Statistics>

The status of commercial fish and shellfish populations was considered in relation to MSFD Descriptor 3<sup>12</sup> in the Initial Assessment of Ireland's marine waters (Marine Institute 2013). Monitoring of commercial fisheries in Ireland for MSFD is based on data collected under the Common Fisheries Policy, with the Marine Institute (2019) indicating that for 2019, 47% (35) of fish stocks were sustainably fished, 18% (13) overfished and with the remaining stocks (26) having an unknown status. Overall fishing pressure on commercial fish and shellfish stocks in the Celtic Sea have declined since a peak in 1998, and there has been a corresponding increase in stock biomass with gradual progress towards sustainability (Marine Institute 2017).

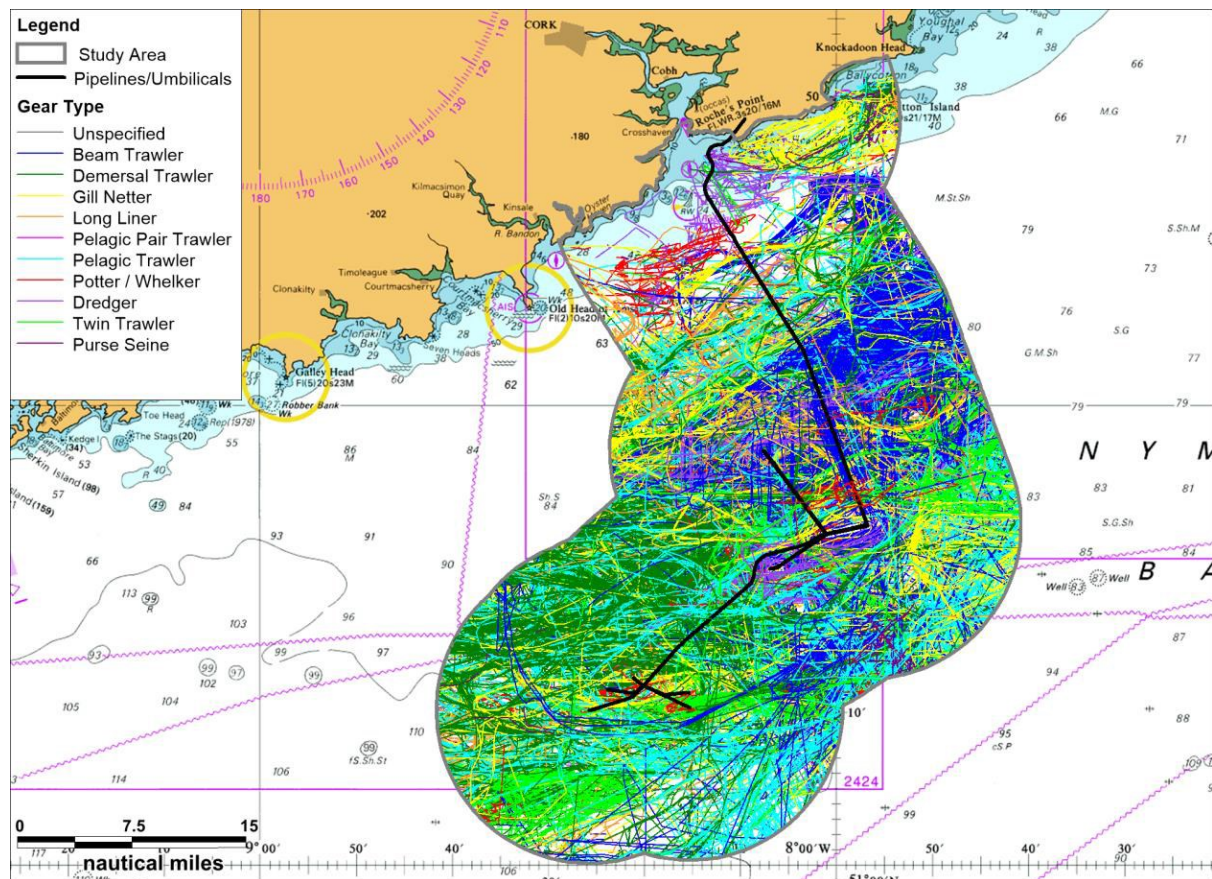
<sup>12</sup> Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.

Figure 3.12: Fishing effort in the Kinsale Area, 2014-2018





**Figure 3.13: Vessels estimated to be actively engaged in fishing (2014 & 2015/16)**



Source: Anatec (2017)

### 3.3.4 Military activity

Military Practice and Exercise Areas (PEXAs) located in Irish waters are used for aircraft and ship manoeuvres or in ranging and bombing practice. There are a number of military installations and firing ranges along the Irish coast, the largest of these include the naval base at Haulbowline in Cork Harbour. There are no PEXA danger areas located within or close to the survey.

### 3.3.5 Subsea cables

Existing subsea cables (Hibernia Atlantic, Hibernia Express) are some distance from the survey. Two cables (the Celtic Interconnector electricity and the Ireland France subsea fibreoptic cable) are proposed to be installed in the Celtic Sea, but both are some distance from the survey, and their installation is not expected until after the survey has taken place.

### 3.3.6 Aggregates

In general, no significant marine aggregate extraction takes place in Ireland (DCENR 2015), with areas identified to potentially supplement terrestrial aggregate sources identified in the western Irish Sea to the north, some distance from the survey (Sutton 2008).

### 3.3.7 Recreation and tourism

Recreational activities are concentrated at the coast, with the most relevant activities to the survey being sea angling, sailing/boating and whale and dolphin watching, primarily from Cork Harbour and Kinsale, as well as other smaller centres along the Cork coast.

An online review of sea angling charter operators in the region (see Ramboll 2017a, b) indicated that most offered half-day to one-day trips (i.e. angling, wreck, reef and shark angling) and were generally licensed to operate within a 30 nautical mile (56km) radius of the harbour, with only a few companies with a licence to operate up to approximately 40 nautical miles (74km). However, Angling Ireland indicates that most offshore angling trips are likely to be within 32km of the coast<sup>13</sup>.

As part of an assessment of coastal recreational activity and capacity for increased boating in Cork Harbour (Kopke *et al.* 2008), a 'spill out area' was estimated to take account of boats that left the harbour on day trips. It was estimated that an average boat travelling at 6-7 knots (3.1-3.6m/s) under favourable conditions and with the desire to return to the harbour the same day, could travel a distance of approximately 24km.

### 3.3.8 Cultural heritage

Wrecks over 100 years old and archaeological objects found underwater are protected under the *National Monuments (Amendment) Acts 1987 to 2004*. Significant wrecks less than 100 years old can be designated by Underwater Heritage Order (UHO) on account of their historical, archaeological or artistic importance. The Archaeological Diving Company Ltd. (ADCO) carried out a desk-top Cultural Heritage Assessment in November 2018 covering the Kinsale Area which included the subsea fields which are the subject of the proposed surveys.

