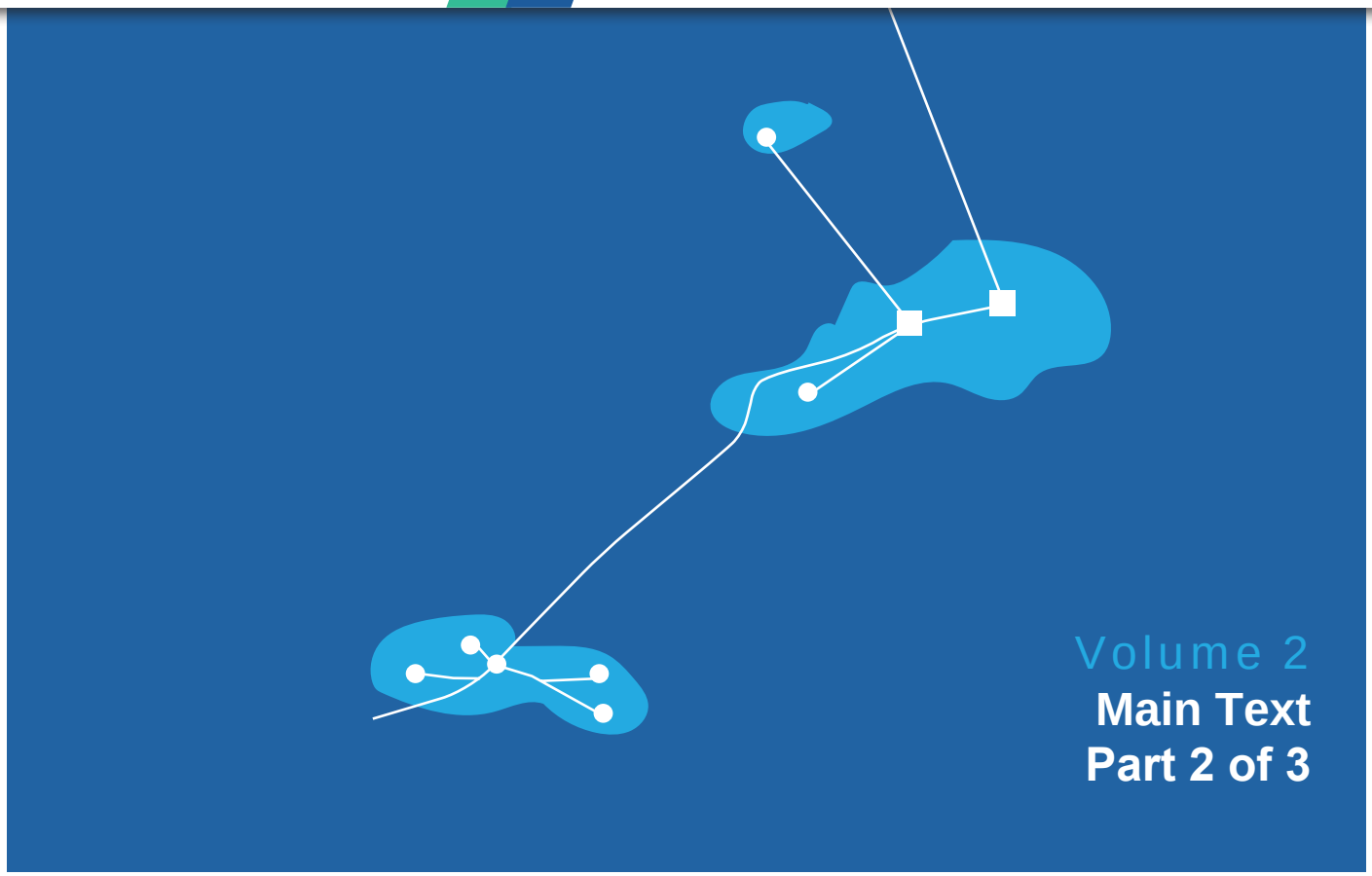
KINSALE ENERGY

Kinsale Area Decommissioning Project

Environmental Impact Assessment Report



Volume 2
Main Text
Part 2 of 3

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Hartley Anderson

ARUP

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Kinsale Area Decommissioning Project

Glossary of Terms

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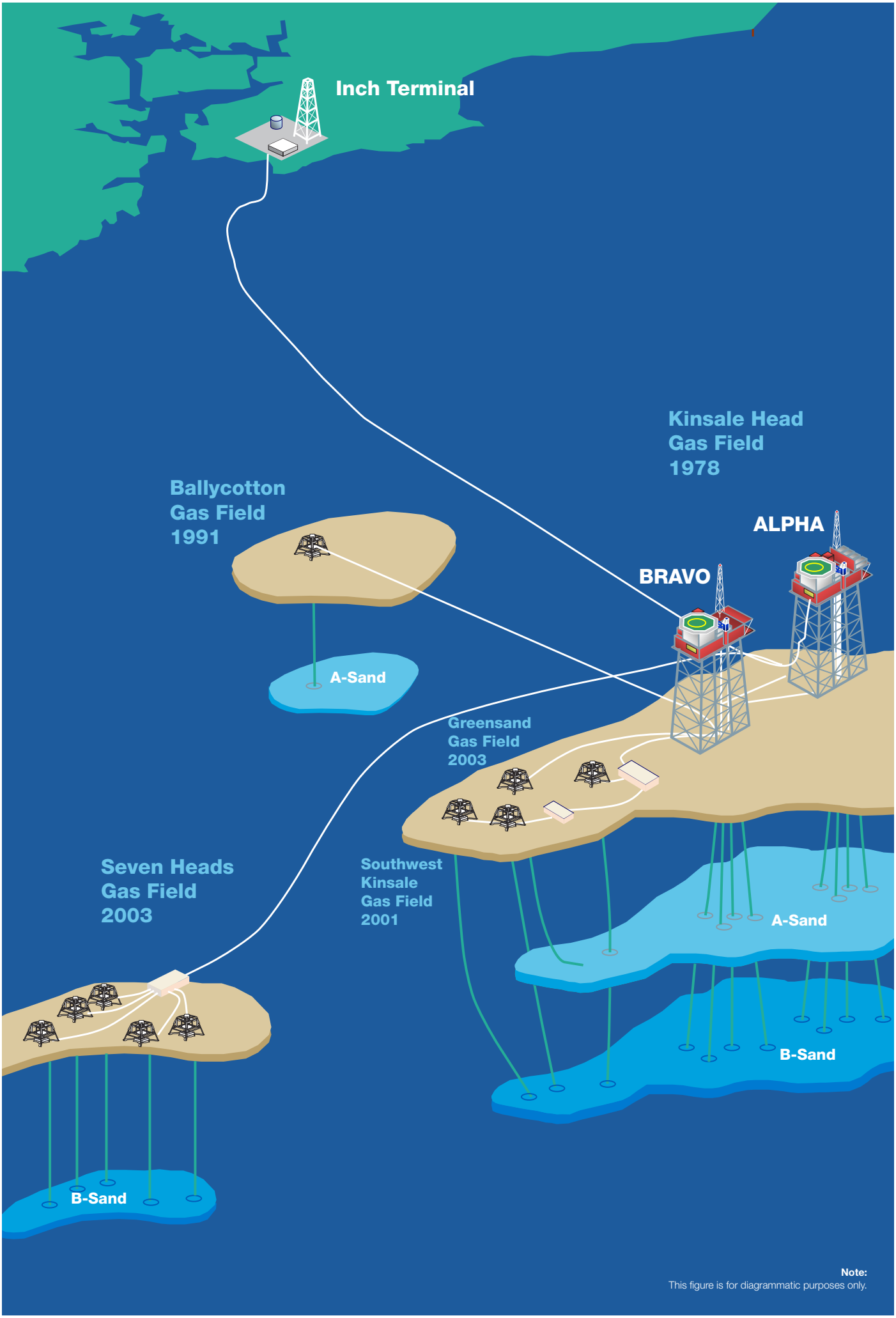
Inch Terminal
Kinsale Head
Gas Field
1978
Ballycotton
Gas Field
1991
ALPHA
BRAVO
A-Sand
Greensand
Gas Field
2003
Seven Heads
Gas Field
2003
Southwest
Kinsale
Gas Field
2001
A-Sand
B-Sand
B-Sand
Note:
This figure is for diagrammatic purposes only.

Glossary of Terms

Term	Explanation
AA	Appropriate Assessment
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
Bathymetry	Measurement of depth of water in oceans, seas, or lakes
Benthic Zone	Ecological region at the lowest level of a body of water such as an ocean or a lake, including the sediment surface and some sub-surface layers
Biotope	Region of a habitat associated with a particular ecological community
Buoyancy tank	An enclosed air-filled section of a boat, ship or hovercraft designed to keep it afloat and prevent it from sinking
Bunker	Fill the fuel containers of a ship (refuel)
Bunkering	Supply of fuel for use by ships in a seaport
CA	Comparative Assessment
Cantilever	Structural element anchored at only one end to a support from which it is protruding
Caprock	Harder or more resistant rock type overlying a weaker or less resistant rock type
CCS	Carbon Capture and Storage
CRU	Commission for Regulation of Utilities Water and Energy
Cephalopods	Any member of the molluscan class Cephalopoda such as a squid, octopus or nautilus
CFP	Common Fisheries Policy
CH_4	Methane
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLC	CORINE Land Cover
CO	Carbon Monoxide
CO_2	Carbon Dioxide
Concrete mattress	A series of concrete blocks usually connected by polypropylene ropes resembling a rectangular mattress, used for the weighting and/or protection of seabed structures including pipelines
CoP	Cessation of Production: the stage at which, after all economic development opportunities have been pursued, hydrocarbon production ceases.
CORINE	Co-Ordinated Information on the Environment
CSO	Central Statistics Office
CSV	Construction Support Vessel
DCCAE	Department of Communications, Climate Action and Environment
DCENR	Department of Communications, Energy and Natural Resources
DECC	Department of Energy & Climate Change (UK)

Term	Explanation
Decommissioning	Planned shut-down or removal of a building, equipment, plant, offshore installation etc.., from operation or usage offshore.
Demersal	Living close to the floor of the sea or a lake
Diesel	A low viscosity distillate fuel
DP	Dynamic Positioning: the use of thrusters and real time positional information to maintain the location of a vessel
Drill cuttings	Rock from the wellbore resulting from the mechanical action of the drill bit
DTTAS	Department of Transport, Tourism and Sport
DSV	Diving Support Vessel
ED	Electoral Division
EEMS	Environmental and Emissions Monitoring System
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
Epifauna	Animals living on the surface of the seabed or a riverbed, or attached to submerged objects or aquatic animals or plants.
EU28	Denotes the 28 member countries which make up the European Union
EUNIS	European Nature Information System
FBE	Fusion Bonded Epoxy
Flowline	Pipeline carrying unprocessed oil/gas within the oil or gas field area
Freespan	A free span on a pipeline is where the seabed sediments have been eroded, or scoured away leaving a void under the pipeline so that the pipeline is no longer supported on the seabed
GHG	Greenhouse gas
GNI	Gas Network Ireland
Grout	Particularly fluid form of concrete used to fill gaps, generally a mixture of water, cement, and sand
GWP	Global warming potential
HES	Health, Environment and Safety
HGV	Heavy Goods Vehicle
HFCs	Hydrofluorocarbons
HLV	Heavy-Lift Vessel
ICES	International Council for the Exploration of the Sea
IEMA	Institue of Environmental Management and Assessment
IMO	International Maritime Organisation
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's marine Resource, joint venture between the Geological Survey of Ireland and the Marine Institute.
In-Situ	In the original place.
Interconnector	Structure which enables energy to flow between networks, refers to international connections between electricity and natural gas networks

Term	Explanation
IOSEA	Irish Offshore Strategic Environmental Assessment
IPCC	Intergovernmental Panel on Climate Change
IRPA	Individual Risk Per Annum
Jacket	The structure comprising the "legs" of the offshore platform connected together by horizontal and diagonal trusses and usually made of welded tubular steel. The jacket is typically secured to the seabed by piles
Jack-up rig	A mobile floating drilling rig typically with three long triangular truss legs which can be lowered to the seabed to provide stability once on location
KA	Kinsale Alpha platform
KADP	Kinsale Area Decommissioning Project
KB	Kinsale Bravo platform
KPIs	Key Performance Indicators
km	Kilometre: 1,000m, equivalent to 0.54 nautical miles
L_{Aeq}	Sound levels that vary over time which results in a single decibel value which takes into account the total sound energy over the period of time of interest
LAT	Lowest Astronomical Tide
LCA	Life cycle assessment
Likelihood – Remote	Unlikely to occur
Likelihood – Unlikely	Once during decommissioning activity
Likelihood – Possible	Foreseeable possibly once a year
Likelihood – Likely	Once a month or regular short term events
Likelihood - Definite	Continuous or regular planned activity
LPP	Layer polypropylene
LULUCF	Land Use, Land Use Change and Forestry
LWIV	Light Well Intervention Vessel
Major Effect	• 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
Manifold	A pipe or chamber branching into several openings.
MARPOL	The International Convention for the Prevention of Pollution from Ships
Megaripple	An extensive undulation of the surface of a sandy beach or sea bed

Term	Explanation
Moderate Effect	• 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
MODU	Mobile Offshore Drilling Unit
MPA	Marine Protected Area
MRCC	Marine Rescue Co-ordination Centres
Natura 2000 sites	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.
Negligible Effect	Change is within scope of existing variability but potentially detectable.
Nephrops	Genus of lobsters comprising a single extant species
NIAH	National Inventory of Architectural Heritage
NIS	Natura Impact Statement
nm	Nautical Mile (1852m = 1 minute of latitude = 1/60 degree of latitude)
NMVOCs	Non-methane volatile organic compounds
None Foreseen (Effect)	No detectable effects.
NOx	Nitrogen Oxides
NPWS	National Parks and Wildlife Service
NTM	Notice to Mariners
NUI	Normally Unmanned Installation: an installation with minimal facilities which is not permanently crewed and is controlled from a remote location (e.g. other platform or shore)
OBMs	Oil Based Mud
OCNS	Offshore Chemical Notification Scheme
OECD	Organisation for Economic Co-Operation and Development
OGUK	Oil & Gas UK
OSPAR	Oslo and Paris Convention
OWF	Offshore Wind Farm
P&A	Plug and Abandon (wells)
PAD	Petroleum Affairs Division of the Department of Communications, Climate Action and Environment
Pelagic (fish)	Fish which live in the pelagic zone. The pelagic zone is any water in sea or lake which is neither close to the bottom nor near the shore.
PETRONAS	Petroliam Nasional Berhad