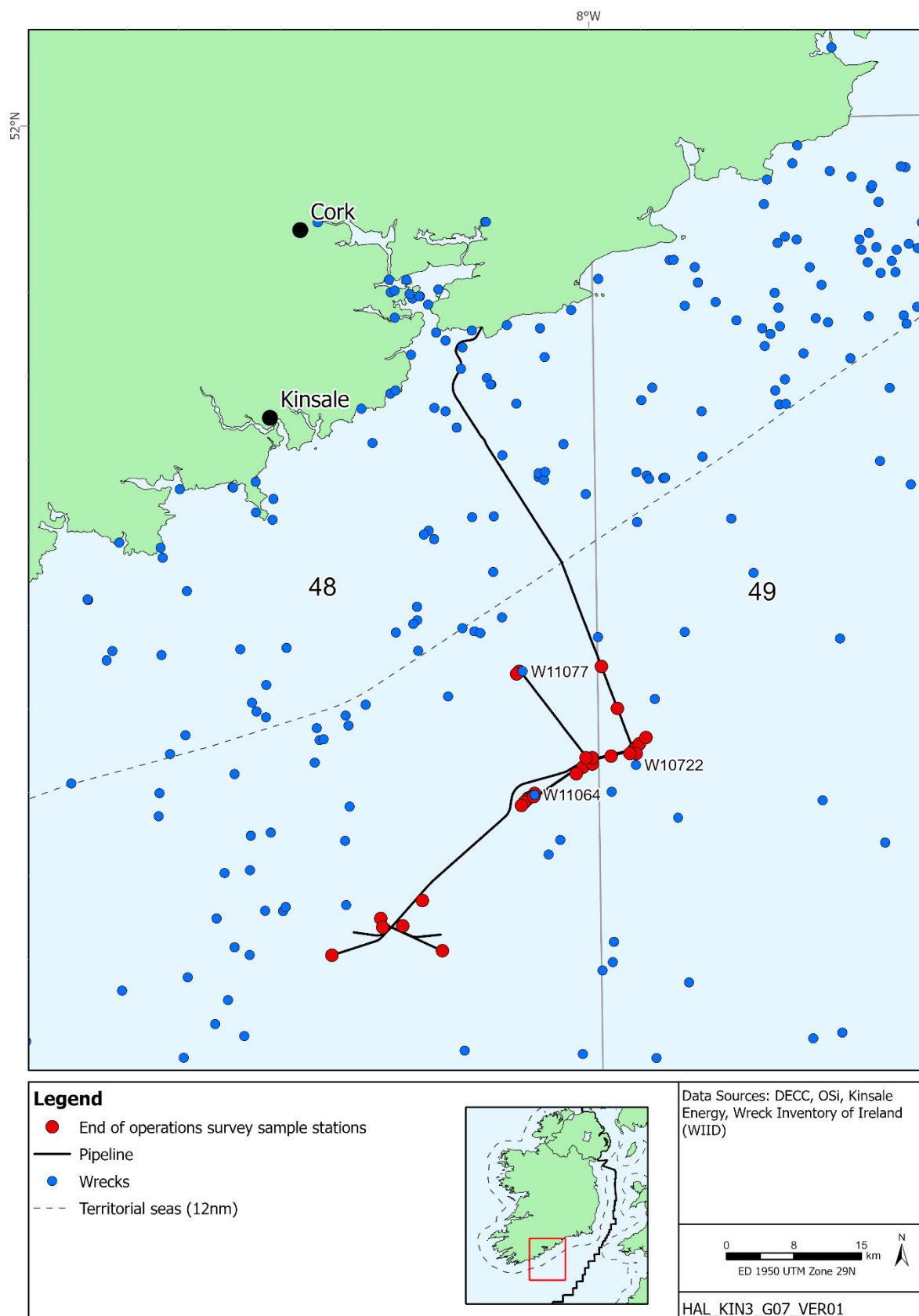
A number of wreck sites were identified in relatively close proximity to the Kinsale Area pipelines by ADCO (2018), and those within 5km of the pipelines are shown in Figure 3.14. The closest wreck to any of the Seven Heads pipelines is W11050 (unnamed) which is 2.7km away and some distance from any of the proposed sampling stations. Similarly, wrecks associated with the Kinsale Head infield pipelines are at least 1.7km distance (W10722, unnamed), with others being closer to the Western Drill Centre pipeline (W11064, unnamed, 190m) and Ballycotton pipeline (W11077, unnamed, 30m). There are several charted wreck sites that lie close to the export pipeline which include W1076 (unnamed, 700m), W08054 (*Carrabin*, 680m), the W08211 (*Elizabeth Jane*, 600m) and W5519 (UC-42, 30m).

Known wreck sites are shown in Figure 3.14 in relation to the proposed sample stations. There are two unnamed wrecks within 1km of sample stations S6 (W11064, 140m) and S6 (W11077, 390m). The next closest wreck is W10722, also unnamed, which is 1.2km from station S18.

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<sup>13</sup> <http://www.fishinginireland.info/sea/index.htm>

Figure 3.14: Wrecks



## **4 IDENTIFICATION OF POTENTIALLY SIGNIFICANT EFFECTS AND EIA SCREENING**

### **4.1 Introduction**

The proposed survey activities do not fall within those which are statutorily required to complete an EIA (i.e. they are not Annex I or II projects within the meaning of the EIA Directive (2011/92/EU as amended by 2014/52/EU)). This EIA screening report is intended to fulfil the requirements of the EIA Directive by providing an environmental appraisal of the potential for direct and indirect significant effects of the proposed survey programme as outlined in Section 2, in order to provide the relevant information to allow the Competent Authority to make a decision on whether an Environmental Impact Assessment (EIA) is required, and whether consent for the activities can be granted.

### **4.2 Approach to Screening for Potential Effects**

Effects likely to arise from the survey programme (relevant to those factors within Article 3(1) of the EIA Directive<sup>14</sup>) have been identified on the basis of the nature of the project described in Section 2 (including its location, physical and operational characteristics, residues, emissions and wastes), considered against the description of the environment in Section 3, and the understanding of impact pathways from a range of sources, including:

- Regional and site specific environmental data, including a number of field-specific surveys previously undertaken in the Kinsale area, most recently in 2017
- Vessel and survey equipment specifications
- Experience of relevant aspects and operations of analogous projects in the Celtic Sea, Irish Sea, North Sea and elsewhere
- Peer reviewed scientific papers describing the effects of specific and analogous interactions
- Other publicly available “grey” literature
- The Irish Offshore Strategic Environmental Assessment (IOSEA) 4 Environmental Report and IOSEA 5 Environmental Report
- Relevant conservation site designations, potential designations, and any site advice
- Applicable legislation, guidance and policies

Defined consequence and likelihood criteria (Table 4.1) were used to screen for the potential effects of the survey activities (Table 4.2). These take account of EPA guidance on preparing EIA documents (EPA 2022) and European Commission guidance (EC 2017). It allows for the consideration of effect likelihood, scale, duration and frequency (Table 4.2), and forms the basis for those sources of potential effect considered further in Section 5.

The identification of potential effects (positive or negative) considered those which are direct and indirect, and which could lead to cumulative or transboundary effects. The vulnerability of the project to risks of major accidents and/or disasters of relevance has also been considered. While this includes a consideration of potential major accidents, as the Celtic Sea shows relatively little seismicity and is not prone to significant natural disasters, the potential for effects to be generated by such events has not been considered.

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<sup>14</sup> a. Population and human health; b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC, c. Land, soil, water, air and climate; d. Material assets, cultural heritage and the landscape; e. The interaction between the factors referred to in points (a) to (d).


Table 4.1: High level description of the criteria used to consider potential environmental effects

Effect	Consequences
None Foreseen	No detectable effects
Positive	Activity may contribute to recovery of habitats Positive benefits to local, regional or national economy
Negligible	Change is within scope of existing variability but potentially detectable.
Moderate	Change in ecosystem leading to short term damage with likelihood for recovery within 2 years to an offshore area less than 100 hectares or less than 2 hectares of a benthic fish spawning ground Possible but unlikely effect on human health Possible transboundary effects Possible contribution to cumulative effects Issue of limited public concern May cause nuisance Possible short term minor loss to private users or public finance
Major	Change in ecosystem leading to medium term (2+ year) damage with recovery likely within 2 - 10 years to an offshore area 100 hectares or more or 2 hectares of a benthic fish spawning ground or coastal habitat, or to internationally or nationally protected populations, habitats or sites Transboundary effects expected Moderate contribution to cumulative effects Issue of public concern Possible effect on human health Possible medium term loss to private users or public finance
Severe	Change in ecosystem leading to long term (10+ year) damage with poor potential for recovery to an offshore area 100 hectares or more or 2 hectares of a benthic fish spawning ground or coastal habitat, or to internationally or nationally protected populations, habitats or sites Major transboundary effects expected Major contribution to cumulative effects Issue of acute public concern Likely effect on human health Long term, substantial loss to private users or public finance

Frequency with which activity or event might occur	Likelihood
Unlikely to occur	Remote
Once during activity	Unlikely
Foreseeable possibly once a year	Possible
Once a month or regular short term events	Likely
Continuous or regular planned activity	Definite

Consequences	Likelihood				
	Definite	Likely	Possible	Unlikely	Remote
Severe	A5	A4	A3	A2	A1
Major	B5	B4	B3	B2	B1
Moderate	C5	C4	C3	C2	C1
Negligible	D5	D4	D3	D2	D1
Positive	E5	E4	E3	E2	E1
None foreseen					

**Key for Table 4.2**
 Potentially significant effects requiring assessment (see Section 5)

 Potential positive or minor or negligible effects


 No likely effects



Table 4.2: Screening matrix for potential activity/environment interactions

Activity/Source Potential Effect	of	Population and human health	Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC						Land, soil, water, air, climate		Material assets, cultural heritage and landscape					Summary consideration		
			Benthic Fauna	Plankton	Fish and Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Conservation Sites and Species <sup>2</sup>	Soils & seabed <sup>2</sup>	Water quality	Air & climate	Fisheries & aquaculture	Other users & resources <sup>3</sup>	Shipping		Waste treatment & landfill resource onshore	Cultural heritage
Power generation on survey vessel		D1									D3							There will be minor and temporary atmospheric emissions from the survey vessel during transit and working in the field which will be incremental to those of wider shipping in the Kinsale area. It is estimated that a representative vessel working for three days would use ~21 tonnes of diesel, generating ~69tCO <sub>2</sub> eq. These will contribute to global greenhouse gas concentrations and local air quality, but these are extremely small in a regional context. <b>Potential for significant effects discounted</b>
Discharges and wastes			D2	D2						D2								The vessel used for the survey will meet MARPOL requirements (e.g. in relation to Annex I and Annex IV on the prevention of pollution by oil and sewage from ships respectively, under the Sea Pollution Act 1991 as amended). Similarly, the vessel will meet MARPOL Annex V requirements. This includes the implementation of a Garbage Management Plan (under the Sea Pollution Act 1991 as amended and the Sea Pollution (Prevention of Pollution by Garbage from Ships) Regulations 2012 as amended) which details specific waste management procedures, documents the segregation and safe handling and storage of waste and waste reduction measures. Wastes including litter will be retained on the vessel and disposed of at a suitable reception facility on return to shore. Kinsale will ensure that such plans are in place as part of standard contractor management. <b>Potential for significant effects discounted</b>