Term	Explanation
PFCs	Perfluorocarbons
Phytoplankton bloom	Plankton consisting of microscopic plants.
Piece Medium	Method of decommissioning the topside structures which involves the separating of the topsides into a number of medium size pieces for removal with a heavy lift vessel and transported to shore for further dismantling. Also known as 'reverse installation'.
Plankton	Small and microscopic organisms drifting or floating in the sea or fresh water
PLEM	Pipeline End Manifold
PLL	Potential Loss of Life
PLONOR	Pose Little or No Risk
PM_{10}	Particulate matter and smaller particulate matter of diameter less than or equal to 10 micrometers
Positive Effect	• Activity may contribute to recovery of habitats • Positive benefits to local, regional or national economy
PSV	Platform supply vessel
PUDAC	Permit to Use or Discharge Added Chemicals
Quaternary	The most recent major geological subdivision, encompassing the past ~2.6 million years up to and including the present day
RAMSAR	Intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources
RF	Recovery Factor
Rigless intervention	A well-intervention operation conducted with equipment and support facilities that precludes the requirement for a rig over the wellbore
RMP	Record of Monuments and Places
ROV	Remotely Operated Vehicle: a small, unmanned submersible used for inspection and the carrying out of some activities such as valve manipulation
SAC	Special Area of Conservation: established under the Habitats Directive
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SEA	Strategic Environmental Assessment
Seafastening	Action of fastening/securing cargoes on ship with the aim of preventing them from movement while the ship is in transit
Semi-submersible rig	A floating mobile drilling rig supported on a number of pontoons, and typically anchored to the seabed while on station
Severe Effect	• 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
SF	Sulphur hexafluoride

Term	Explanation
SFPA	Sea Fisheries Protection Authority
Shears	Cutting instrument in which two blades move past each other
Shelter	Place giving temporary protection from bad weather or danger
Shingle	a mass of small rounded pebbles
Shut-in	to close off a well so that it stops producing
Sidescan sonar	category of sonar system that is used to efficiently create an image of large areas of the sea floor
SO_2	Sulphur Dioxide
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area: established under the Birds Directive
Steel jackets	Structural sections made of tubular steel members, and are usually attached to the seabed using piles
Subcrop	Part of a geological formation that is close to the surface but is not a visible exposing of bedrock
Subsea manifold	Large metal piece of equipment made up of pipes and valves, designed to transfer oil or gas
SWK	South West Kinsale
TEG	Triethylene Glycol
Tidal Channel	Protion of a stream that is affected by ebb and flow of ocean tides, in the case that the subject stream discharges to an ocean, sea or strait
Tie-backs	Link between a satellite field and an existing production facility
TII	Transport Infrastructure Ireland
Topsides	The collective name for the many drilling, processing, accommodation and other modules which when connected together make up the upper section of the platform which rests on the installation jacket
TVD	Total Vertical Depth
UHO	Underwater Heritage Order
UKCS	United Kingdom Continental Shelf
UKHO	United Kingdom Hydrographic Office
UKOOA	UK Offshore Operators Association
UNCLOS	UN Convention on the Law of the Sea
Umbilical	Cable and/or hose which supplies required consumables to an apparatus
VMS	Vessel Monitoring System
WDC	Western Drill Centre
WEEE	Waste Electrical and Electrical Equipment
Wet Gas	Any gas with a small amount of liquid present
WFD	Water Framework Directive

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Section 4

Characteristics of the Marine Environment

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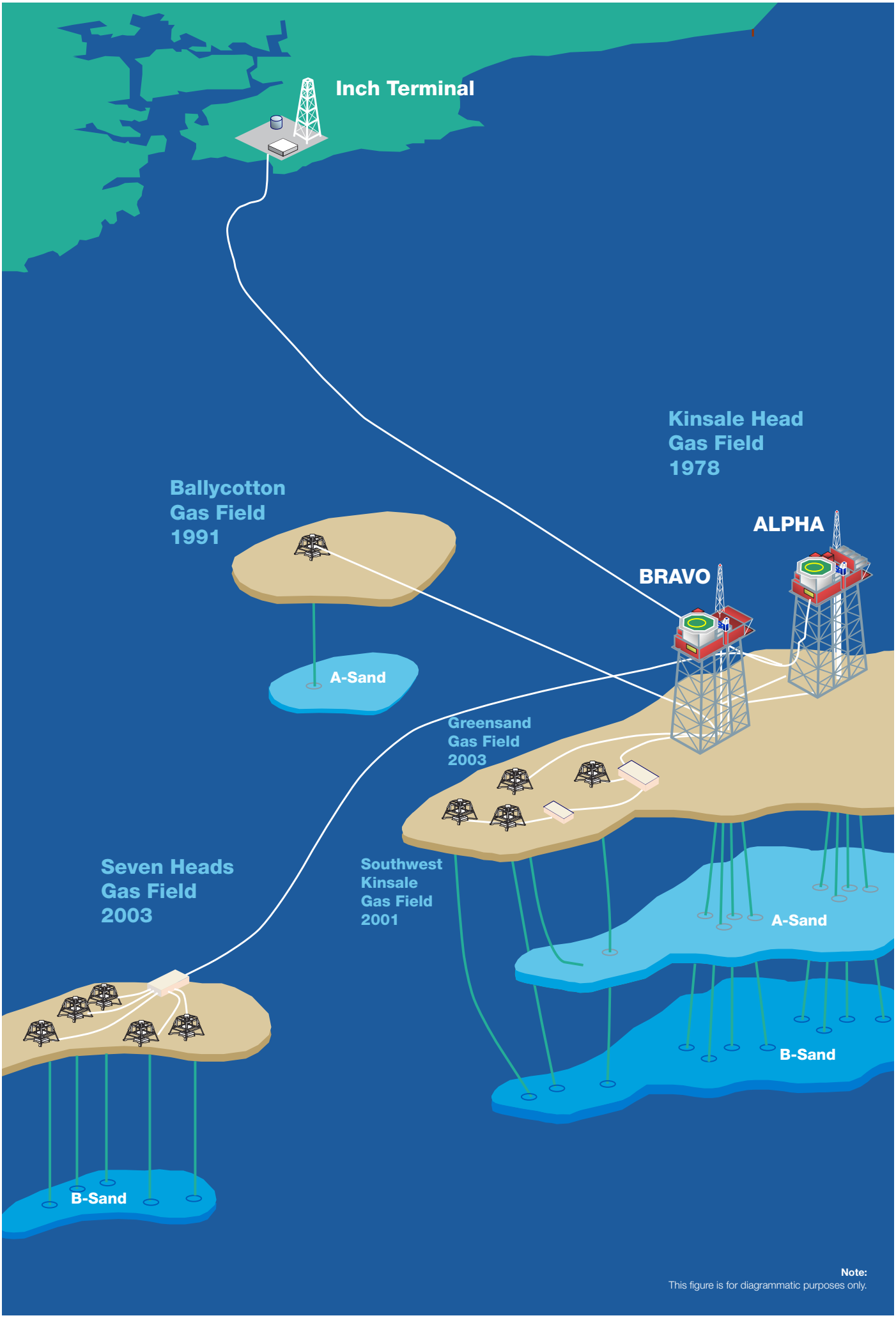
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Note:
This figure is for diagrammatic purposes only.

4 Characteristics of the Marine Environment

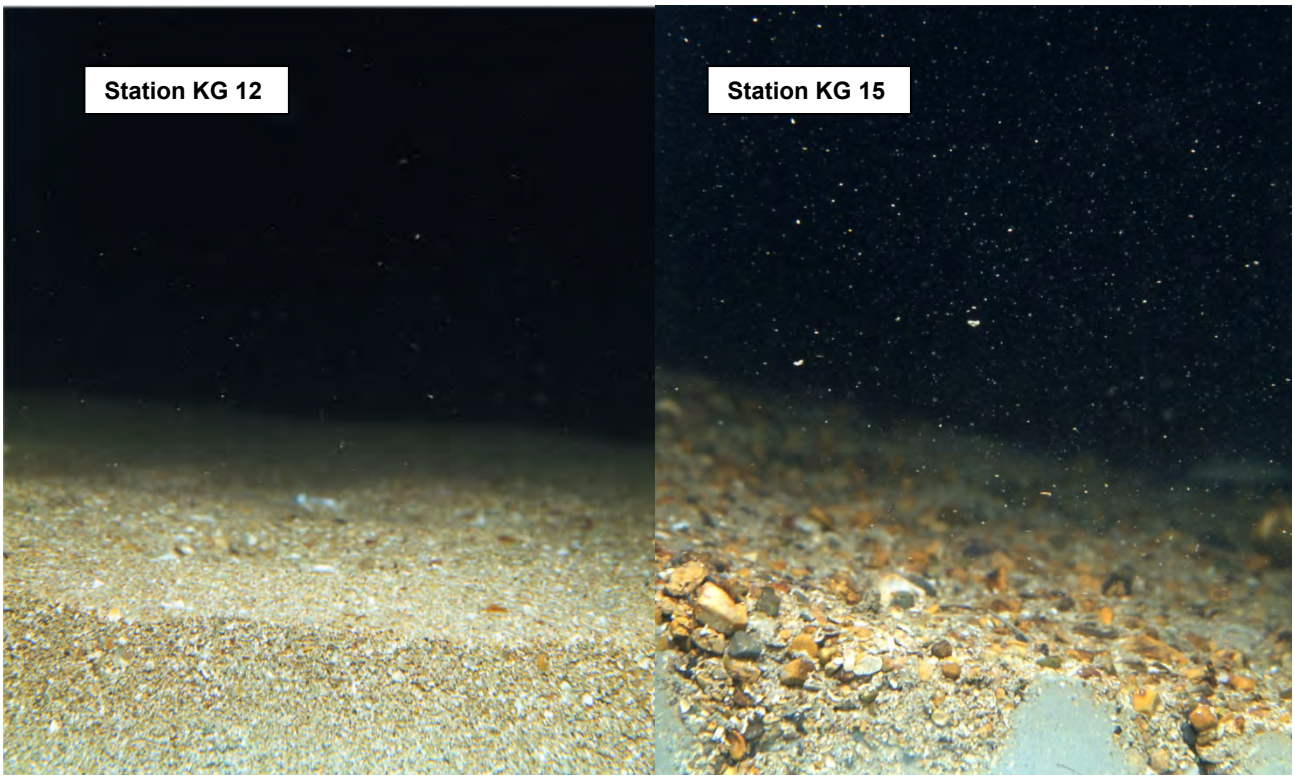
The characteristics of the marine environment in the vicinity of the Kinsale Area are detailed in this chapter. It has been prepared based on a desktop study, including a review of all seabed surveys, with the seabed survey coverage shown in **Figure 4.5**. **Appendix B** provides further details of seabed features and habitats in the vicinity of the Kinsale Area facilities.

4.1 Seabed Topography, Geology and Sediments

Water depths extend from the intertidal area at the main export pipeline landfall at Powerhead Bay, to approximately 90m across the Kinsale Head, Southwest Kinsale, Ballycotton areas and to 100m at the Seven Heads field (**Figure 4.2**).

The seafloor is generally flat in the area encompassing the Kinsale Area fields with gentle slopes across the region. Rig site and pipeline route surveys undertaken around the Seven Heads, SW Kinsale and Greensand developments (**Figure 4.5**) 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 (station KG 12 in **Figure 4.1** shows slightly muddy sand recorded from the 2002 survey). 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 evident in the right hand sediment profile image of Station KG 15 from the 2002 survey as shown in **Figure 4.1**. This mixture of sediment types is reflected on the fauna present, so that a single sample may contain species characteristic of both muds and clean sands.

Figure 4.1: Seabed photographs illustrating typical sandy and gravelly sediments in the Kinsale Area



There have been a series of seabed baseline and monitoring surveys undertaken in the Kinsale Area since 2002 associated with exploration wells, field and pipeline developments and operations e.g. Aquafact (2003), Hartley Anderson (2003), Aquafact (2005), Marine Institute (2010), Ecoserve (2011), Gardline (2015) and Marine Institute (2017).

Together with geophysical mapping undertaken as part of rig site and pipeline route surveys, these surveys provide a good understanding of the seabed topography, sediments and their dynamics, fauna and contaminant status which are summarised in this section.

According to the EUNIS habitat classification, the underlying habitat is circalittoral coarse sediment (**Figure 4.4**). These are characteristically found in tidal channels of marine inlets, along exposed coasts and offshore and particle sizes range through coarse sands, gravel and shingle. Deep circalittoral sand is defined as fine sands or non-cohesive muddy sands which are likely to be more stable due to their depth. Existing seabed surveys of the area (**Figure 4.5**) generally support the EUNIS habitat descriptions and mapped distribution in the area. The dynamic nature of the sedimentary environment of the area presents a range of relatively impoverished heterogeneous benthic habitats.

Sidescan sonar records from the Kinsale Area indicate the presence of distinctive Holocene sand, together with exposures of older Quaternary sand and gravel linear patches, all within spatial scales of a few hundred metres.

A total of 24 development wells (14 platform wells and 10 subsea/other wells) are either producing or have been shut-in in the Kinsale Area. There are also 4 previously abandoned exploration wells. The nature of the produced hydrocarbons (dry gas), the fact that Oil Based Muds (OBMs) were only used in the drilling of one well (the cuttings from which were not discharged to sea) and the absence of cuttings piles (see **Appendix B**) has limited the potential for large hydrocarbon releases or persistent contamination of sediments from the Kinsale Area.

Results from the 2017 pre-decommissioning environmental survey of the Kinsale Area (see **Table 4.1** and **Figure 4.3)** (Marine Institute 2017) indicate that for most samples the concentrations of hydrocarbons and metals are at or below background assessment concentrations (BAC) as defined by OSPAR (mean concentrations significantly below the BAC are said to be near background i.e. “natural” concentrations). As further context **Table 4.1** includes Effects Range Low (ERL) values, these were developed by the USEPA/NOAA; concentrations below the ERL are considered rarely to cause adverse effects in marine organisms. In a few samples elevations in concentrations of some determinands were noted (e.g. copper, lead and zinc), although typically these did not show correlations between determinands within a sample nor with proximity to installations and are considered to reflect natural variability in the area.