Activity/Source of Potential Effect	Population and human health	Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC							Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
		Benthic Fauna	Plankton	Fish and Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Conservation Sites and Species <sup>2</sup>	Soils & seabed <sup>2</sup>	Water quality	Air & climate	Fisheries & aquaculture	Other users & resources <sup>3</sup>	Shipping	Waste treatment & landfill resource onshore	Cultural heritage	Landscape/seascape	
Noise generated survey vessel and positioning equipment	C3			C3	C3	C3	C3	C3				C3						The surveys do not involve the use of noise generating equipment to collect survey data, for example, multibeam or sidescan sonar (Section 2), and therefore, the main contribution to underwater noise will be from the vessel. A USBL system will be used for drop down camera positioning which does involve a noise source.  <b>See Section 5.2 for further consideration</b>
Seabed disturbance		D2							D2							D2		The sediment grab sample will interact with the seabed, collecting a total sample area of up to 0.2m <sup>2</sup> per sampling location, or 6.6m <sup>2</sup> across the whole survey campaign. This will represent a minor level of seabed disturbance and any effect would be negligible and not significant. Previous surveys have not recorded sensitive habitats, including Annex I habitats, within the Kinsale area, and interaction with these is, therefore, not anticipated. The closest wreck site to a sampling station is 140m. It is expected that samples would be collected within 50m of the station positions, and any impact on wrecks is not considered to be likely.  <b>Potential for significant effects discounted</b>

Activity/Source Potential Effect	of	Population and human health	Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC						Land, soil, water, air, climate			Material assets, cultural heritage and landscape					Summary consideration		
			Benthic Fauna	Plankton	Fish and Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Conservation Sites and Species <sup>2</sup>	Soils & seabed <sup>2</sup>	Water quality	Air & climate	Fisheries & aquaculture	Other users & resources <sup>3</sup>	Shipping	Waste treatment & landfill resource onshore		Cultural heritage	Landscape/seascape
Physical presence of survey vessel (ecological impacts)							D3	D3	D3										<p>The physical presence of the vessel has the potential for interaction/disturbance of birds and marine mammal species through physical presence. Most species from relevant SPAs within foraging range of the survey (Woodward <i>et al.</i> 2019) have been judged to have a low to moderate sensitivity to disturbance by shipping traffic (e.g. gannet, fulmar, kittiwake, gulls, auks; Old Head of Kinsale SPA 34km distant; Saltee Islands SPA 119km distant see Garthe &amp; Hüppop 2004, Fliessbach <i>et al.</i> 2019).</p> <p>Physical disturbance of seaduck and other waterbird flocks by vessel traffic is unlikely, and the coastal nature of the foraging activities of waterbirds further limits the potential for interaction between such birds and the survey, which will be undertaken at least 33km from the coast. The survey vessel would use established routes to reach the survey area, and the increment of one trip to/from port to the survey would not represent a significant increase in vessel traffic relative to current levels (see Section 3.3.2). <b>Potential for significant effects discounted</b></p>

Activity/Source of Potential Effect	Population and human health	Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC							Land, soil, water, air, climate			Material assets, cultural heritage and landscape					Summary consideration	
		Benthic Fauna	Plankton	Fish and Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Conservation Sites and Species <sup>2</sup>	Soils & seabed <sup>2</sup>	Water quality	Air & climate	Fisheries & aquaculture	Other users & resources <sup>3</sup>	Shipping	Waste treatment & landfill resource onshore	Cultural heritage		Landscape/seascape
Physical presence of survey vessel (other users of the sea)	D1											D2		D2				There is the potential for interaction with fisheries and shipping interests, but this is limited by the small working area and limited duration of the survey relative to the wider Celtic Sea, and its distance from most other offshore activities. Interactions are limited to the survey vessel in transit and time spent conducting the survey, which represents a minor increment to activity. The vessel will be mobile and only operating for a limited number of days, and the activities will be communicated through relevant notices to mariners. <b>Potential for significant effects discounted</b>
Accidental events	B1											B1		B1				The survey vessel represents a minor increment to vessel traffic in Kinsale Area and interaction with other users is limited by its short time in the field. The vessel will display navigational lighting and awareness of the survey will be communicated through Notices to Mariners. The risks to population and human health are limited and not considered to be likely.  Risks of oil spills (including all types of liquid hydrocarbon) associated with the proposed surveys are considered small.  <b>See Section 5.3 for further consideration</b>

Notes: <sup>1</sup>. Includes Annex II and IV species <sup>2</sup>. Includes natural seabed features <sup>3</sup>. Includes amenity, cables, oil and gas, aggregate and other dredging, military, renewables etc.

## **5 CONSIDERATION OF POTENTIAL EFFECTS**

### **5.1 Introduction**

The following section presents a description and assessment of those potential significant environmental effects identified in Section 4. The assessment has been undertaken on the basis of the survey methods described in Section 2. These include a worst case assessment (e.g. in terms of vessel timings and the equipment which could be used), such that those effects described below will not be exceeded, regardless of the final equipment selected.

### **5.2 Underwater Noise**

Anthropogenic noise in the marine environment is widely recognised as a potentially significant concern to marine fauna, especially in relation to marine mammals, with much attention also given to effects on fish and, more recently, invertebrates. Potential (and postulated) effects of anthropogenic noise on receptor organisms range from acute trauma to subtle behavioural and indirect ecological effects (e.g. effects on prey species). The sources, measurement, and propagation of anthropogenic underwater noise, along with the auditory abilities of marine fauna, evidence of effects and potential mitigation have been extensively reviewed and assessed (e.g. Richardson *et al.* 1995, McCauley *et al.* 2000, Southall *et al.* 2007, 2019, Popper *et al.* 2014, Carroll *et al.* 2017). Further effects on the UK and Irish marine environment from underwater noise have been extensively assessed; for example, the UK Offshore Energy SEAs (DECC 2009, 2011, 2016, BEIS 2022) and SEAs for offshore energy in Irish waters (e.g. DCENR 2011) provided detailed strategic assessments at a regional scale.

#### **5.2.1 Noise sources and propagation**

The noise sources associated with the survey are those from the vessel, and the Ultra-Short Baseline (USBL) acoustic system used to position the drop down camera.

The propagation of sound in the marine environment is complex and has been the subject of considerable research (e.g. Wang *et al.* 2014). Once a sound is emitted, its characteristics will be altered with distance from source. Changes will affect the amplitude of the signal and its frequency content and, in the case of impulsive sounds, the injurious elements will be reduced through propagation (i.e. pulse duration increases and rise-time decreases with distance). The main process that reduces the amplitude of the sound wave as it propagates is geometrical spreading; while a host of other processes come into play (e.g. reflection, refraction, scattering, reverberation and absorption), many of which are dependent on environmental conditions. The effect of frequency-dependent absorption loss is small on lower frequency sources (e.g. <0.3dB/km at 4kHz), which contributes to seismic survey noise being detectable by hydrophones hundreds of km from the source, but acts to rapidly attenuate higher frequency sources (e.g. 36dB/km at 100kHz) (Francois & Garrison 1982).

The USBL system consists of a multi-element transducer mounted on the hull of a vessel and a transponder attached to the equipment, in this case, the drop down camera. The hull-mounted transducer emits an acoustic pulse that is detected by the transponder, which replies with its own acoustic pulse, and its position is subsequently determined from the range and angle of the pulse as received by the transducer. USBL equipment is widely used by offshore commercial and research vessels where positional accuracy of survey



equipment is critical. The emitted pulses will be short pulse width 'pings', approximately in the range of 20-40kHz and with a source level of up to ~196dB re 1µPa @1m<sup>15</sup>.

In generic terms, underwater noise emitted by small leisure craft and vessels <50m tends to have a source level of 160-175 dB re 1µPa@1m, and with greater sound energy in relatively higher frequency (above 1kHz) when compared to large ships; support and supply vessels (50-100m) are expected to have source levels in the range 165-180dB re 1µPa@1m range and with most energy in lower frequencies (OSPAR 2009). For the purpose of this noise assessment, the offshore survey vessel is assumed to be of 50-100m in length. Veirs *et al.* (2016) estimated sound characteristics for a wider variety of ships (from pleasure craft to container ships) in transit across the Haro Strait (west coast of North America). Median received levels of ship noise within the study area were measured to be most elevated above ambient noise at the lower frequencies (20-30dB from 100-1,000Hz), and to a lesser extent also at higher frequencies (5-13dB from 10-40kHz).

Cavitation noise commonly arises at speeds between 8 and 12 knots and grows in amplitude with increasing speed; its frequency spectrum is broad with dominant frequencies above a few hundred Hz. In addition to vessels in transit, cavitation noise is important when vessels are operating under high load conditions (high thrust) and when dynamic positioning (DP) systems are in use. For example, the use of thrusters for DP has been reported to result in increased sound generation of ~10dB compared to the same vessel in transit: measurements at 600m range to an offshore supply vessel of 79m length recorded broadband SPL (18-3,000Hz) of 148.0dB re 1µPa (root-mean-squared, rms) when in DP mode, compared to 135.5dB re 1µPa rms when in transit at a speed of 10 knots (Rutenko & Ushchikovskii 2015).

Acoustic modelling in support of oil & gas operations have shown that across a variety of vessels, activities and localities, exposure to sound pressure level (SPL) above >180 dB re 1 µPa rms is highly unlikely; SPL >160 dB re 1 µPa rms are encountered only within the immediate vicinity of the activity (<50m) while SPL >120 dB re 1 µPa rms are encountered up to a few kilometres (Neptune LNG 2016, Fairweather 2016, Owl Ridge Natural Resource Consultants 2016).

### 5.2.2 Marine mammals

Marine mammals, for which sound is fundamental across a wide range of critical natural functions, show high sensitivity to underwater sound. Generally, the severity of effects tends to increase with increasing exposure to noise with both sound intensity and duration of exposure being important. A distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria of sound levels, with the most recent criteria presented in Southall *et al.* (2019). Auditory capabilities, and in particular the range of frequencies over which sensitivity is greatest, varies between species and criteria are assigned to functional hearing groups with accompanying injury criteria. Table 5.2 provides details of the relevant marine mammals listed by functional hearing group, their estimated hearing range and recommended injury criteria, defined as the sound level at which a permanent threshold shift (PTS; permanent hearing damage) is estimated to occur.

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<sup>15</sup> Based on manufacturer technical data

Table 5.1: Marine mammal auditory injury criteria to pulsed sounds by functional hearing group

<b>Functional hearing group</b> (species relevant to the Kinsale area)	<b>Estimated hearing range</b> (region of greatest sensitivity) [frequency of peak sensitivity]	<b>Proposed injury (PTS onset) threshold criteria to impulsive noise</b> (dB re 1µPa, peak, unweighted)
<b>Low frequency cetaceans</b> Fin whale ( <i>Balaenoptera physalus</i> ) Minke whale ( <i>Balaenoptera acutorostrata</i> ) Humpback whale ( <i>Megaptera novaeangliae</i> )	7Hz to 35kHz (200Hz to 19kHz) [5.6kHz]	219
<b>High frequency cetaceans</b> Common dolphin ( <i>Delphinus delphis</i> ) Bottlenose dolphin ( <i>Tursiops truncatus</i> ) Risso's dolphin ( <i>Grampus griseus</i> ) Killer whale ( <i>Orcinus orca</i> )	150Hz to 160kHz (8.8kHz to 110kHz) [58kHz]	230
<b>Very high frequency cetaceans</b> Harbour porpoise ( <i>Phocoena phocoena</i> )	275Hz to 160kHz (12kHz to 140kHz) [105kHz]	202
<b>Phocid seals in water</b> Grey seal ( <i>Halichoerus grypus</i> ) Harbour seal ( <i>Phoca vitulina</i> )	50Hz to 86kHz (1.9kHz to 30kHz) [13kHz]	218

Source: Southall et al. (2019). Notes: The region of greatest sensitivity represents parameters  $f_1$  and  $f_2$ , which are the bounds of the flat, central portion of the frequency-weighting curve region; the frequency of peak sensitivity represents parameter  $f_0$ .

Of the species likely to occur in the survey area, the harbour porpoise has the lowest threshold criteria for the onset of PTS at 202dB re 1µPa. Given the source characteristics and evidence of propagation presented above, the potential sources in the planned Kinsale survey (vessel and USBL) will not generate source levels of this amplitude. For all other species/functional hearing groups, the risk is lower still. Therefore, **the risk of injury to marine mammals (including all Annex IV Cetacea) from the planned survey activities is considered to be negligible, and significant effects are not considered to be likely.**

Underwater noise from the survey vessel could potentially cause behavioural disturbance of marine mammals present in the area. Reported responses include avoidance, changes in swimming speed, direction and surfacing patterns, alteration of the intensity and frequency of calls (review Erbe et al. 2019). Harbour porpoises and minke whales have been shown to respond to survey vessels by moving away from them, while some other species, such as common dolphins, have shown attraction (Palka & Hammond 2001).

While there is potential for some behavioural disturbance of cetaceans in response to survey vessel noise, the area of potential disturbance will be highly localised (i.e. within a few hundred metres radius), in an open sea habitat (i.e. with movement of animals not restricted by geographic features such as a shoreline), transient and of short overall duration. The increase in underwater noise from the survey vessel activities, relative to existing levels in the wider area from other shipping and fisheries, is expected to be negligible.

The waters off the south coast of Ireland support a high diversity of cetaceans, and the wider Kinsale-Ballycotton-Seven Heads area may occasionally experience temporarily high localised densities of some species (primarily common dolphins) during the period April-December. However, considering the acoustic characteristics of the potential sources and

their propagation, the relevant evidence of effects on marine mammals from vessel noise and the proportionally lower potential for effects of the USBL compared with seismic or other impulsive noise sources, in addition to the small spatial footprint and short duration (see Section 2.2) of the planned survey, **the risk of behavioural disturbance to any species of marine mammal (including on Annex IV species) is considered to be extremely low, and significant effects are not considered to be likely.**

The risk of negative effects on marine mammals is considered to be sufficiently low that no mitigation measures are necessary. The planned survey campaign involved grab sampling, and the only noise source of relevance is from the vessel and USBL positioning system. This reflects the low risk to marine life posed by the potential equipment, and the survey area environment not being of high sensitivity to these sources of effect.

### **5.2.3 Fish and fisheries**

Fish exhibit large variation in their response to sound, largely due to the great diversity in anatomical features, hearing physiology and behaviour; all species respond to particle motion, but several have adaptations that make them sensitive also to the pressure component of sound. Most species can detect sounds from <50Hz to a few hundred Hz, with some extending this range to approximately 500Hz (e.g. cod, saithe), and those with specialisations to be sensitive to sound pressure being able to detect sounds up to several kHz (e.g. herring) (review in Hawkins & Popper 2017). Broadly applicable sound exposure criteria have been published (Popper *et al.* 2014); the criteria for mortality and potential injury from seismic survey noise for species lacking a swim bladder (sensitive to particle motion only) is >213dB re 1  $\mu$ Pa (peak) and for all other groups is >207dB re 1  $\mu$ Pa (peak).

There have been numerous reviews of the effects of anthropogenic sound on fish (e.g. Popper *et al.* 2014, Hawkins *et al.* 2015, Slabbekoorn *et al.* 2019). Of relevance is Carroll *et al.* (2017), who present a systematic and critical review of scientific studies investigating the impacts of low-frequency sound on marine fish, with a focus on seismic surveys. Of studies investigating adult/juvenile fish mortality and physical injury, the majority showed no effects, some reported temporary hearing loss and one observed long-term hearing damage; none showed mortality. Of six studies investigating mortality of fish eggs or larvae, none reported mortality at realistic known exposure levels. Behavioural effects are the most studied aspect, numbering 15 studies, with most being laboratory or caged field experiments. Startle/alarm responses, avoidance of the sound source or changes in vertical or horizontal distribution were widely reported, while several studies reported no significant response or conflicting results. Observed responses were temporary, and fish returned to pre-exposure behaviour typically within less than an hour of the last exposure. The majority of studies of effects on catch rates or abundance report no effect or conflicting results, although in some cases reduced trawl and/or longline catch occurred; where effects have been reported, these are most likely due to changes in fish distribution and behaviour, such as vertical movements.