Figure 4.2: Bathymetry in the vicinity of the Kinsale Area

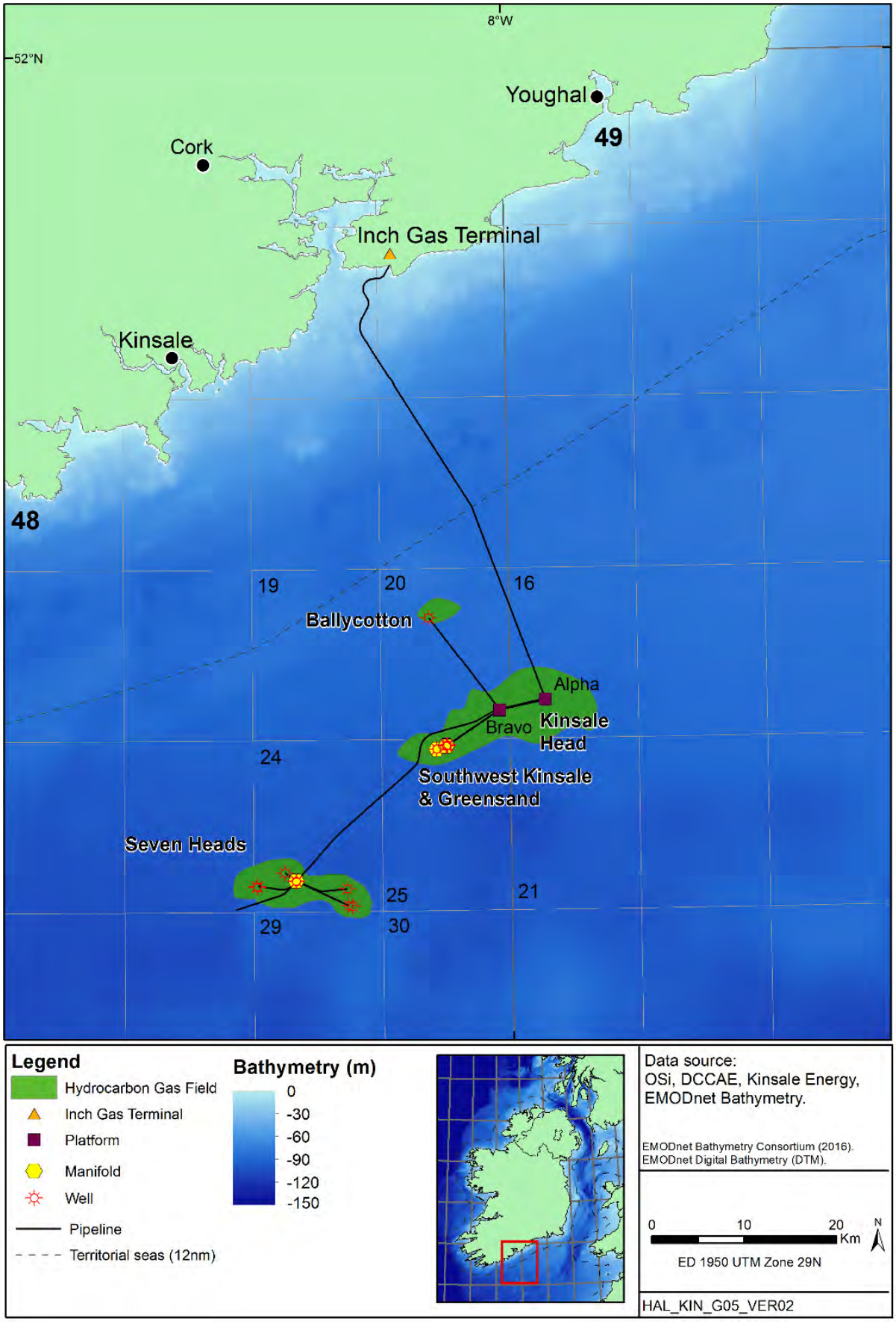


Table 4.1: Summary of sediment and contaminant sample analyses, 2017 survey

Station	Mud in Sediment (%)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Aluminium (mg/kg)	Barium (mg/kg)	Iron (mg/kg)	Lithium (mg/kg)	Total Oils (µg/kg)	Total n-alkanes (ng/kg)
S1	27.4	7.3	0.4	73.4	423.2	168.2	0.06	21.7	41.2	161.2	19800	348	13600	17.9	14966.8	524
S2	0.5	12.5	0.2	12.5	7.5	179	0.02	5.6	28.3	105.7	5750	112	10300	8	1553.8	55
S3	21.3	22.7	0.7	13.1	4.3	501.2	0.01	8.9	43.6	175.7	8040	121	13100	9.96	4968.2	154
S4	12.7	24.9	1.1	22.9	6.7	1545	0.02	11.5	50.9	294.9	14100	142	16800	14.2	4345.3	164
S5	0.9	7.4	<0.1	12.9	9.3	26.3	0.02	6.7	27.7	51.1	8050	847	9400	8.44	2192.1	70
S6	5.2	23.7	<0.1	23.5	6.6	15.5	0.01	14.9	53	49.3	16500	251	19400	14.5	492	69
S7	0.6	28.2	0.1	14.2	3.3	9.5	0.01	9.6	48.1	29.9	11800	104	13300	10.7	1812.8	90
S8	0.6	28.7	<0.1	14	3.9	9.3	0.01	9.6	48.3	29.1	11600	107	13500	10.9	1150.8	35
S9	1.3	8.6	0.1	16.7	3.8	5.5	0.01	8.1	33	28.5	10900	80	10300	11.2	1618.6	78
S10	0.6	9	0.1	12.6	3.3	6.2	0.01	6	32.2	27.3	7610	66.7	9800	8.18	1639	65
S11	11.8	6.4	0.2	18.6	6.6	18.8	0.04	8	33.6	50.9	12200	106	9530	12.3	3766.3	184
S13	0.2	19.5	0.3	17.4	19.8	60.8	0.04	12.9	42.6	102.4	8120	89	14000	8.61	3943.3	117
S14	1.1	7.7	0.2	15.1	10	30.1	0.03	7.4	28.6	77.4	7310	107	8620	7.83	10692	462
S15	0.1	19.5	0.1	18.3	4.1	9.9	0.01	10.2	48	43.4	10800	150	15600	9.18	2528.7	74
S16	0.3	6.1	0.1	9.8	2.7	6.4	0.01	4.8	24.6	25.5	5270	52.9	6330	6.28	3541.5	81
S17	0.2	21.1	0.1	18	5	16.7	0.01	10.3	50.5	73	10800	72.6	15800	11	1615.3	81
S18	5.9	17.9	<0.1	11.8	3	10.1	0.01	7.1	39.8	31.7	7720	69	12800	7.81	6334.3	187
S19	0.2	17.7	<0.1	11.3	3.5	10.6	0.01	7.1	39.4	30.9	7060	53.9	11700	7.48	2588.2	74
S20	0.1	10	0.2	23.2	21	43.5	0.04	10.8	35.6	652.6	10500	83.9	14900	9.7	3763.5	131
S21	7.1	6.8	<0.1	29.4	41.8	55.1	0.03	12.7	34	311	19500	211	14500	16.8	10390.8	218
S22	6.4	3.8	<0.1	11.1	6.7	28.1	0.02	5.7	20.9	47.6	10300	100	7760	10.1	9426.7	156
S23	5.4	11.6	<0.1	9.9	2.9	33.4	0.01	5.1	27.7	43.7	6150	47.6	9890	6.73	2525.8	61
S24	19.3	4.5	<0.1	15	13.8	66.6	0.02	8	25.5	61.6	11400	145	10400	12.1	7958.7	224

Station	Mud in Sediment (%)	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	Aluminium (mg/kg)	Barium (mg/kg)	Iron (mg/kg)	Lithium (mg/kg)	Total Oils (µg/kg)	Total n-alkanes (ng/kg)
S25	1.5	8.1	<0.1	10.7	5.6	67	0.02	5.5	26.6	35.7	6970	61.9	10600	6.89	904	59
S26	1.1	7.5	<0.1	12.6	8.9	23.1	0.03	6.3	24.3	151.3	7180	191	10200	7.64	6520.7	144
S27	0.9	15.7	<0.1	18.4	3.9	10	0.01	9.3	41.1	33.4	13000	85.1	15800	11.6	6246.7	161
S28	3.4	12.7	<0.1	13.9	28.6	4.5	0.01	8.2	28.6	39.6	16200	100	20000	15.2	3730.6	63
S29	3.4	12.5	<0.1	11.6	10.8	13.1	0.01	6.7	29.3	25.6	9020	72.6	13800	10.9	2455.5	95
S30	8.4	4.9	<0.1	10.3	2.7	6	0.01	5.1	22.2	19.7	7530	58	7520	8.44	7802.6	196
S31	3.7	14.4	<0.1	8.9	2	6	0.01	5.3	28.7	17	7460	64.4	12200	8.61	1622.5	59
Minimum	0.1	3.8	0.1	8.9	2	4.5	0.01	4.8	20.9	17	5270	47.6	6330	6.28	492	35
Maximum	27.4	28.7	1.1	73.4	423.2	1545	0.06	21.7	53	652.6	19800	847	20000	17.9	14966.8	524
BAC		25	0.31	81	27	38	0.07	36		122						
ERL		8.2	1.2	81	34	47	0.15	21		150						

Source: Marine Institute (2017), OSPAR (2014)