Given the reported hearing ranges of fish, it is anthropogenic sound sources generating high amplitude low-frequency noise (i.e. seismic airgun surveys, along with percussive pile-driving and explosions) which are of primary concern to fish; the operating frequency of the USBL is above the hearing range of fish, and noise sources for the vessel and USBL are well below the exposure criteria for mortality or injury. **Therefore, the risk of injury to fish is considered to be extremely remote and significant effects are not considered to be likely.**

Given the limited and variable evidence of behavioural responses of fish to high amplitude low-frequency seismic survey noise, the comparative characteristics of the potential sources

in the planned survey (vessel noise and USBL), in addition to the relatively small spatial footprint and short duration of the planned survey, **the risk of significant effects on fish due to behavioural disturbance is considered to be extremely low.**

The Kinsale area and proposed timing of the survey campaign overlaps reported spawning and nursery areas for a variety of fish species; however, given the above assessment in relation to behavioural disturbance, **significant disruption of spawning or nursery activity is not anticipated, and significant effects are not considered to be likely.**

#### 5.2.4 Diving birds

Information on the underwater hearing abilities of diving birds and evidence of the effects of underwater anthropogenic noise is very limited. Direct effects from underwater acoustic surveys on diving birds could potentially occur through physical damage, given exposure to sufficiently high amplitudes, or through behavioural disturbance. Deeper-diving species which spend longer periods of time underwater (e.g. auks) may be most at risk of exposure, but all species which routinely submerge in pursuit of prey and benthic feeding opportunities in marine and estuarine habitats (i.e. also including divers *Gavia spp.*, grebes, diving ducks, cormorant, shag, gannet, and Manx shearwater) may be exposed to anthropogenic noise.

While seabird responses to approaching vessels are highly variable (e.g. Fliessbach *et al.* 2019), flushing disturbance would be expected to displace most diving seabirds from close proximity to the survey vessel, thereby limiting their exposure to vessel or USBL noise. Similarly, any behavioural disturbance of seabirds due to the survey activities is most likely to be temporary displacement associated with the physical presence of the vessel, comparable to that experienced by routine shipping traffic.

While acknowledging limited data and the importance of the survey area to several species of diving birds (i.e. guillemot and razorbill), a consideration of the lack of reported effects of seismic survey on diving birds, the comparatively lower amplitude and higher frequency source characteristics of the vessel and USBL noise sources in the planned survey, in addition to its small spatial footprint and short duration, leads to the conclusion that **significant negative effects on diving birds are considered to be highly unlikely.**

#### Marine turtles

Available information on potential effects of underwater sound on marine turtles is very limited (Nelms *et al.* 2016). The hearing range of cheloniid species has been estimated to be between 50-2,000Hz, with highest sensitivity below 400Hz (Popper *et al.* 2014). For leatherback turtles, measurements made on hatchlings suggested a similar low frequency sensitivity, with sound detection ranging between 50 and 1,200Hz when in water and between 50 and 1,600Hz in air (Dow Piniak *et al.* 2012).

A variety of potential functions of hearing have been proposed for marine turtles, although the issue is poorly understood; they do not appear to vocalize or use sound for communication, but may use sound for navigation, locating prey, avoiding predators, and general environmental awareness (see Dow Piniak *et al.* 2012, Nelms *et al.* 2016 and references therein). While some authors have raised concerns over the potential for physical injury (including hearing damage) to marine turtles from seismic surveys (Nelms *et al.* 2016) and disturbance from increasing anthropogenic noise generally (Samuel *et al.* 2005), such potential impacts remain to be investigated, as do any subsequent ecological effects (Nelms *et al.* 2016).

Underwater noise generated by the survey vessel may be detectable by leatherback turtles, although their low density and limited seasonal presence in the area dictates that very few individuals are likely to be exposed to noise levels beyond that of the background for the region. Additionally, the operating frequencies of the USBL are above those estimated for the hearing ranges of turtles noted above. Considering this low likelihood of exposure, the perceived limited sensitivity of the receptor, and the moderate intensity nature of the noise sources, **significant impacts on marine turtles (including Annex IV species, see Section 3.2.7) are considered to be extremely remote.**

### **5.3 Accidental Events**

The survey activities will be communicated through notices to mariners and the vessel will display appropriate navigational lighting. In view of the duration and scale of activity (see Section 2.2), the probability of a collision with another vessel is considered to be extremely low, such that potential effects are not considered to be likely.

While the risks of oil spills (including all types of liquid hydrocarbon) associated with the proposed survey are extremely small, consideration of the potential sources and effects enables effective management and mitigation. Given the duration of the proposed survey (two to three days), refuelling at sea is not expected to occur. With regard to oil discharges (e.g. from machinery space drainage), the vessel will operate to MARPOL requirements for a Special Area, requiring oily water separation and monitoring prior to discharge. Discharges must be 15ppm or less, recorded in the Oil Record Book and only be made when underway. The vessel will also implement a Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with guidelines issued by the Marine Environment Protection Committee of the International Maritime Organisation. Kinsale will ensure that such plans are in place prior to any work taking place as part of standard contractor management.

### **5.4 Cumulative Effects**

The range of activities undertaken in and around the Kinsale area are detailed in Section 3.3. Proposed projects in the wider Kinsale Area include the Celtic Interconnector and Ireland-France subsea cable. The timing of any works associated with these projects is not considered likely to interact with the proposed survey schedule, and in view of the nature and scale of potential effects associated with the survey (Sections 4 and 5), significant in-combination effects are not considered to be likely.

Two Foreshore Licences have been applied for in relation to offshore wind farm site investigation work in the territorial waters off Cork (see Section 3.3), however, both are located entirely within territorial waters and there will be no spatial overlap with the proposed Kinsale end of operations survey. The indicative schedule in their respective applications suggest activities starting in 2021, or likely taking place 2020-2023. As neither application has been approved, there is the potential for the timescale within which works take place to be later than proposed. There is the potential for interaction between the timings of these surveys and work associated with the proposed survey, but the duration and scale of the survey campaign are such that there is considerable scope to avoid interactions.

The wind farm proposals associated with the site investigations are at a conceptual stage. No consent application for either development has been made, and no approvals have been granted. In the absence of project information, including indicative design parameters and schedule, the development stages of these wind farms will not be considered here, in keeping with Article IV(5e) of the EIA Directive.



There is the potential for future development associated with the Barryroe oil discovery. While a number of recent surveys have been completed to inform appraisal well drilling, applications relating to the appraisal or any development of the field are yet to be made and any interaction with the end of operations survey is not expected.

Kinsale Energy will maintain a dialogue with the developers of both wind farms, and further proposals in relation to the Barryroe field, to ensure that activities do not proceed in a manner which could lead to cumulative impacts.

## **5.5 Transboundary Effects**

Ireland has ratified the Convention on Environmental Impact Assessment in a Transboundary Context (the Espoo Convention) and thus an assessment is needed of the potential for the proposed KADP to result in significant transboundary effects<sup>16</sup> – the shortest distance to the nearest Median line is 74km (Ireland/UK).

The likely nature and footprint of effects described above are regarded to be localised in extent, minor in a regional context, and are not regarded to pose a risk of transboundary effects to UK waters.

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<sup>16</sup> Defined in the Espoo Convention as, “any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party”.

## **6 CONCLUSION**

### **6.1 EIA Screening Conclusion**

The overall conclusion of the Environmental Impact Assessment Screening Report is that, in view of the predicted scale, intensity and duration of the survey activities, the survey will not result, directly or indirectly, in likely significant adverse effects on the environment, alone or cumulatively with other existing or approved projects. No residual effects are predicted to occur.

A screening checklist has also been prepared for the project (Section 6.1) based on that provided in EC (2017).

## 6.2 Screening Checklist

Screening question	Yes/No and Brief description	Is this likely to result in a significant impact? Yes/No and a description of why.
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc.)?	No	n/a
2. Will construction or the operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or are in short supply?	Yes. The vessel involved will use fuel.	No. Fuel use is limited by the temporary nature of the activities (2 to 3 days).
3. Will the Project involve the use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?	No	n/a
4. Will the Project produce solid wastes during construction or operation or decommissioning?	No	n/a
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air or lead to exceeding Ambient Air Quality standards in Directives 2008/50/EC and 2004/107/EC)?	Yes. Atmospheric emissions will be generated from the vessel	No, the survey is a temporary and short term activity. Any air quality effects are mitigated either by distance to shore (~33km) or else their limited duration (2 to 3 days).
6. Will the Project cause noise and vibration or the releasing of light, heat energy or electromagnetic radiation?	Yes. Noise will be generated by the vessel.	No. Noise from the vessel is not considered a source of significant effect for noise sensitive species.
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal waters or the sea.	Yes. There will be a very low incremental risk of an accidental event or spill from the vessel.	No.