Figure 4.3: Sampling locations referenced in Table 4.1

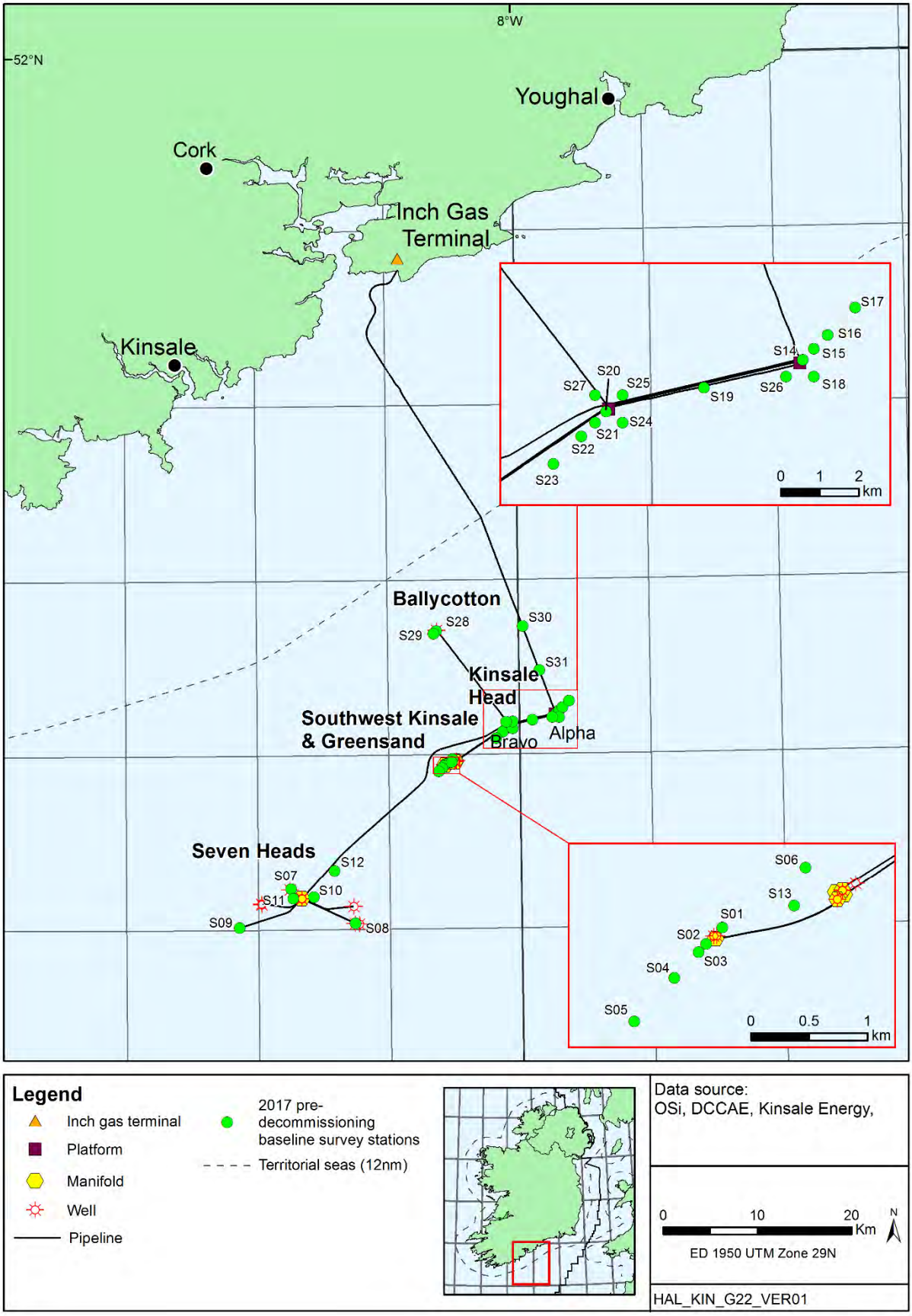


Figure 4.4: Predicted seabed habitats

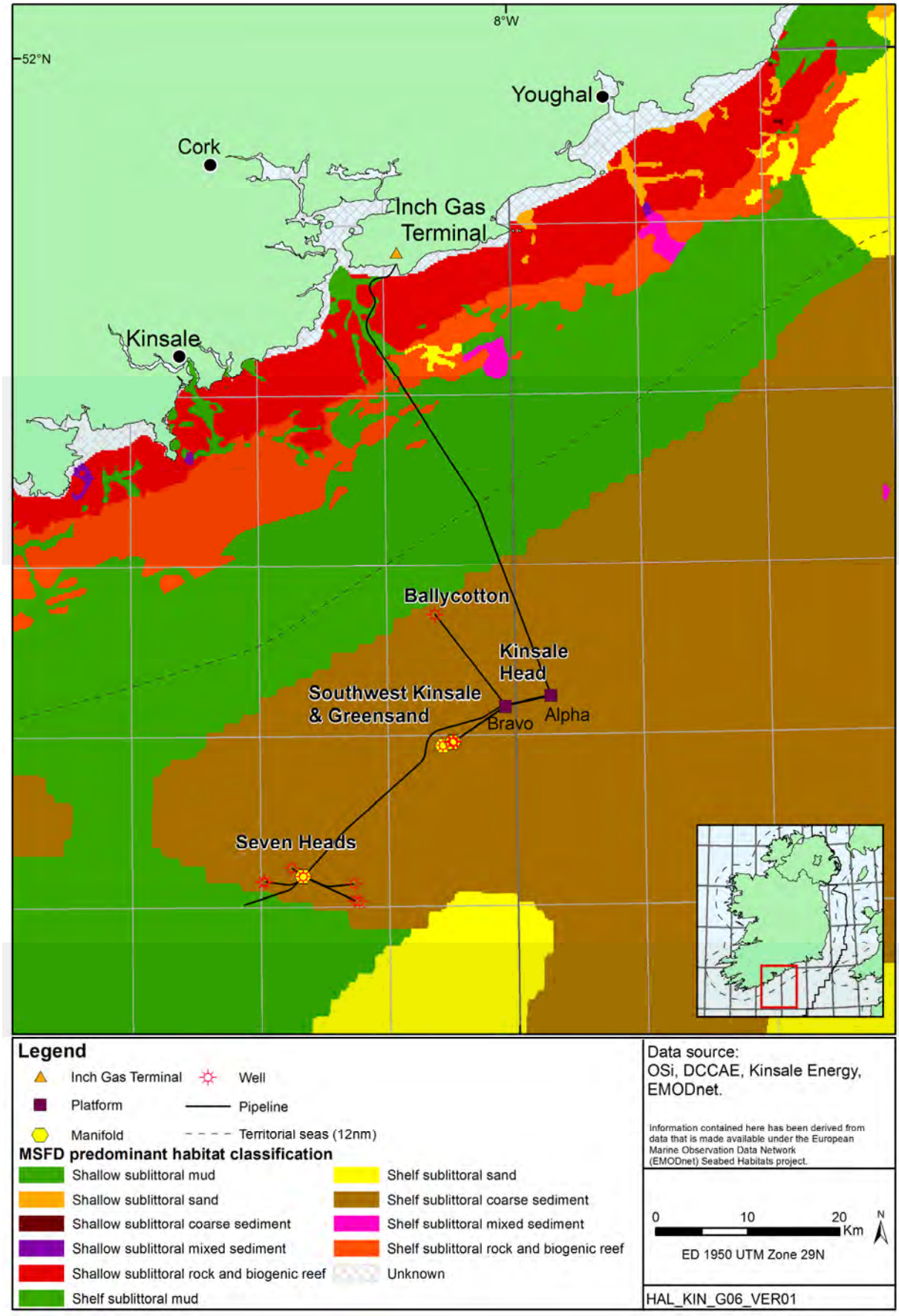
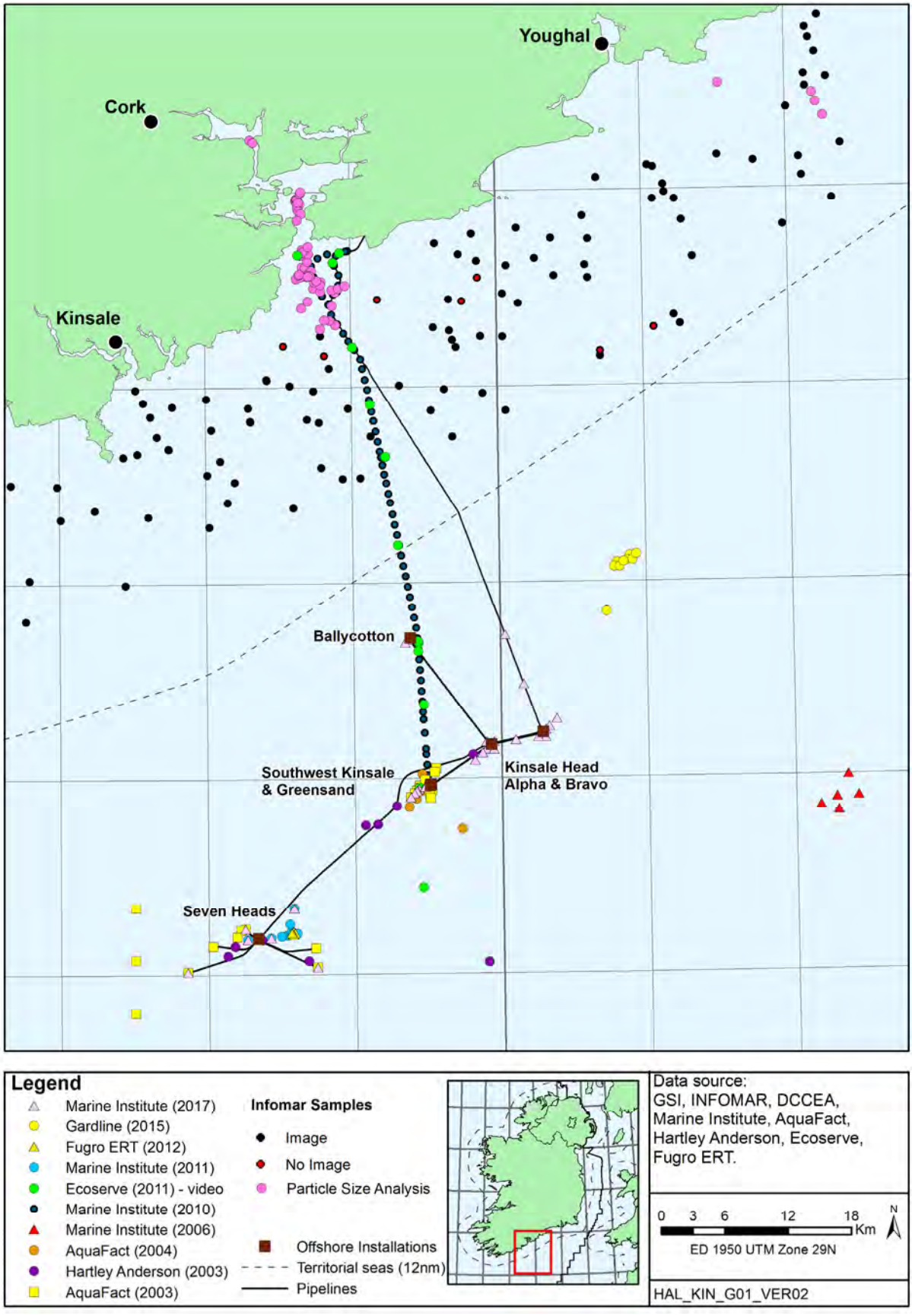


Figure 4.5: Existing seabed survey coverage



4.2 Climate, Meteorology and Air Quality

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). Coastal wind data from Cork Airport for the period between 1981 to 2010 show mean winter winds (October to March) of 5.9m/s and mean summer winds (April to September) of 4.9m/s. Gales occurred at Cork Airport an average of 1.6 days per month over winter and 0.2 days in the summer (Met Eireann website[2]). 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.

Ambient air quality monitoring at Monkstown, Cork Harbour (air quality zone D – rural background area) between August 2007 and March 2008 indicated that concentrations of carbon monoxide, nitrogen dioxide, sulphur dioxide, benzene and lead were below their respective lower assessment thresholds. Concentrations of PM_{10} exceeded the upper assessment threshold for this pollutant (EPA 2009), most likely due to residential solid fuel emissions in rural areas (O'Dwyer 2016). Similar patterns were observed in the 2015 data for Cork City (air quality zone B), with PM_{10} exceedance attributed to traffic emissions (O'Dwyer 2016).

4.3 Oceanography, Hydrography and Water Quality

The Celtic Sea is particularly susceptible to rough seas due to strong to gale force southwesterly winds. The highest frequency of rough to high seas over the open ocean to the south is associated with winds between south-south-east and north-west (UKHO 1997).

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[3]). Estimates of 100 year extreme metocean conditions for the Kinsale Area 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).

Semi-diurnal tidal components dominate short-term current velocities at the Kinsale Area, with typical spring velocities of around 0.5m/s and a north-easterly flood and south-westerly ebb orientation (UKHO 1997).

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). See **Figure 4.6** for a schematic of the currents in the Kinsale Area.

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 at the Kinsale Area during the summer is 34.75‰ increasing in winter to 35.10‰, reflecting stratified and mixed conditions respectively (BODC 1998).

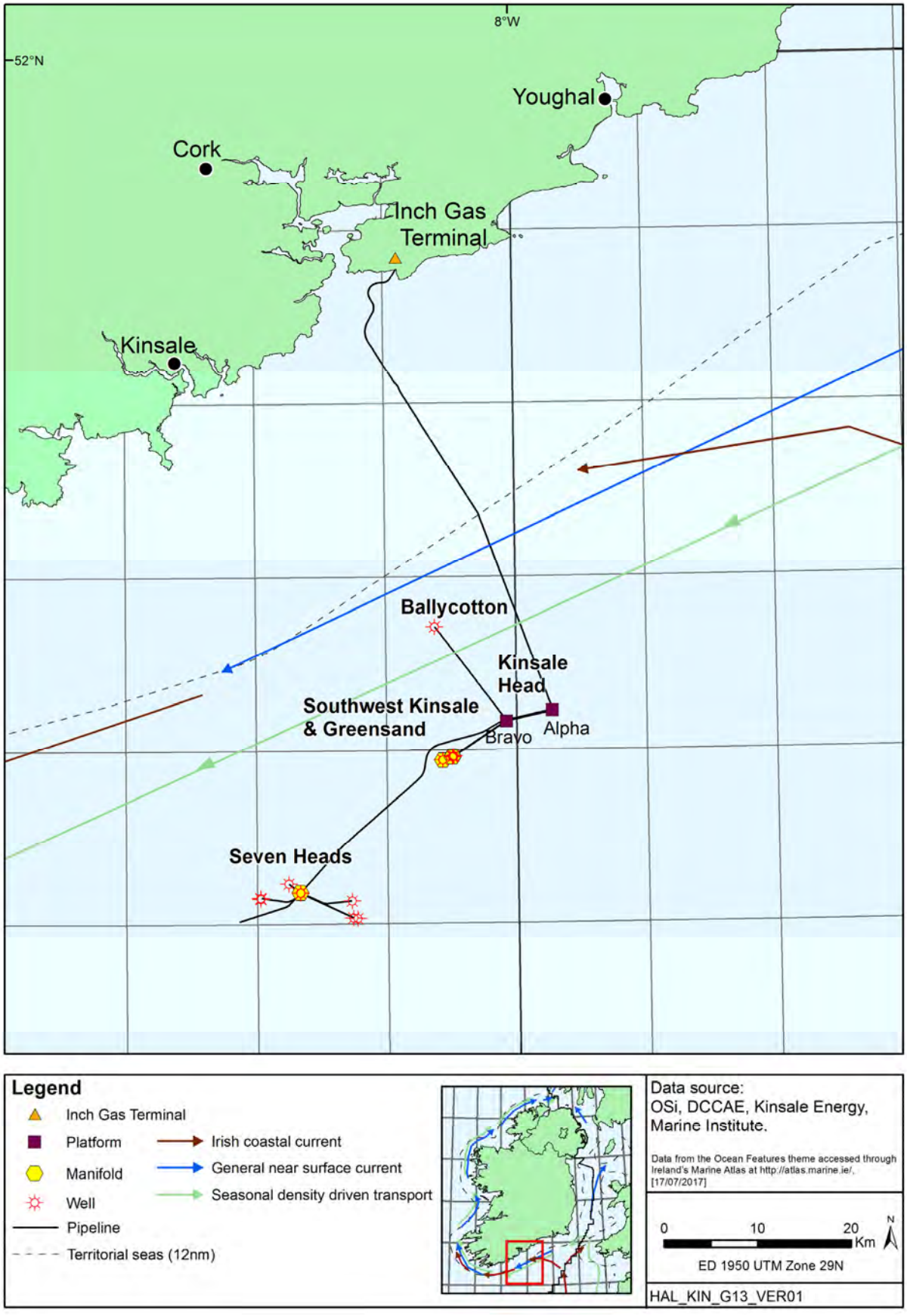
The Marine Framework Strategy Directive (MFSD) initial assessment (Marine Institute 2013), provides an overview of water quality in the Irish marine environment. Monitoring results of water sampling (in addition to sediment and organism sampling) indicate that the concentrations of monitored non-synthetic chemicals (e.g. trace metals, hydrocarbons) and synthetic contaminants (e.g. PCBs, flame retardants, TBT) are within internationally acceptable ranges or standards and at levels unlikely to cause adverse effects on marine life.

[2] http://www.met.ie/climate-ireland/1981-2010/cork.html
[3] http://data.marine.ie/Dataset/Details/20956#

The OSPAR Intermediate Assessment 2017 provides an assessment of the eutrophication status of NE Atlantic waters, drawing on data from 2006-2014 (OSPAR 2017). Results for Republic of Ireland waters are very similar to previous assessments, with the vast majority (> 99.9% by area) of assessed areas classified as non problem areas for eutrophication. Problem (n = 20) and potential problem (n = 16) areas are restricted to small inshore and coastal areas; these include some estuaries and embayments on the south coast of Ireland. Offshore waters, such as the Kinsale Area, do not show elevated nutrient concentrations (OSPAR 2017).

The status of inland and coastal waterways adjacent to the Kinsale Area, in relation to the Water Framework Directive, is summarised in Section 5.4.2. The status of relevant bathing waters is provided in Section 4.8.

Figure 4.6: Currents in the Kinsale Area



Net movement of material from the St George's and Bristol Channels dominates sediment transport in the Celtic Sea. From these channels, outgoing tidal streams carrying fine sediment fan out in a south west direction across the Celtic Sea. From the erosion areas of coarse material in the two channels, Holocene sediments are deposited progressively, as the stream weakens from zones of shelly gravel, to large zones of sandwaves up to 18m high and to sheets of fine sand and mud (Pantin 1991). Suspended sediment concentrations are seasonally variable at between ~5mg/l in January and <1mg/l in July (Cefas 2016).

4.3.1 Ambient underwater noise

Ambient (or background) noise is made up of contributions from many sources, both natural and anthropogenic. In the marine environment, these include natural physical sources (e.g. waves, precipitation), biological sources (e.g. fish, crustaceans) and anthropogenic sources (e.g. commercial shipping, aggregate extraction, sonar, offshore energy activities).

Under conditions of low wind speeds and no precipitation, noise from commercial shipping is likely to be the dominant component of ambient underwater noise (Hildebrand 2009). Shipping noise is most evident in lower frequencies of 50-300Hz, where the sounds of multiple distant ships may merge into a background continuum (Harland & Richards 2006). Closer to passing ships, sound levels are greater and with components of slightly higher frequencies arising from rotating machinery and water displacement. Seismic surveys produce high energy pulses of sound, the low frequency components of which can be audible over large distances and prevalent in ambient noise (Hildebrand 2009).

Biological sources of ambient noise are generally dominated by snapping shrimp, fish and marine mammal vocalisations. With the exception of very low frequency baleen whale calls, the medium to high frequencies of most biological noise sources are rapidly attenuated and contribute to ambient noise levels only on local scales.

Ambient noise exhibits considerable spatial and temporal variability, and accurate characterisation requires location-specific measurements. However, a consideration of the dominant noise sources in the region provides insight as to the likely characteristics of the area's ambient noise spectrum. The Kinsale Area is a high-energy environment which experiences frequent strong winds in winter and considerable precipitation; as such, natural physical noise from waves and precipitation will be important components of ambient underwater noise in the area, dominating the medium frequencies and particularly in winter. Moderate levels of noise from commercial shipping are to be expected, with notable contributions from passing vessels (≥750 per annum; mostly cargo) transiting to/from Cork and support vessels servicing the Kinsale platforms (DCENR 2011). Operations on the Kinsale platforms will also contribute to the ambient noise, generally emitting continuous wide-spectrum and tonal sounds (e.g. from rotating machinery such as turbines, generators, compressors) which are qualitatively similar to those from ships (DECC 2016). Noise from fishing vessels (e.g. propellers, winches, sonar, trawled gear in contact with the seabed) will also contribute to anthropogenic ambient noise in the area.

A comparative study of low frequency (up to 500Hz) ambient noise in the Celtic Sea, Southern and Northern North Sea revealed the Celtic Sea site to be the least influenced by anthropogenic noise (Merchant *et al.* 2016, also see Beck *et al.* 2013). While the site was positioned off the North Cornwall coast, far from the Kinsale Area, the findings are indicative of the lower overall vessel traffic and anthropogenic sources of ambient noise in the Celtic Sea compared to busier UK and Irish waters (e.g. Irish Sea, Southern North Sea, English Channel) (DECC 2016). Monitoring programmes for marine noise are being developed as part of the implementation of the MSFD in Irish waters, including the establishment of a noise register of known activities, with new noise sources identified at the consenting stage (Marine Institute & the Department of Housing, Planning and Local Government (2015).

4.4 Biodiversity

4.4.1 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.*, *Protoperidinium 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).

The zooplankton acts as a trophic link between the producers (phytoplankton) and the higher predators within the ecosystem. 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*, found in extremely large summer aggregations at the entrance of Wexford Harbour (some 150km to the east of the Kinsale Area facilities) and nearby waters between 2003 and 2006 (Marine Institute 2009), as well as *Aurelia aurita*, *Chrysaora hysoscella* and *Cyanea lamarckii*, the hydrozoans *Physalia physalis* (the Portuguese man-o-war) and *Velella* (Pikesley *et al*. 2014). *Pelagia noctiluca*, an oceanic water-water species, may be carried into Irish waters by the shelf edge current (Marine Institute 2009).

4.4.2 Benthos

Benthic biota is usually 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 and hard substrates, 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 has led to heterogeneous benthic habitats. According to the EUNIS habitat classification, the main habitat is circalittoral coarse sediment (**Figure 4.4**). This habitat, as with shallower coarse sediments, can be characterized by robust infaunal polychaetes, mobile crustaceans and bivalves (Connor *et al.* 2004). Prior to oil and gas exploration in the area, the benthic communities of the Celtic Sea were studied by Hartley and Dicks (1977), Hartley (1979) and Cabioch, *et al.* (as reported in Boelens *et al*. 1999).

In the sediment types present around the Kinsale Area, Hartley & Dicks (1977) found that many species characterising boreal offshore muddy sand and offshore gravel associations had overlapping distributions. Muddy sand associations were characterised by the molluscs *Turritella communis*, *Aporrhais pes-pelicani*, *Phaxas pellucidus* and the brittlestar *Amphiura filiformis*; gravel associations by the mollusc *Spisula elliptica* and the echinoderms *Asterias rubens*, *Echinocyamus pusillus* and *Spatangus purpureus*.

Benthic sampling (2002-2012), to inform various exploration and development activities within the proposed Kinsale Area are summarised below. These include the pipeline route between Seven Heads and Kinsale Bravo (Hartley Anderson 2003), the Barryroe well (Marine Institute 2011, Fugro ERT 2012) and the pipeline route between Inch and the gas fields of Ballycotton and SW Kinsale (Marine Institute 2010).

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 amphiurids 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.

Seabed images obtained close to the Seven Heads field (Barryroe well; Marine Institute 2011) depict a muddy/sandy seabed with little visible fauna (occasional burrowing anemones, hydroids and bryozoans on cobbles, hermit crabs); however, abundant worm tubes, *Nephrops* burrows and the clear reworking of sediments all provide evidence of bioglogical activity. Grab samples from 11 stations identified only 92 taxa (predominantly polychaetes); thus the infauna was considered to be relatively impoverished and typical of the sediment heterogeneity.

At a smaller geographic scale, video observations within 150m of a single well (48/24-10) (Fugro ERT 2012) showed evidence of faunal tracks and burrows with sparse occurrences of mobile epifauna including *Cancer pagurus* (edible crab), Paguridae spp. (hermit crabs), *Octopus vulgaris* (common octopus), *Asterias rubens* (common starfish) and *Luidia ciliaris* (seven armed starfish). *Nephrops* burrows, polychaete burrows and Actiniidae species (possibly Dahlia anemone) were also observed. The area was described as showing a high level of homogeneity, with a range of sediments (from coarse to fine sands) interspersed with occasional pebbles and bedrock outcrops; sand ripples aligned north-south were also present, indicative of east–west currents. The single biotope identified was offshore circalittoral sand SS.SSa.OSa (EUNIS A5.2 (Connor *et al*. 2004) with no attributed species associations.

Grab sampling and seabed video data acquired by Ecoserve (2011) in support of the Marine Institute's (2010) environmental baseline assessment for a proposed pipeline route from the Inch landfall out to Ballycotton, SW Kinsale and Greensand summarised the area as being relatively diverse with 280 taxa identified from 13 stations. The number of species per station ranged from 42 to 68. Eleven of the 16 most abundant taxa were polychaetes, in particular *Scalibregma inflatum*, *Lumbrineris sp.*, *Magelona mirabilis*, and to a lesser extent *Magelona filiformis* and *Chaetozone setosa*; abundant non-polychaete species were the brittlestar *Amphiura filiformis*, the bivalve *Abra nitida* and the burrowing urchin *Echinocardium cordatum*.

A total of seven biotopes were described from video material, but the positional relationship between these and the grab sampling stations is not clear. However, a theme of mixed sediments and patchiness is emphasised and the overall description of the pipeline area is 'diverse'.

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 aniara*, *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. 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.

4.4.3 Cephalopods

Cephalopods frequently recorded in the Irish and Celtic Seas include the long-finned squid *Alloteuthis subulata* and *Loligo forbesii*, which are typically found in coastal waters, the short-finned squid *Illex coindetii* and *Todaropsis eblanae*, typically found further offshore, the cuttlefish *Sepia officinalis*, the octopuses *O. vulgaris* and *Eledone cirrhosa* as well as a number of sepiolid species (DCENR 2015, Jereb *et al*. 2015).

A. subulata is the most abundant cephalopod in the Celtic Sea. It is common throughout the area, particularly at depths of less than 50m (Collins *et al*. 1995). Distribution of this species is linked to physical factors in spring and autumn with peak abundance observed in the warmest waters in March and October (Jereb *et al*. 2015). The demographic structure of the population in the region is seasonal, with mature animals dominating in spring and summer and juveniles dominating in autumn (Jereb *et al*. 2015).

L. forbesii is typically found in shallow, coastal waters and continental shelf areas. It tends to avoid waters cooler than 8.5°C and is the largest and most northerly distributed of the long-finned squids (Oesterwind *et al*. 2010). There is a single extended breeding period from December to May, and squid lay their eggs in batches before dying (Rocha *et al*. 2001). Research suggests that individuals migrate inshore from deep waters in the winter months during the peak of spawning (Stowasser *et al*. 2004).

4.4.4 Fish and Shellfish

Pelagic Fish

Pelagic species, including herring (*Clupea harengus*), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*) and horse mackerel (*Trachurus trachurus*) are abundant in the Celtic Sea, and move widely between feeding and spawning grounds (Heessen *et al*. 2015).

Mackerel are widely distributed around the north-east Atlantic where they tend to shoal in large schools. Mackerel undergo extensive migration between over-wintering grounds in the northern North Sea and spawning grounds to the west and south of Ireland (Boelens *et al*. 1999). Horse mackerel is a schooling fish, particularly abundant to the south and west of Ireland. Adults form large shoals in coastal areas with sandy sediments, where they feed on fish, cephalopods and crustaceans.

Herring are widespread throughout the north-east Atlantic, although they reach the southern limit of their range to the south of Ireland and the UK (Heessen *et al*. 2015). Spawning usually takes place at depths of between 15-40m, when herring deposit their sticky eggs on coarse sand and gravel. The dependency of herring on these specific substrates largely limits herring distribution to the shelf region and makes the species susceptible to disturbance at these sites. Young herring occur in dense shoals in inshore waters, and are often found in mixed shoals with sprat (Heessen *et al*. 2015). Sprat are usually found in shallow water close to shore, where they can tolerate low salinities. Spawning mainly occurs in the summer months, near the coast or up to 100km out to sea, at depths of 10-20m (Gordon 2006). The Celtic Sea Herring Acoustic Surveys in autumn 2016 and 2017 (O'Donnell *et al*. 2016, 2017) identified aggregations of herring at or near to the seabed; the bulk of the stock was observed within the cooler waters of the Celtic Deep in 2016, while major aggregations in both the Celtic Deep and coastal waters were observed in 2017. Higher proportions of immature fish were present in inshore waters in 2016. In both 2016 and 2017, sprat were widely distributed throughout the survey area, while several shoals of tuna (most probably *Thunnus thynnus*) were observed at the surface in offshore waters.

Results from the DCCAE ObSERVE Programme of aerial surveys indicate summer and winter presence of the largest known bony fish, ocean sunfish (*Mola mola*) in the Kinsale Area, with peak abundance in summer (Breen *et al*. 2017), presumably coinciding with invasions of jellyfish medusae, salps and ctenophores which are important food sources for sunfish.

Demersal fish

The most common species in the Celtic Sea 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 merlucius*), plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*) are also abundant (Heessen *et al*. 2015). Areas of sandy sediment tend to support flatfish and sandeels (*Ammodytes spp.*), while gobies, blennies, wrasse, John dory (*Zeus faber*) and large gadoids are more abundant over rockier regions (Boelens *et al*. 1999).

Gadoids are important components of the fish community of the north-east Atlantic. Cod are distributed throughout Irish waters, where they are found from the shoreline down to depths of 600m, but reach the southern limit of their range in the Celtic Sea (DCENR 2015). Cod are omnivores, feeding on a variety of invertebrates and fish. Adult cod aggregate in loose shoals and generally remain within the continental shelf area (Heessen *et al*. 2015). Haddock are found close to the seabed, typically over sandy and muddy substrates and are abundant in the northern half of the Celtic Sea (Heessen *et al*. 2015). Adults congregate to spawn, with the Celtic Sea one of several spawning areas around the coasts of Ireland and the UK (DCENR 2015). Whiting are widespread around European coasts at depths of 10-200m over sandy or muddy ground. Whiting spend their first 2-3 months near the surface, often associating with *Cyanea* jellyfish blooms (Hay *et al*. 1990), after which they adopt a demersal way of life. Hake are most abundant along the continental slope to the west of Ireland. They feed nocturnally in mid-water, returning to the bottom during the day, while juveniles aggregate in nursery areas over muddy sediments (DCENR 2015). A number of smaller gadoid species such as poor cod and Norway pout can be very abundant in places and may be ecologically important

as prey for other species. Poor cod is widespread around the Irish coast, mainly in waters >70m deep, and population densities in the Celtic Sea can be much greater than those in the North Sea (Heessen *et al*. 2015). Poor cod has undergone a significant decrease in abundance off the south of Ireland, while increasing in the north and may be considered a climate indicator species (Marine Institute, 2009). Norway pout is mainly found in open, deeper water (>80m) over muddy bottoms and, although abundance is low in the southern half of the Celtic Sea, they are abundant in waters off the south coast of Ireland (Heessen *et al*. 2015).

Plaice are found to depths of 200m, mainly on soft sediments. They live on mixed substrates at depths of up to 200m (although generally in much shallower waters), with older individuals generally found in deeper water (Whitehead *et al*. 1986). Plaice have a complicated life cycle, with each life stage having a specific set of habitat requirements. Larvae and juveniles rely on transport by currents to move them from spawning grounds to nursery areas (Heessen *et al*. 2015). Dab are spring and summer spawners which mature at 2-3 years to produce pelagic eggs and larvae. Dab are typically found in shallower water, where they feed on small benthic invertebrates (Amara *et al*. 1998). Other important flatfish species in the area include sole (*Solea solea*), especially on finer sandy and muddy seabeds to around 120m, including estuarine areas and the megrim (*Lepidorhombus whiffiagonis*), which occurs over mud and sand sediments across the south and west coasts of Ireland (DCENR 2015).

Two similar species of monkfish, white-bellied (*Lophius piscatorius*) and black-bellied (*L. budegassa*) are found in Irish waters ranging from shallow, inshore waters down to depths of 1,100m, with the white-bellied the most abundant. Monkfish are ambush predators, enticing prey towards their mouths with a lure that extends from the top of their head (Fariña *et al*. 2008). Spawning is thought to take place in deep water, with each female thought to produce just one batch of eggs (in a large, buoyant and gelatinous ribbon) in winter and spring (Laurenson *et al*. 2008). Juvenile monkfish descend to the seabed after and are generally found in shallower water than adults.

Elasmobranchs

A number of elasmobranch species are present in the Celtic Sea, including the spurdog (*Squalus acanthias*) and the lesser spotted dogfish (*Scyliorhinus canicula*) (Marine Institute 2012). The lesser spotted dogfish, like the poor cod, has decreased in abundance off the south of Ireland, while increasing in the north and may be considered a climate indicator species (Marine Institute 2009). Skates and rays that may be found in the region include the thornback ray (*Raja clavata*), cuckoo ray (*Raja naevus*), shagreen ray (*Raja fullonica*) and the rare common skate (*Dipturus batis*), listed as “Critically Endangered” on the IUCN Red List (Ellis *et al*. 2004), and now known to consist of two species, both rare (Iglésias *et al.* 2010). Oceanic sharks such as blue (*Prionace glauca*), 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). Sightings of basking and blue sharks have also been reported in the area by the Celtic Sea Herring Acoustic Surveys (Cronin & Barton 2014, O’Donnell *et al*. 2016, 2017), while satellite tagging of basking sharks in the Celtic Sea revealed evidence of migration between the west of France and the Irish coast (Marine Institute 2013, Sims *et al*. 2005).

Diadromous fish

Diadromous species are those which migrate between marine and freshwater as part of their lifecycle. Salmonids, including Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*) undertake extensive migrations out to sea to feed, before returning to “home” rivers to spawn. Spawning takes place in shallow gravelly areas in clean rivers and streams. After a period of up to 5 years the young salmon migrate downstream to the sea as smolts (DCENR 2015), where they are thought to migrate northwards up the west coast, and then towards Greenland and the Norwegian Sea via the Faroe-Shetland Channel (Hansen & Jacobsen 2003). Salmon have a homing instinct and spawn in the river of their birth after 1-4 years at sea (Heessen *et al*. 2015). The River Lee, flowing into Cork Harbour, contains populations of salmon and trout which migrate to spawning locations up-river. The Blackwater River, approximately 40km to the east of Cork Harbour, is a designated SAC (Special Area of Conservation – see Section 3.2.8), with Atlantic salmon as a qualifying feature.