Screening question	Yes/No and Brief description	Is this likely to result in a significant impact? Yes/No and a description of why.
8. Will there be any risk of accidents during construction or operation of the Project that could affect human health or the environment?	Yes. There will be a very low incremental risk of an accidental event or spill from the vessel.	No, as above.
9. Will the Project result in environmentally related social changes, for example, in demography, traditional lifestyles, employment?	No. The project is small in scale and temporary.	n/a
10. Are there any other factors which should be considered such as consequential development that could lead to environmental impacts or the potential for cumulative impacts with other existing or planned activities in the locality?	No. The survey programme is part of a wider decommissioning project with no likelihood of consequential development.	n/a
11. Is the project located within or close to any areas which are protected under international, EU, or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the Project?	Yes. Features of conservation sites in Ireland and the UK, and in particular mobile species such as birds, marine mammals and fish, have the potential to be present in the survey area.	No. None of the sources of effect identified (e.g. physical disturbance, physical presence, underwater noise, discharges, emissions), are considered to present a likely significant effect for the designated features of protected sites.
12. Are there any other areas on or around the location that are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other waterbodies, the coastal zone, mountains, forests or woodlands, that could be affected by the Project?	Yes. The project is located in the Celtic Sea, which is used by a wide range of fish species of both conservation value, are prey species of birds and marine mammals, and which are commercially exploited. The wider Celtic Sea provides a habitat for a range of bird and marine mammal species e.g. for foraging.	No. The proposed activities are small scale and temporary, and are not likely to result in more than minor short-term impacts.
13. Are there any areas on or around the location that are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the Project?	Yes. Protected mobile species including birds, marine mammals, turtles and fish may be present around the survey location.	No. The proposed activities are small scale and temporary, and are not likely to result in more than minor short-term impacts.

Screening question	Yes/No and Brief description	Is this likely to result in a significant impact? Yes/No and a description of why.
14. Are there any inland, coastal, marine or underground waters (or features of the marine environment) on or around the location that could be affected by the Project?	Yes. The project is located in the Celtic Sea, and as noted above, a range of protected and other species and habitats are present in the wider Celtic Sea, and are, or could be, present with the survey coverage.	No. The proposed activities are small scale and temporary, and are not likely to result in more than minor short-term impacts.
15. Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the Project?	No. There are no designations with landscape components (e.g. National Parks) present near to the survey area. The activities will not be visible from the coast.	No. The survey campaign involves the use of ships, the scale of which are typical of vessel traffic in the Celtic Sea, and which will represent a minor and temporary increment to existing shipping traffic. Activities will take place some distance from the coast (~33km).
16. Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the Project?	Yes. There is the potential for recreational boating to take place.	No. The number of recreational vessels likely to transit the area is low. The works will be communicated through marine notices.
17. Are there any transport routes on or around the location that are susceptible to congestion or which cause environmental problems, which could be affected by the Project?	No. The survey area does not interact with and is not close to any IMO routing measure, shipping lane, or anchorage.	n/a
18. Is the Project in a location in which it is likely to be highly visible to many people?	No.	The survey activities will take place offshore, and all of the activities will be some distance from any population centre (~33km offshore).
19. Are there any areas or features of historic or cultural importance on or around the location that could be affected by the Project?	No. While a number of wrecks are identified to be close to the sample stations, these are at least 140m distance.	No. Accuracy of grab sample placement is approximately 50m from the sample station. There will be no interaction with features of historic or cultural importance.
20. Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No.	n/a



Screening question	Yes/No and Brief description	Is this likely to result in a significant impact? Yes/No and a description of why.
21. Are there existing land uses within or around the location e.g. homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying that could be affected by the Project?	No.	n/a
22. Are there any plans for future land uses within or around the location that could be affected by the Project?	No.	n/a
23. Are there areas within or around the location which are densely populated or built-up, that could be affected by the Project?	No.	n/a
24. Are there any areas within or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, that could be affected by the Project?	No.	n/a
25. Are there any areas within or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, that could be affected by the Project?	Yes. Fisheries take place in the area.	No. The survey activities will be temporary and transient in nature. Notices to Mariners will be used to communicate the timing and nature of the survey to other sea users.
26. Are there any areas within or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, that could be affected by the Project?	No.	n/a

Screening question	Yes/No and Brief description	Is this likely to result in a significant impact? Yes/No and a description of why.
27. Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems?	Yes. Gales and adverse sea conditions are possible, particularly in the winter months.	No. The survey would not take place if there were adverse weather conditions.

## **7 REFERENCES**

- ADCO (2018). Cultural Heritage Assessment: Kinsale Field Decommissioning. 22pp.
- Anatec (2017). Kinsale Decommissioning Fishing Risk Assessment. Prepared by Anatec Ltd on behalf of PSE Kinsale Energy Ltd, 75pp.
- AquaFact (2003). Seven Heads and Kinsale Head Benthic Studies 2002/2003. Report to Ramco Seven Heads Ltd.
- AquaFact (2004). Environmental monitoring of the seabed at Greensand Well. Document Number JN677. Report to Marathon oil Ireland Ltd.
- AquaFact (2005). Environmental Monitoring of the Seabed at Greensand Well. Report to Marathon Oil Ireland.
- BEIS (2022). Offshore Energy Strategic Environmental Assessment 4, Environmental Report. Department for Business, Energy and Industrial Strategy, UK, 689pp plus appendices.
- Berrow S, Ronan H, O'Connor I & McGrath D (2014). Density estimates of harbour porpoise (*Phocoena phocoena*) at eight coastal sites in Ireland. *Biology and Environment, Proceedings of the Royal Irish Academy*, DOI: 10.3318/BIOE.2014.03.
- Berrow SD, Whooley P, O'Connell M & Wall D (2010). Irish Cetacean Review (2000-2009). Irish Whale and Dolphin Group, 60pp.
- BODC (1998). UKDMAP. An Atlas of the Seas Around the British Isles. Third Edition, Natural Environment Research Council.
- Boelens RGV, Maloney DM, Parsons AP & Walsh AR (1999). Ireland's Marine and Coastal Areas and Adjacent Seas: an Environmental Assessment. Marine Institute, Dublin, 388pp.
- Breen P, Cañadas A, Cadhla OÓ, Mackey M, Scheidat M, Geelhoed SCV, Rogan E & Jessopp M (2017). New insights into ocean sunfish (*Mola mola*) abundance and seasonal distribution in the northeast Atlantic. *Science Reports* 7: 2025.
- Carroll AG, Przeslawski R, Duncan A, Gunning M & Bruce B (2017). A critical review of the potential impacts of marine seismic surveys on fish & invertebrates. *Marine Pollution Bulletin* 114: 9-24.
- Connor DW, Allen JH, Golding N, Howell KL, Lieberknecht LM, Northen KO & Reker JB (2004). The Marine Habitat Classification for Britain and Ireland Version 04.05. Joint Nature Conservation Committee, Peterborough, UK, 49pp.
- Connor DW, Gilliland PM, Golding N, Robinson P, Todd D & Verling E (2006). UKSeaMap: the mapping of seabed and water column features of UK seas. Joint Nature Conservation Committee, Peterborough, UK, 107pp.
- Coull KA, Johnstone R & Rogers SI (1998). Fisheries Sensitivity Maps in British Waters. Report to United Kingdom Offshore Operators Association, Aberdeen, 58pp.
- Cronin C & Barton C (2014). Cetacean monitoring during the Celtic Sea Herring Acoustic Survey (CSHAS) October 2014. A report to the National Parks and Wildlife Service (NPWS), 24pp.
- Cronin M, Jessop M & del Villar D (2011). Tracking grey seals on Ireland's continental shelf. A report to the National Parks and Wildlife Service (NPWS), 31pp.
- Cronin M, Kavanagh K & Rogan E (2008). The foraging ecology of the harbour seal (*Phoca vitulina vitulina*) in southwest Ireland. Final report to the Marine Institute St/05/12, 145 pp.
- DCENR (2011). Fourth Strategic Environmental Assessment for Oil and Gas Activity in Ireland's Offshore Waters: IOSEA4 Irish and Celtic Seas, Environmental Report. Department of Communications, Energy and Natural Resources, 353pp.
- DCENR (2015). Irish Offshore Strategic Environmental Assessment (IOSEA) 5. Environmental Report, 210pp. + Appendices.
- DECC (2009). Offshore Energy Strategic Environmental Assessment, Environmental Report. Department of Energy and Climate Change, UK, 307pp plus appendices.
- DECC (2011). Offshore Energy Strategic Environmental Assessment 2, Environmental Report. Department of Energy and Climate Change, UK, 443pp plus appendices.
- DECC (2016). Offshore Energy Strategic Environmental Assessment 3, Environmental Report. Department of Energy and Climate Change, UK, 652pp plus appendices.

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

Doyle TK, Houghton JDR, O'Suilleabháin PF, Hobson VJ, Marnell F, Davenport J & Hays GC (2008). Leatherback turtles satellite tagged in European waters. *Endangered Species Research* **4**: 23-31.

Duck C & Morris C (2013). An aerial survey of harbour seals in Ireland: Part 2 – Galway Bay to Carlingford Lough, August – September 2012. A report to the National Parks and Wildlife Service (NPWS), 28pp.

Ecoserve (2011). Environmental baseline report. Report to PSE Kinsale Energy Ltd, Kinsale Head Gas Storage Project, North Celtic Sea Basin. Ecological Consultancy Services, Dublin, 86pp plus appendices.

Ellis JR, Milligan SP, Readdy L, Taylor N & Brown MJ (2012). Spawning and nursery grounds of selected fish species in UK waters. Science Series Technical Report, Cefas, Lowestoft, 147: 56pp.