The Blackwater River SAC also contains populations of sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and twaite shad (*Alosa fallax*). Lampreys are eel-like, jawless fish which migrate up rivers to spawn and spend the larval stage buried in muddy substrates in freshwater. Both species need clean gravel for spawning, and silt or sand for the burrowing juveniles (JNCC website). Once metamorphosis takes place, the adults migrate to the sea. Sea lampreys are thought to venture further out to sea and spawn in

lower reaches of the rivers than the river lampreys (Heessen *et al*. 2015). Shads are clupeids, or herring-like fish. They feed in estuaries before moving upstream to spawn between April and July. Juveniles are thought to remain in freshwater for up to two years, before returning to the sea (Maitland & Hatton-Ellis 2003). There are several other riverine SACs supporting nationally important populations of migratory fish along the south coast.

The European eel (*Anguilla anguilla*) is recorded in rivers throughout Ireland (DCENR 2015).

They spend most of their lives in freshwater or inshore coastal waters, before migrating across the Atlantic to the Sargasso Sea to spawn in late summer (McCleave & Arnold 1999). The larvae drift north-east with the Gulf Stream and after about 6-8 months reach the Irish coast from December into spring (Moriarty 1999) where they transform into transparent elvers (glass eels). Glass eels gather in river estuaries and wait for the river water to reach 10-12°C, before swimming upstream and migrating into inland waters. Eels spend between 2 and 20 years in rivers and other inland waters, before mature fish migrate seawards to the Sargasso Sea, where they spawn and die.

Shellfish

There are important *Nephrops norvegicus* (Norway lobster, scampi) grounds to the south of Cork (Lordan *et al*. 2015) including the Kinsale Area. Other common shellfish species in the area include edible (brown) crabs, lobster (*Homarus gammarus*), spider crabs (*Maja squinado = brachydactyla*), green (*Carcinus maenas*) and velvet (*Necora puber*) crabs, whelks (*Buccinum undatum*), cockles (*Cerastoderma edule*), mussels (*Mytilus edulis*), periwinkles (*Littorina littorea*), razor clams (*Ensis* spp.) and brown shrimp (*Crangon crangon*).

Spawning and nursery areas

The Kinsale Area is primarily within the International Council for the Exploration of the Sea (ICES) Rectangle 31E1 but extends into 31E2 and 32E1 (**see Figure 4.7**). These rectangles are within spawning areas for herring, sprat, cod, whiting, plaice, lemon sole and *Nephrops* (Coull *et al*. 1998), as well as haddock, megrim, mackerel and horse mackerel (Marine Institute data). Mackerel, cod, whiting, lemon sole, blue whiting (*Micromesistius poutassou*), ling (*Molva molva*), European hake and *Nephrops* all use the area as a nursery area at low intensity, while the area is a high intensity nursery area for monkfish (Ellis *et al*. 2012). The Marine Institute has also identified nursery grounds for herring, haddock, megrim and horse mackerel, in addition to whiting and mackerel. The Kinsale Area is not located within any known elasmobranch spawning grounds, but was identified within low intensity nursery grounds for spurdog and common skate (Ellis *et al.* 2012). **Figures 4.7 and 4.8** combine information from Coull *et al*. (1998), Ellis *et al*. (2012) and the Marine Institute (2012) to show the known spawning grounds and nursery areas that overlap with the Kinsale Area. Fish spawning can vary temporally and spatially; spawning areas are not rigidly fixed and fish may spawn earlier or later in the season.

The high density of spawning and nursery grounds around the south and west coasts of Ireland, and particularly those of hake, were a key factor in the establishment in 2003 of the Irish Conservation Box (or Biologically Sensitive Area), an area of 100,00km^2 extending out from Waterford Harbour along the 200m depth contour to Slyne Head on the west coast within which fishing restrictions are in place (see https://www.marine.ie/Home/site-area/areas-activity/fisheries-ecosystems/biologically-sensitive-area-0). **Figure 4.7** and **Figure 4.8** illustrate spawning and nursery areas of selected species in the Kinsale Area. The species represented are those mapped by the Marine Institute, based on data layers produced by ICES (2009) as part of their assessment of the importance of the Irish Conservation Box. Additional data layers are derived from Coull *et al*. (1998). Spawning or nursery areas of those species present in **Table 4.2**, but not represented in **Figure 4.7** and **Figure 4.8** may be assumed to be generally present throughout the area mapped. Spawning and/or nursery areas for several species, notably herring, whiting and cod are closely associated with coastal waters. Herring spawning, in particular, is restricted to areas of coarse sand or gravel substrates.

Table 4.2: Spawning and nursery grounds in the Kinsale Area

Species	Spawning grounds	Nursery grounds	Spawning period
Herring (a,c)	✓	✓	January - March
Sprat (a)	✓	-	May - August
Mackerel (b,c)	✓	✓ (low)	March - July

Species	Spawning grounds	Nursery grounds	Spawning period
Horse mackerel (c)	✓	✓	March - August
Blue whiting (b)	-	✓ (low)	-
Cod (a,b,c)	✓	✓ (low)	January - April
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)	-	✓ (high)	-
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)

Figure 4.7: Spawning sites of selected species in the Kinsale Area

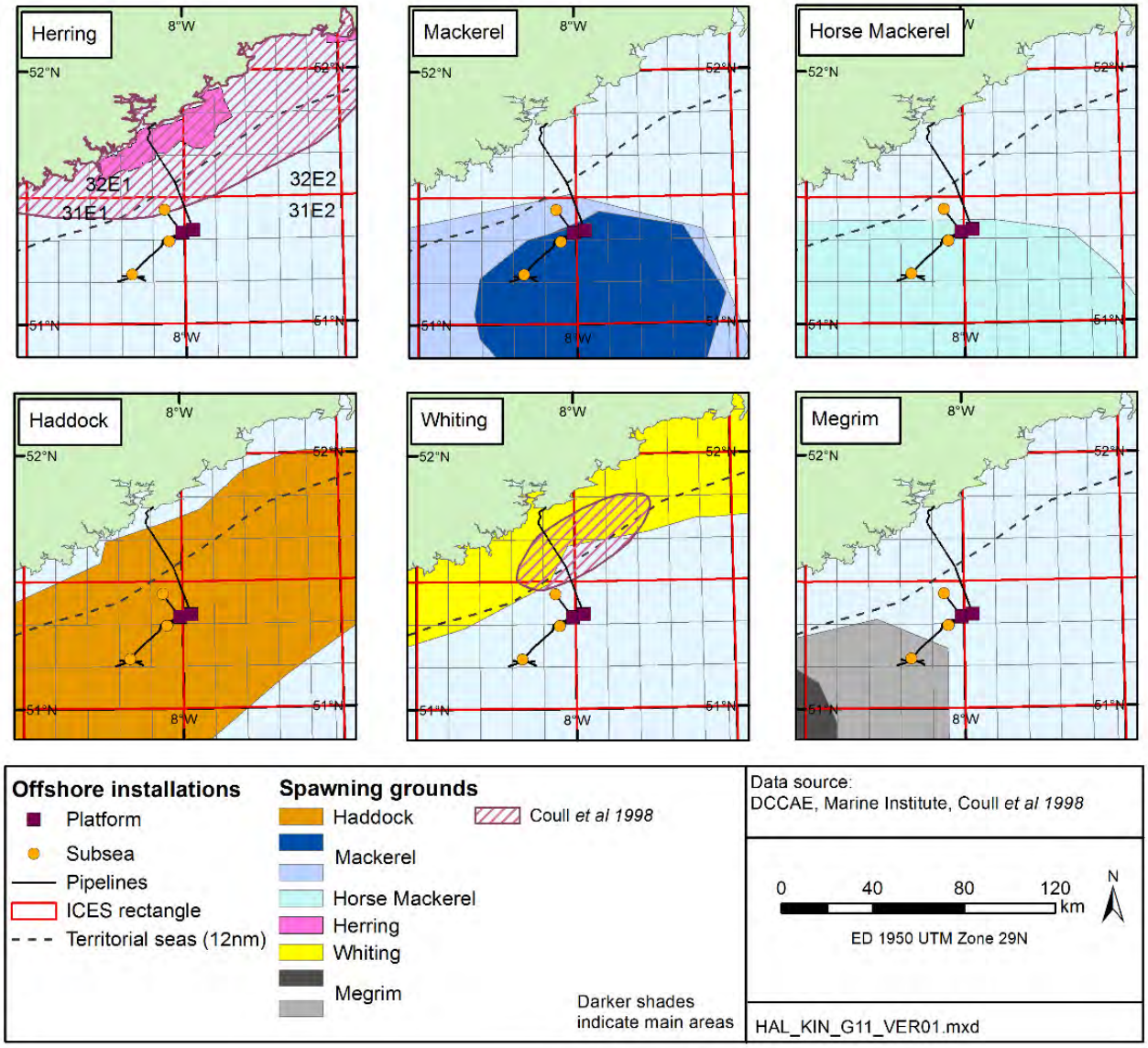
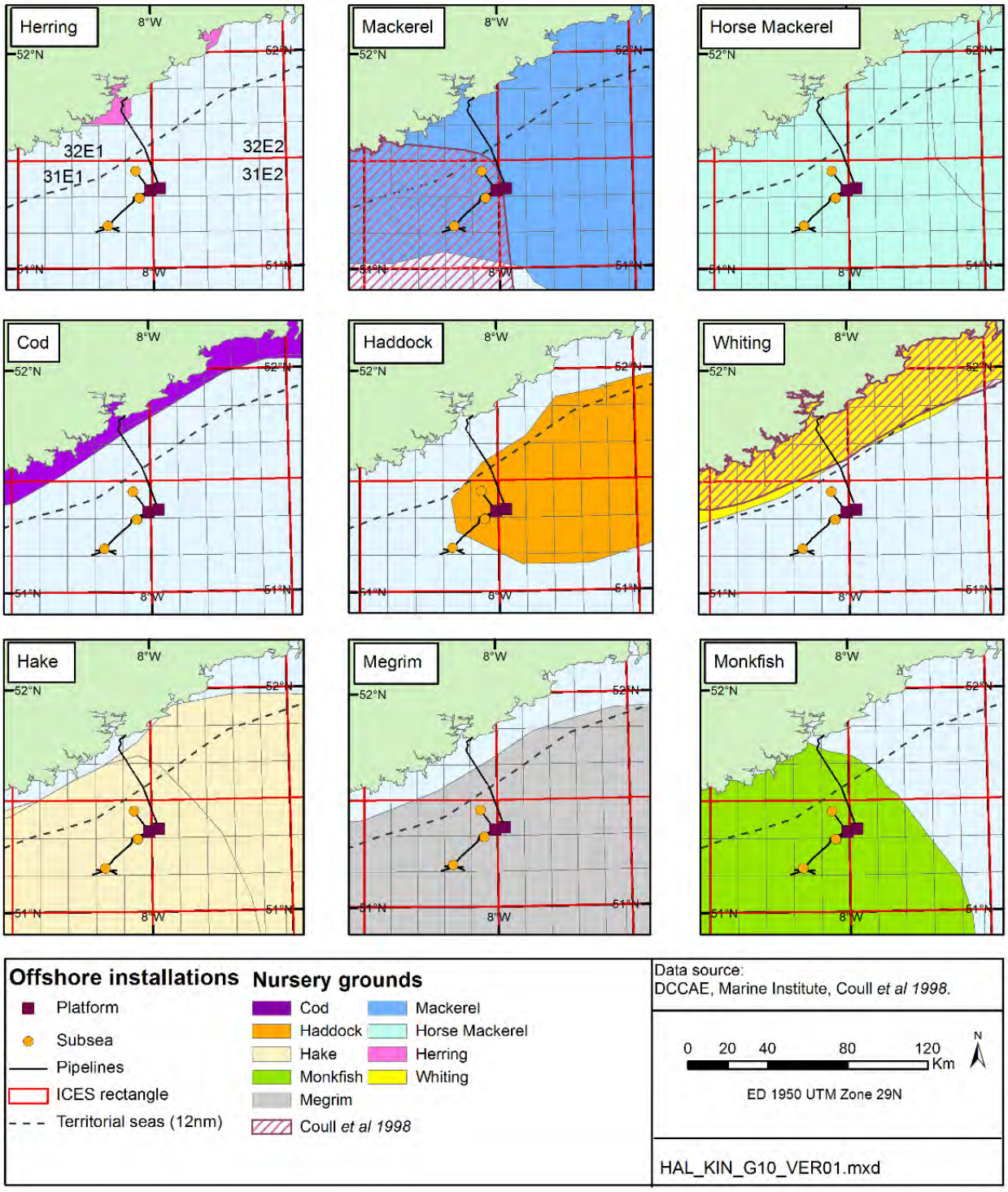


Figure 4.8: Nursery sites of selected species in the Kinsale Area



Irish Wildlife Trust (2018) list a number of marine species, primarily fish and shellfish, within Irish waters which are threatened, including those on the IUCN Red list and also a number for which there is evidence of decline or that have very localised populations.

These include elasmobranchs[4], the European eel[5], and a range of species which are also listed in the Habitats Directive including, Atlantic salmon, sea and river lamprey, common sturgeon and shad.

4.4.5 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 adaptions to cold water (Goff & Stenson 1988). The species is covered under Annex IV of the Habitats Directive.

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 none were recorded in the 2016 or 2017 surveys (O'Donnell *et al*. 2016. 2017).

4.4.6 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 (https://www.npws.ie/research-projects/animal-species/birds/wintering-waterbirds). There are numerous SPAs (Special Protection Areas) along the coast which offer protection to species or aggregations of seabirds and waterbirds (see **Section 4.4.8**). 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) have recorded seabird sightings around the Kinsale Area.

Seabirds

Gulls commonly found in the Kinsale 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*) (https://www.npws.ie/research-projects/animal-species/birds/seabirds). 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 4.9** for locations).

[4] Also see Clarke *et al.* (2016). Ireland Red List No. 11: Cartilaginous fish [sharks, skates, rays and chimaeras].
[5] Note that Council Regulation (EC) No 1100/2007 establishing measures for the recovery of the stock of European eel is implemented through eel management plans for Ireland.

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 Kinsale Area, 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 coastal waters of the Kinsale Area include the common tern (*Sterna hirundo*), the Arctic tern *(Sterna paradisaea*), the Sandwich tern (*Sterna sandivicensis*) and the little tern (*Sternula albifrons*). Lady's Island Lake to the south of Rosslare supports nationally important populations of common, Sandwich, Arctic and roseate terns which breed on the islands in the lake (NPWS website). 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 (*Stercorarius skua*) is a resident which breeds in the west of Ireland (DCENR 2015), and is occasionally recorded in the Celtic Sea. The highly pelagic petrels and shearwaters, including the Northern fulmar -, 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). 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 Kinsale Area. The 2016 and 2017 Celtic Sea Herring Acoustic Surveys (O'Donnell *et al*. 2016, 2017) surveyed coastal and offshore waters from Mizen Head eastwards to the Irish Sea, each taking place over 2-3 weeks in October[6].. 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 survey observed a similar species composition but the total number of individuals recorded on survey (6,939) was 61% less than in 2016; the majority of this reduction in numbers was attributable to almost 9,000 fewer gannet sighted in 2017[7].