EMODnet (2019). EU Vessel density map: Detailed method. Version 1.5, 26pp.

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports, 71pp + appendices.

Erbe C, Marley SA, Schoeman RP, Smith JN, Trigg LE & Embling CB (2019). The effects of ship noise on marine mammals - A Review. *Frontiers in Marine Science* **6**: 606.

European Commission (2017). Environmental Impact Assessment of Projects: Guidance on Screening, 80pp.

Fairweather (2016). Application for incidental harassment authorization for 2016 anchor retrieval program Chukchi and Beaufort Seas Alaska. Prepared for Fairweather LLC by Fairweather Science LLC, April 2016.

Fernand L, Nolan GD, Raine R, Chambers CE, Dye SR, White M & Brown J (2006). The Irish coastal current: a seasonal jet like circulation. *Continental Shelf Research* **26**: 1775-1793.

Fliessbach KL, Borkenhagen K, Guse N, Markones N, Schwemmer P & Garthe S (2019). A ship traffic Disturbance Vulnerability Index for Northwest European seabirds as a tool for marine spatial planning. *Frontiers in Marine Science* **6**: 192.

Fossette S, Hobson VJ, Girard C, Calmettes B, Gaspar P, Georges J & Hays H (2010). Spatio-temporal foraging patterns of a giant zooplanktivore, the leatherback turtle. *Journal of Marine Systems* **81**: 225-234

Francois RE & Garrison GR (1982). Sound absorption based on ocean measurements: Part II: Boric acid contribution and equation for total absorption. *Journal of the Acoustical Society of America* **72**:1879-90.

Fugro (2015). Metocean Criteria for the Kinsale Head Field. Report Number: C70236/8564/R4, 49pp. + appendices.

Fugro (2017). Pre-decommissioning Environmental Survey Results, Kinsale Area.

Fugro ERT (2012). Well 48/24-10 Barryroe post-drilling ROV survey. March 2012 Report for Providence plc. Report Number: J36244-1.

Gardline (2015). Middleton Site Survey, Irish Celtic Sea Block 49/11. Environmental Baseline Survey. Document Reference 10501. Report to PSE Seven Heads Limited.

Garthe S & Hüppop O (2004). Scaling possible adverse effects of marine windfarms on seabirds: developing and applying a vulnerability index. *Journal of Applied Ecology* **41**: 724-734.

Gerritsen HD & Kelly E (2019). Atlas of Commercial Fisheries around Ireland, third edition. Marine Institute, Ireland. ISBN 978-1-902895-64-2. 72 pp.

Goff GP & Stenson GB (1988). Brown adipose tissue in leatherback sea turtles: a thermogenic organ in an endothermic reptile? *Copeia* **1988**:1071-1075.

Hartley Anderson (2003). Ecological Review of ROV video and other seabed survey information for the Seven Heads gas field development. Report to Ramco Seven Heads Limited, 13pp.

Hartley Anderson (2007). 2006 Celtic Sea Drilling Programme, Seabed Monitoring Results, Summary Report. Report to Island Oil and Gas plc.

- Hartley J & Dicks B (1977). Survey of the benthic macrofaunal communities of the Celtic Sea. FSC Report No. FSC/OPRU/10/77. Oil Pollution Research Unit (Field Studies Council), Pembroke. 16pp. + appendix.
- Hawkings AD, Pembroke AE & Popper AN (2015). Information gaps in understanding the effects of noise on fishes and invertebrates. *Reviews in Fish Biology and Fisheries* **25**: 39-64.
- Hawkins & Popper (2017). A sound approach to assessing the impact of underwater noise on fish and invertebrates
- Hays GC, Houghton JDR & Myers AE (2004). Pan-Atlantic leatherback turtle movements. *Nature* **429**: 522.
- Heessen HJL, Daan H & Ellis JR (2015). *Fish Atlas of the Celtic Sea, North Sea and Baltic Sea*. Wageningen Academic Publishers, the Netherlands, 572pp.
- Johns D & Wootton M (2003). Plankton Report for Strategic Environment Assessment Area 4. Report to the Department of Trade and Industry. The Sir Alister Hardy Foundation for Ocean Science (SAHFOS), 26pp.
- Jones EL, McConnell BJ, Smout S, Hammond PS, Duck CD, Morris CD, Thompson D, Russell DJF, Vincent C, Cronin M, Sharples RJ & Matthiopoulos J (2015). Patterns of space use in sympatric marine colonial predators reveal scales of spatial partitioning. *Marine Ecology Progress Series* **534**: 235-249.
- King & Berrow (2009). Marine turtles in Irish waters. Special Supplement to the Irish Naturalists' Journal, 30pp.
- Kopke K, O'Mahony C, Cummins V & Gault J (2008). Assessment of coastal recreational activity and capacity for increased boating in Cork Harbour. Coastal and Marine Resources Centre, University College Cork, 52pp.
- Lordan L, Doyle J, Fitzgerald R, O'Connor S, Blaszkowski M, Stokes D, Ni Chonchuir G, Gallagher J, Butler R, Sheridan M & Simpson S (2015). FU19 *Nephrops* grounds 2015UWTV survey report and catch options for 2016. Marine Institute UWTV Survey Report, 18pp.
- Marine Institute (2009). Irish ocean climate and ecosystem status report 2009, 116pp.
- Marine Institute (2010). Kinsale Head Gas Storage Project. Final Report Volume 2 of 2; Results; Geophysical, Geotechnical and Environmental Services; Project Reference CE10018; July – September 2010.
- Marine Institute (2011). Environmental Baseline Survey Report, Barryroe Drill Site. Eire Block 48/24. Report to Senergy.
- Marine Institute (2012). Atlas of Irish groundfish trawl surveys: supporting fish stock assessment and new ecosystem advice. Marine Institute, ISBN 978-1-902895-53-6, 61pp.
- Marine Institute (2013). Marine mammals and megafauna in Irish waters – behaviour, distribution and habitat use. Marine Research Sub-Programme, NDP 2007-13 Series, 200pp.
- Marine Institute (2017a). KADP Environmental Survey Report. Celtic Sea. 101pp.
- Marine Institute (2017b). The Stock Book. Annual Review of Fish Stocks in 2017 with Management Advice for 2018. Marine Institute, 492pp.
- Marine Institute (2020). The Stock Book. Annual Review of Fish Stocks in 2020 with Management Advice for 2021. Marine Institute, 453pp.
- McCauley RD, Fewtrell J, Duncan AJ, Jenner C, Jenner M-N, Pernrose JD, Prince RIT, Adhitya A, Murdoch J & McCabe K (2000). Marine seismic surveys - a study of environmental implications. *APPEA Journal* **40**: 692-708.
- MMO (2014). Mapping UK Shipping Density and Routes Technical Annex. A report produced for the Marine Management Organisation by ABP Marine Environment Research Limited. Project No. 1066, 52pp.
- Nelms SE, Piniak WED, Weir CR & Godley BJ (2016). Seismic surveys and marine turtles: an underestimated global threat? *Biological Conservation* **193**: 49-65.
- Neptune LNG (2016). Application for incidental harassment authorization for the non-lethal taking of marine mammals – Neptune LNG Deepwater Port. Prepared for Neptune LNG LLC by CSA Ocean Sciences, Inc. June 2016.
- Nolan C, O'Donnell C, Lynch D, Lyons K, Keogh N, McAvoy S, Cronin C & Hunt W (2014). Celtic Sea Herring Acoustic Survey cruise report 2014. FSS Survey Series 2014/04, 51pp.



NPWS (2014). Guidance to minimise the risk to marine mammals from man-made sound sources in Irish waters. Guidance Document by the National Parks and Wildlife Service of the Department of Arts, Heritage and Gaeltacht, Dublin. January 2014.

Ó Cadhla O, Strong D, O' Keeffe C, Coleman M, Cronin M, Duck C, Murray T, Dower P, Nairn R, Murphy P, Smiddy P, Saich C, Lyons D & Hiby L (2008). An assessment of the breeding population of grey seals in the Republic of Ireland, 2005. Irish Wildlife Manuals No. 34. National Parks & Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland. 60pp.

O'Boyle S & Silke J (2010). A review of the phytoplankton ecology in estuarine and coastal water around Ireland. *Journal of Plankton Research* **32**: 99-118.

O'Brien JM, Berrow SD, Ryan C, McGrath D, O'Connor I, Pesante G, Burrows G, Massett N, Lötzer V & Whooley P (2009). A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photo-identification. *Journal of Cetacean Research and Management* **11**: 71-76.

O'Donnell C, Lynch D, Lyons K, Keogh N & O'Donovan M (2015). Celtic Sea Herring Acoustic Survey cruise report 2015. FSS Survey Series 2015/04, 53pp.