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 4.4.8**).

4.4.7 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[8]. 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 Kinsale 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

[6] The 2016 survey spanned 8-26 October; the 2017 survey spanned 15 October to 03 November.
[7] It was noted that while a similar amount of survey effort took place in 2016 and 2017, two major storms (Ophelia and Brian) occurred during the 2017 survey period.
[8] 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.

mammal observers recorded sightings when light and environmental conditions permitted; combined data from 10 years of surveys from 2008-2017 are provided in **Table 4.3**. **Table 4.3** 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 (IWDG 2018). These extracted data include all sightings from January 2008 to December 2017 within an area approximately bounded by Ardmore in the east, Galley Head in the west and south to 51ºN (the typical offshore extent of the CSHAS) (Figures 4.9 and 4.10). 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 4.3**), where they are sighted year-round (**Table 4.4**). 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. Fin whales (*Balaenoptera physalus*) are the most commonly sighted baleen whale, most frequently and in the greatest numbers in late summer and autumn. Minke whale are also most frequently observed during late summer to autumn, albeit in apparently lower abundance. Small numbers of humpback whales also occur in this area, with sightings peaking from late summer through to JanuaryGrey (*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 Kinsale 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 4.4.8**. The indicative seasonal occurrence of cetaceans is given in **Table 4.4**.

Table 4.3: Cetacean sightings recorded during the annual Celtic Sea Herring Acoustic Surveys and submitted to the IWDG Casual Cetacean Sightings database over 10 years from 2008-2017.

	Celtic Sea Herring Acoustic Surveys (CSHASs)		IWDG Casual sightings database
Species	Number of years observed (of a maximum of 10)	Total number of sightings (individuals)	Total number of sightings (individuals)
Toothed cetaceans			
Common dolphin	10	783 (11,138)	265 (15,858)
Harbour porpoise	7	40 (244) *	173 (568)
Bottlenose dolphin	5	7 (29)	136 (998)
Risso's dolphin	4	6 (14)	10 (108)
Killer whale	1	1 (3)	3 (11)
Unidentified dolphin	*na*	*71 (592)*	70 (814)
Baleen whales			
Fin whale	10	111 (202)	295 (1,232)
Minke whale	10	78 (89)	146 (368)
Humpback whale	5	17 (24)	49 (110)
Unidentified whale	*8*	*57 (73)*	*107 (244)*
Total	**na**	**1,184 (12,421)**	**1,254 (20,311)**

*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 (>100km east of the Kinsale field).*

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

Table 4.4: 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
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.

Figure 4.9: Sightings of toothed cetaceans submitted to the IWDG Casual Cetacean Sightings database from 2008-2017.

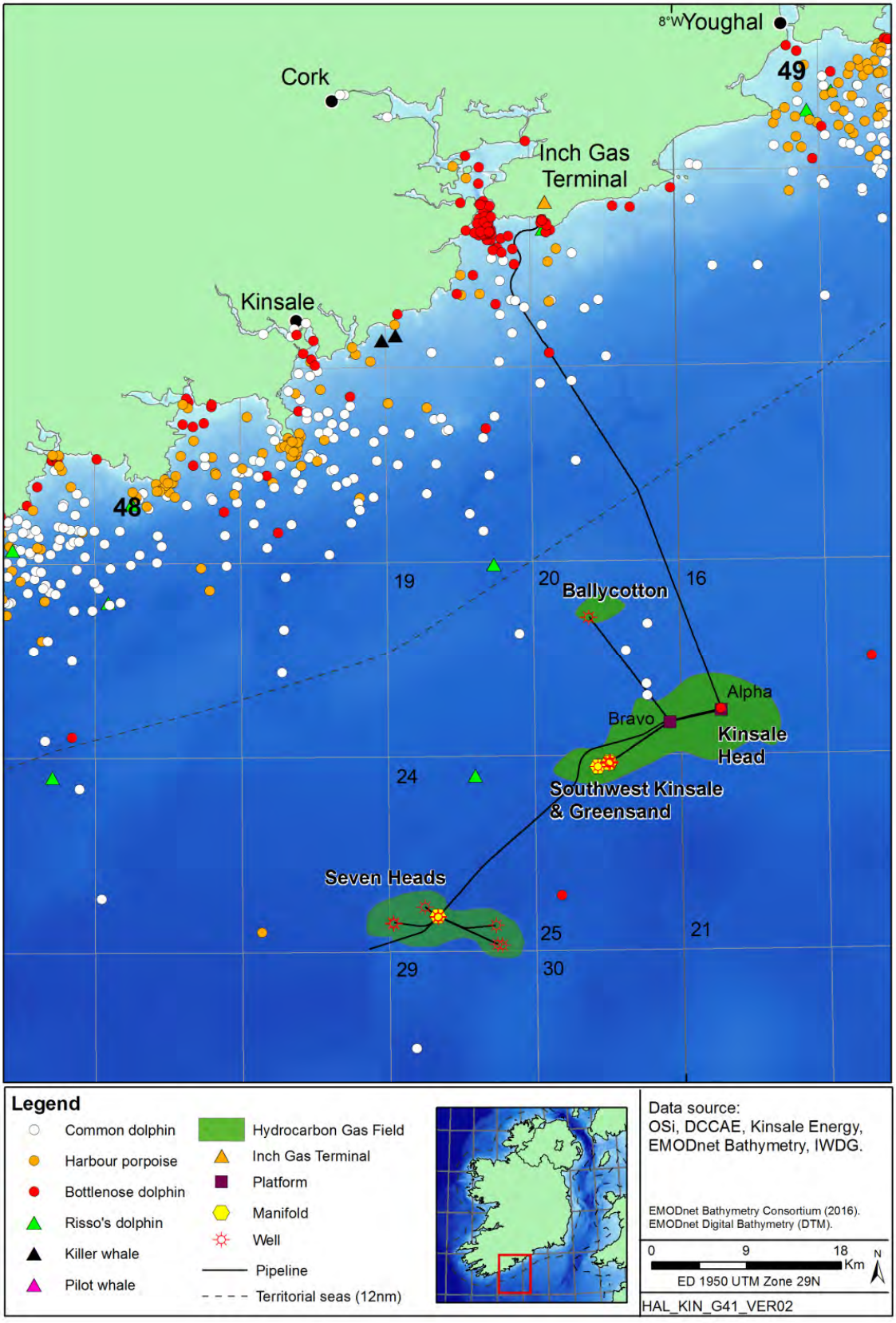
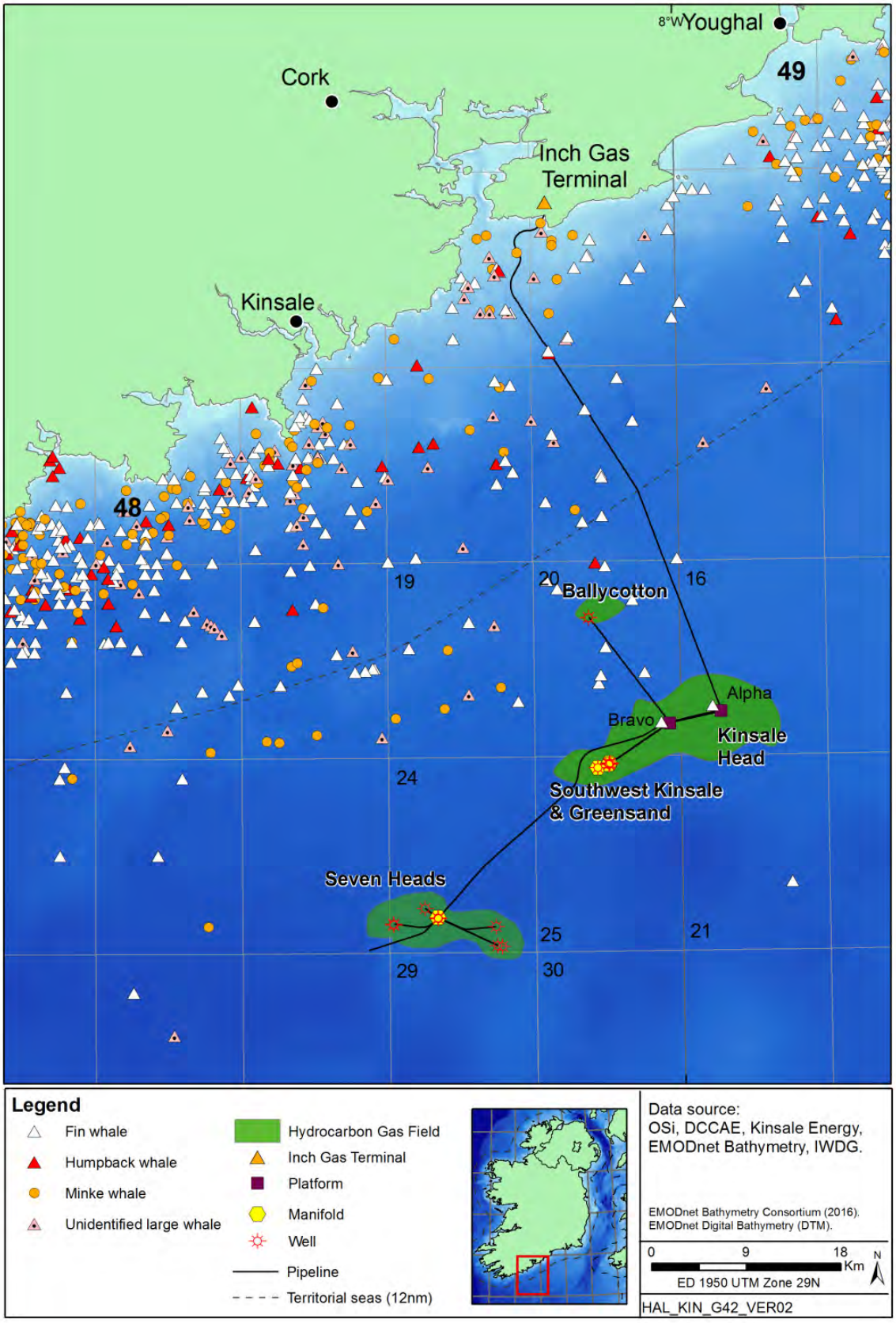


Figure 4.10: Sightings of baleen whales submitted to the IWDG Casual Cetacean Sightings database from 2008-2017.



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 4.3**), harbour porpoise are the second most frequently sighted toothed cetacean, seen both close to shore and in offshore waters (**Figure 4.9**).

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, 76km to the west of the Kinsale 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 4.9**). 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 2018). 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 Kinsale 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 is most frequently seenfrom 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 whales 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 and IWDG casual sightings data (**Table 4.3**). 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 Kinsale 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 Kinsale 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 Kinsale 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 four of the ten annual CSHAS from 2008-2017, comprising 13 sightings of single seals, most of which were close to the coast (e.g. O'Donnell et al. 2017).

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 Kinsale Area, with animals present in waters around the south coast of Ireland focused off southwest Cork and Kerry (Jones *et al*. 2015).

No harbour seals were sighted off the south coast of Ireland in any of the ten annual CSHAS.

4.4.8 Conservation Sites and Species

Conservation sites in proximity to the Kinsale Area include Natura 2000 sites (Special Areas of Conservation and Special Protection Areas), some of which are also OSPAR Marine Protected Areas or coincident with Ramsar designations (e.g. Cork Harbour, Ballycotton Bay and Blackwater Estuary) which are designated as wetlands of international importance. National designations 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.

The location of SACs and SPAs currently designated are shown in **Figure 4.11** for marine and coastal sites and for riverine and inland sites; only inland sites with features linked to the marine environment (e.g. breeding areas for birds which feed in coastal/marine habitats, freshwater pearl mussel, Atlantic salmon) are shown. Sites within 100km of Kinsale area facilities (wells, manifolds, pipelines or platforms), consistent with the Zone of Influence chosen for the accompanying Appropriate Assessment (AA) screening report. Further details on the specific features for each site are given in **Table 4.5**. Other conservation sites including Natural Heritage Areas, potential Natural Heritage Areas and Ramsar sites, are shown in **Figure 4.12.**

EU Member States are required to report on the conservation status of habitats and species every six years. The latest review of Irish habitats and species was submitted in 2013 and covers the period 2007-2012 (NPWS 2013). Knowledge is still improving for Annex II and Annex IV species of marine mammal which occur in the Celtic Sea and wider Irish waters, and hence certain parameters of assessment were indicated as unknown (e.g. range, population, habitat, future prospects and overall status), however for those categories considered, all were indicated to be favourable for marine mammals. Due to limited knowledge of the ecology of leatherback turtles, the overall status of this species was indicated to be unknown. In addition, the overall population and breeding range trends, and population trends for relevant qualifying species under the Birds Directive are reported by Ireland. The results for the period 2008-2012 are reported on the NWPS website[9].