O'Donnell C, Lynch D, Lyons K, Ni Riogain P & Volkenandt M (2011). Celtic Sea Herring Acoustic Survey cruise report 2011. FSS Survey Series 2011/03, 48pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Connaughton P & Perez Tadeo M (2020). Celtic Sea Herring Acoustic Survey cruise report 2020. FSS Survey Series 2020/04, 54pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Connaughton P & Power J (2019). Celtic Sea Herring Acoustic Survey cruise report 2019. FSS Survey Series 2019/04, 49pp.

O'Donnell C, Mullins E, Lynch D, Lyons K, Keogh N & O'Callaghan S (2018). Celtic Sea Herring Acoustic Survey cruise report 2018. FSS Survey Series 2018/04, 44pp.

O'Donnell C, Nolan C, Mullins E, Lyons K, Volkenandt M, Keogh N, McAvoy S & Williams D (2013). Celtic Sea Herring Acoustic Survey cruise report 2013. FSS Survey Series 2013/04, 51pp.

O'Donnell C, Nolan C, Sullivan M, Lyons K, McKeogh E, McAvoy S, Ingham S & O'Sullivan E (2012). Celtic Sea Herring Acoustic Survey cruise report 2012. FSS Survey Series 2012/05, 43pp.

O'Donnell C, O'Malley M, Lynch D, Lyons K, Keogh N & O'Driscoll D (2017). Celtic Sea Herring Acoustic Survey (CSHAS) cruise report 2017. FSS Survey Series 2017/04, 38pp.

O'Donnell C, Saunders R, Lynch D, Lyons K & Wall D (2008). Celtic Sea Herring Acoustic Survey cruise report 2008. FSS Survey Series 2008/03, 57pp.

O'Donnell C, Sullivan M, Lyons K, Keogh N & Quinn M (2016). Celtic Sea Herring Acoustic Survey (CSHAS) cruise report 2016. FSS Survey Series 2016/04, 44pp.

OSPAR (2009). Overview of the impacts of anthropogenic underwater sound in the marine environment. OSPAR Commission Biodiversity Series 2009. Publication Number 441/2009, 134pp.

Owl Ridge Natural Resource Consultants (2016). Application for incidental harassment authorization for the taking of marine mammals in conjunction with proposed Alaska Phase of the Quintillion Subsea Project 2016. Prepared for Quintillion Subsea Operations LLC by Owl Ridge Natural Resource Consultants, January 2016.

Palka DL & Hammond PS (2001). Accounting for responsive movement in line transect estimates of abundance. *Canadian Journal of Fisheries and Aquatic Sciences* **58**: 777-787.

Penrose & Gander (2016). British Isles & Republic of Ireland Marine Turtle Strandings & Sightings Annual Report 2015, 27pp.

Pichegru L, Nyengera R, McInnes AM & Pistorius P (2017). Avoidance of seismic survey activities by penguins. *Scientific Reports* **7**: 16305.

Pikesley SK, Godley BJ, Ranger S, Richardson PB & Witt MJ (2014). Cnidaria in UK coastal waters: description of spatio-temporal patterns and inter-annual variability. *Journal of the Marine Biological Association of the United Kingdom* **94**: 1401-1408.

Pingree RD & Le Cann B (1989). Celtic and Armorican slope and shelf residual currents. *Progress in Oceanography* **23**: 303-338.

Popper AN, Hawkins AD, Fay RR, Mann DA, Bartol S, Carlson TJ, Coombs S, Ellison WT, Gentry RL, Halvorsen MB, Løkkeborg S, Rogers PH, Southall BL, Zeddies DG & Tavalga WN (2014). Sound exposure guidelines for fishes and sea turtles: A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.

- Pybus C (1996). The planktonic diatoms of Galway Bay, seasonal variations during 1974/5. *Biol. Environ. Proc. R. Irish Acad.* **96B**: 169-176.
- Rakka M & Minto C (2015). An investigation into the effects of environmental and observational variables on haul-out counts of harbour seals (*Phoca vitulina vitulina*) in Ireland. A report by the Marine and Freshwater Research Centre, Galway-Mayo Institute of Technology, 201pp.
- Ramboll (2017a). Seven Heads Gas Field Decommissioning - Report to inform the Comparative Assessment of Decommissioning Options using Net Environmental Benefit Analysis
- Ramboll (2017b). Kinsale Head Rest of Field Decommissioning - Report to inform the Comparative Assessment of Decommissioning Options using Net Environmental Benefit Analysis.
- Richardson WJ, Greene CR Jr, Malme CI & Thomson DH (1995). Marine Mammals and Noise. Academic Press, San Diego, US, 576pp.
- Rogan E, Breen P, Mackey M, Cañadas A, Scheidat M, Geelhoed S & Jessopp M (2018). Aerial surveys of cetaceans and seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017. Department of Communications, Climate Action & Environment and National Parks and Wildlife Service (NPWS), Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland. 297pp.
- Rutenko AN & Ushchipovskii VG (2015). Estimates of noise generated by auxiliary vessels working with oil-drilling platforms. *Acoustical Physics* **61**: 556-563.
- Ryan C, Rogan E & Cross T (2010). The use of Cork Harbour by bottlenose dolphins (*Tursiops truncatus*, Montagu, 1821). *Irish Naturalists Journal* **31**: 1-9.
- Ryan C, Whooley P, Berrow S, Barnes C, Massett N, Strietman W, Broms F, Stevick PT, Fernald Jr TW & Schmidt C (2016). A longitudinal study of humpback whales in Irish waters. *Journal of the Marine Biological Association of the United Kingdom* **96**: 877-883.
- Samuel Y, Morreale SJ, Clark CW, Greene CH, Richmond ME (2005). Underwater, low-frequency noise in a coastal sea turtle habitat. *Journal of the Acoustical Society of America* **117**: 1465-1472.
- Saunders R, O'Donnell C, Campbell A, Lynch D, Egan A, Lyons K & Wall D (2010). Celtic Sea Herring
- Saunders R, O'Donnell C, Campbell A, Lynch D, Lyons K & Wall D (2009). Celtic Sea Herring Acoustic Survey cruise report 2009. FSS Survey Series 2009/03, 63pp.
- Slabbekoorn H, Dalen J, de Haan D, Winter HV, Radford C, Ainslie MA, Heaney KD, van Kooten T, Thomas L & Harwood J (2019). Population-level consequences of seismic surveys on fishes: An interdisciplinary challenge. *Fish and Fisheries* **20**: 653-685.
- Solandt J-L & Chassin E (2014). Basking shark watch – overview of data from 2009-2013. Report by the Marine Conservation Society, 6pp.
- Southall B, Finneran JJ, Reichmuth C, Nachtigall PE, Ketten DR, Bowles AE, Ellison WT, Nowacek DP & Tyack PL (2019). Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects. *Aquatic Mammals* **45**: 125-232.
- Southall BL, Bowles AE, Ellison WT, Finneran JJ, Gentry RL, Greene Jr. CR, Kastak D, Ketten DR, Miller JH, Nachtigall PE, Richardson WJ, Thomas JA & Tyack PL (2007). Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* **33**: 411-522.
- Stone C, Webb A, Barton C, Ratcliffe N, Reed T, Tasker M, Camphuysen C & Pienkowski M (1995). An Atlas of Seabird Distribution in North-west European waters. Joint Nature Conservation Committee, Peterborough.
- Sutton G (2008). Irish Sea Marine Aggregate Initiative (IMAGIN) Project Synthesis Report Including: Geological Assessment, Environmental Assessment, Morphodynamic Modelling Web-based GIS System, Cost Benefit Analysis, Aggregate Resources and Markets-Wales. Marine Environment and Health Series, No. 36, 66pp.
- Thaxter CB, Lascelles B, Sugar K, Cook ASCP, Roos S, Bolton M, Langston RHW & Burton NHK (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine protected Areas. *Biological Conservation* **156**: 53-61.
- Veirs S, Veirs V & Wood JD (2016). Ship noise extends to frequencies used for echolocation by endangered killer whales. *PeerJ* **4**: e1657.

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

Wang L, Heaney K, Pangerc T, Theobald P, Robinson S & Ainslie M (2014). Review of underwater acoustic propagation models. National Physical Laboratory Report AC 12, 35pp.

Webb A, Harrison N, Leaper G, Steele R, Tasker M & Pienkowski W (1990). Seabird distribution west of Britain. Final report of Phase 3 of the Nature Conservancy Council Seabirds at Sea Project, November 1986 to March 1990. Nature Conservancy Council, Aberdeen.

Whooley P, Berrow S & Barnes C (2011). Photo-identification of fin whales (*Balaenoptera physalus* L.) off the south coast of Ireland. *Marine Biodiversity Records* 4: E8.

Woodward I, Thaxter CB, Owen E & Cook ASCP (2019). Desk-based revision of seabird foraging ranges used for HRA screening. Report of work carried out by the British Trust for Ornithology on behalf of NIRAS and The Crown Estate. BTO Research Report No. 724, 139pp.