[9] https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting

Table 4.5: Relevant SACs and SPAs, their features and the closest distance to Kinsale Area facilities

Site code	Site name	Closest distance (km)			Summary of features
		Subsea wells & other subsea structures	Offshore pipelines	Offshore platforms	
SACs					
002123	Ardmore Head	61	40	65	**Annex I Habitats:** Vegetated sea cliffs; Dry heaths
000077	Ballymacoda (Clonpriest & Pillmore)	84	17	58	**Annex I Habitats:** Estuaries; Tidal mudflats and sandflats; *Salicornia* mud and sand; Atlantic salt meadows; Mediterranean salt meadows
001040	Barley Cove to Ballyrisode Point	95	95	118	**Annex I Habitats:** Tidal mudflats and sandflats; Perennial vegetation of stony banks
002170	Blackwater River	58	26	64	**Annex I Habitats:** Estuaries; Tidal mudflats and sandflats; Perennial vegetation of stony banks; *Salicornia* mud; Atlantic salt meadows; Mediterranean salt meadows; Floating river vegetation; Old oak woodlands; Alluvial forests **Annex II Species:** Freshwater pearl mussel (*Margaritifera margaritifera*); White-clawed crayfish (*Austropotamobius pallipes*); Sea lamprey; Brook lamprey (*Lampetra planeri*); River lamprey; Twaite shad; Atlantic salmon; Otter (*Lutra lutra*); Killarney fern (*Trichomanes speciosum*)
000091	Clonakilty Bay	54	45	63	**Annex I Habitats:** Tidal mudflats and sandflats; Annual vegetation of drift lines; Embryonic shifting dunes; Shifting white dunes; Fixed grey dunes; Decalcified fixed dunes
001230	Courtmacsherry Estuary	51	32	55	**Annex I Habitats:** Estuaries; Tidal mudflats and sandflats; Annual vegetation of drift lines; Perennial vegetation of stony banks; *Salicornia* mud and sand; Atlantic salt meadows; Mediterranean salt meadows; Embryonic shifting dunes; Shifting white dunes; Fixed grey dunes
001058	Great Island Channel	48	8	59	**Annex I Habitats:** Tidal mudflats and sandflats; Atlantic salt meadows
000665	Helvick Head	76	57	79	**Annex I Habitats:** Vegetated sea cliffs; Dry heaths
000764	Hook Head	100	82	98	**Annex I Habitats:** Large shallow inlets and bays; Reefs; Vegetated sea cliffs

Site code	Site name	Closest distance (km)			Summary of features
		Subsea wells & other subsea structures	Offshore pipelines	Offshore platforms	
001061	Kilkeran Lake and Castlefreke Dunes	56	56	58	**Annex I Habitats:** Coastal lagoons; Embryonic shifting dunes; Shifting white dunes; Fixed grey dunes
000097	Lough Hyne Nature Reserve and Environs	69	78	79	**Annex I Habitats:** Reefs; Large shallow inlets and bays; Sea caves
002162	River Barrow & River Nore	115	91	114	**Annex I Habitats:** Estuaries; Tidal mudflats and sandflats; Reefs; *Salicornia* mud and sand; Atlantic salt meadows; Mediterranean salt meadows; Floating river vegetation; Dry heaths; Halophilus scrubs; Petrifying springs; Old oak woodlands **Annex II:** Desmoulin's whorl snail *(Vertigo moulinsiana)*; Freshwater pearl mussel; White-clawed crayfish; Sea lamprey; Brook lamprey; River lamprey; Twaite shad; Atlantic salmon; Otter; Killarney fern; Nore pearl mussel (*Margaritifera durrovensis*)
000101	Roaringwater Bay and Islands	74	74	94	**Annex I Habitats:** Large shallow inlets and bays; Reefs; Vegetated sea cliffs; Dry heath; Sea caves **Annex II Species:** Harbour porpoise; Otter; Grey seal
000671	Tramore Dunes and Backstrand	104	80	104	**Annex I Habitats:** Tidal mudflats and sandflats; Annual vegetation of drift lines; Perennial vegetation of stony banks; *Salicornia* mud and sand; Atlantic salt meadows; Mediterranean salt meadows; Embryonic shifting dunes; Shifting white dunes; Fixed grey dunes
002171	Bandon River cSAC	71	58	83	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*); *Margaritifera margarififera* (Freshwater Pearl Mussel); *Lampetra planeri* (Brook Lamprey)
					SPAs
004022	Ballycotton Bay	43	9	51	**Article 4 Species:** Teal (*Anas creca*); Ringed plover (*Charadrius hiaticula*); Golden plover (*Pluvialis apricaria*); Grey plover (*Pluvialis squatarola*); Lapwing (*Vanellus vanellus*); Black-tailed godwit (*Limosa limosa*); Bar-tailed godwit (*Limosa lapponica*); Curlew (*Numenius arquata*); Turnstone (*Arenaria interpres*); Common gull; Lesser black-backed gull; Wetland & Waterbirds

Site code	Site name	Closest distance (km)			Summary of features
		Subsea wells & other subsea structures	Offshore pipelines	Offshore platforms	
004023	Ballymacoda Bay	51	19	51	**Article 4 Species:** Wigeon (*Anas penelope*); Teal; Ringed plover; Golden plover; Grey plover; Lapwing; Sanderling (*Calidris alba*); Dunlin (*Calidris alpina*); Black-tailed godwit; Bar-tailed godwit; Curlew; Redshank (*Tringa totanus*); Turnstone; Black-headed gull; Common gull; Lesser black-backed gull; Wetland & Waterbirds
004028	Blackwater Estuary	59	34	65	**Article 4 Species:** Wigeon; Golden plover; Grey plover; Lapwing; Dunlin; Black-tailed godwit; Bar-tailed godwit; Curlew; Redshank; Wetland & Waterbirds
004081	Clonakilty Head	53	46	63	**Article 4 Species:** Shelduck; Dunlin; Black-tailed godwit; Curlew; Wetland & Waterbirds
004030	Cork Harbour	37	4	50	**Article 4 Species:** Little grebe (*Tachybaptus rufficolis*); Great crested grebe (*Podiceps cristatus*); Cormorant; grey heron (*Ardea cinerea*); Shelduck; Wigeon; Pintail; Shoveler (*Anas clypeata*); Red-breasted merganser (*Mergus serrator*); Oystercatcher; Golden plover; Grey plover; Lapwing; Dunlin; Black-tailed godwit; Bar-tailed godwit; Curlew; Redshank; Black-headed gull; Common gull; Lesser black-backed gull; Common tern; Wetland & Waterbirds
004219	Courtmacsherry Bay	42	32	53	**Article 4 Species:** Great northern diver (*Gavia immer*); Shelduck; Wigeon; Red-breasted merganser; Golden plover; Lapwing; Dunlin; Black-tailed godwit; Bar-tailed godwit; Curlew; Black-headed gull; Common gull; Wetland & Waterbirds
004032	Dungarvan Harbour	75	51	80	**Article 4 Species:** Great crested grebe; Light-bellied brent goose; Shelduck; Red-breated merganser; Oystercatcher; Golden plover; Grey plover; Lapwing; Knot; Dunlin; Black-tailed godwit; Bar-tailed godwit; Curlew; Redshank; Turnstone; Wetland & Waterbirds
004190	Galley Head to Duneen Point	53	48	64	**Article 4 Species:** Chough
004192	Helvick Head to Ballyquin	65	37	69	**Article 4 Species:** Cormorant; Puffin; Herring gull; Kittiwake; Chough
004193	Mid-Waterford Coast	84	55	87	**Article 4 Species:** Cormorant; Peregrine; Herring gull; Chough

Site code	Site name	Closest distance (km)			Summary of features
		Subsea wells & other subsea structures	Offshore pipelines	Offshore platforms	
004021	Old Head of Kinsale	34	25	46	**Article 4 Species:** Razorbill; Fulmar; Herring gull; Shag; Kittiwake; Guillemot
004191	Seven Heads	42	32	53	**Article 4 Species:** Chough
004156	Sheep's Head to Toe Head	65	65	84	**Article 4 Species:** Peregrine (*Falco peregrinus*); Chough
004124	Sovereign Islands	33	16	46	**Article 4 Species:** Cormorant
004027	Tramore Back Strand	104	87	103	**Article 4 Species:** Light-bellied brent goose; Golden plover; Grey plover; Lapwing; Dunlin; Black-tailed godwit; Bar-tailed godwit; Curlew; Wetland & Waterbirds

Figure 4.11: Special Areas of Conservation and Special Protection Areas

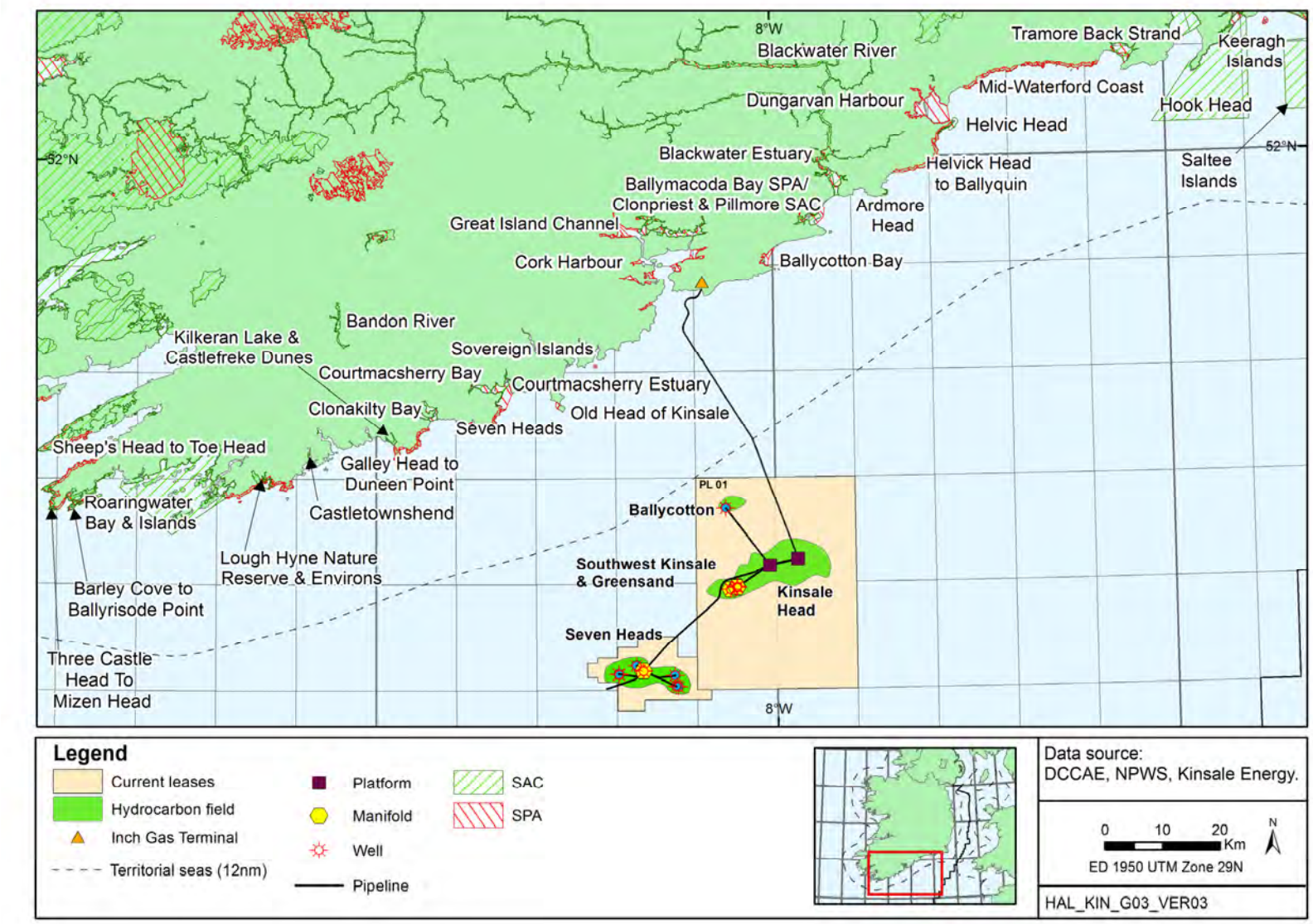
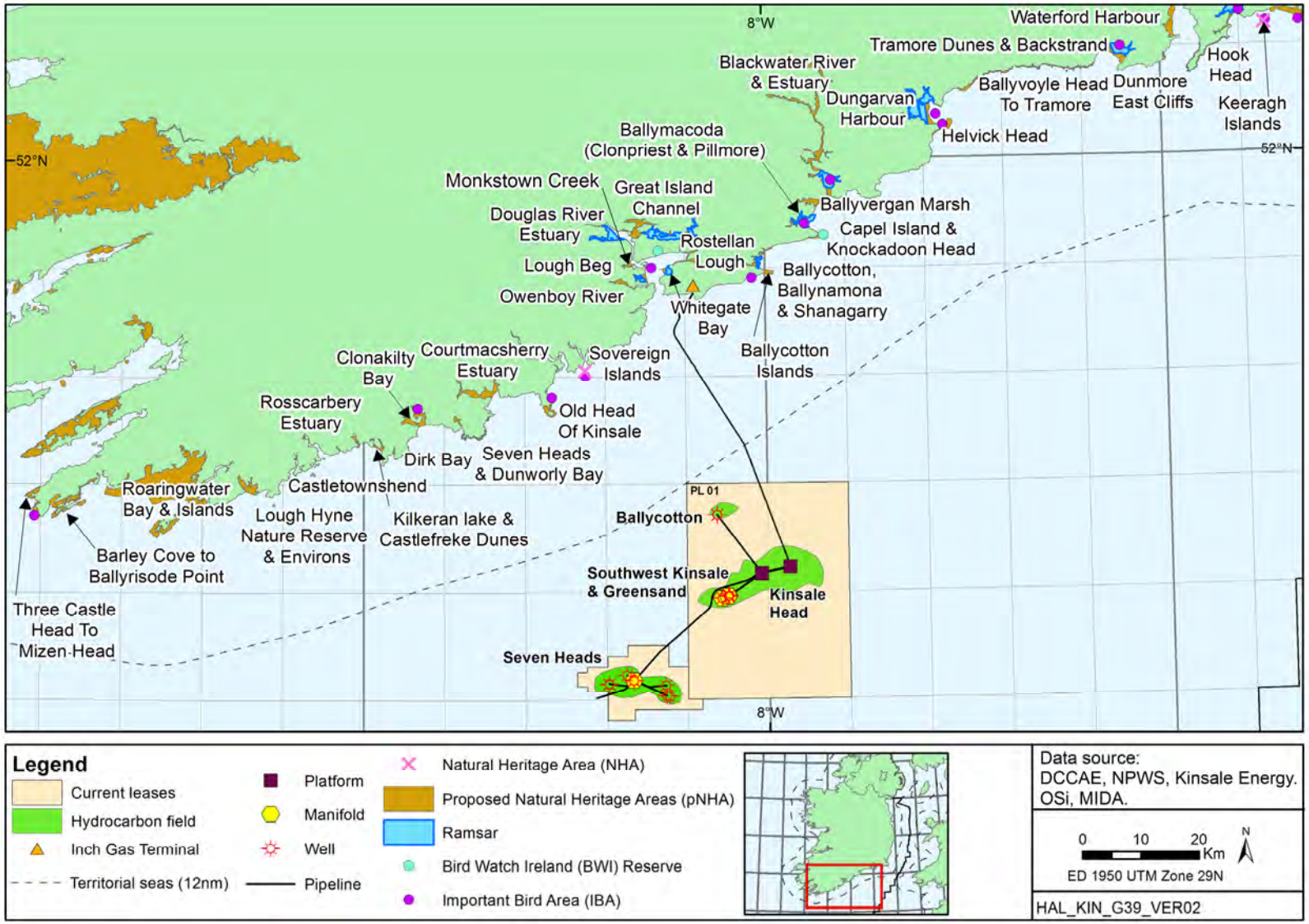


Figure 4.12: Other Conservation Sites



4.5 Other users of the sea

Other users of the sea are set out below. These have been assessed with reference to a wide range of information sources (referenced throughout) covering both the local area (e.g. Anatec 2017) and the wider Celtic Sea region (e.g. ABPmer & ICF International 2016, DCENR 2011, 2015). Following on from Harnessing Our Ocean Wealth: An Integrated Marine Plan for Ireland (Irish Government 2012), the objectives of marine planning and marine management of activities within the Celtic Sea, including relevant coexistence, will be documented in plans created under the European Union (Framework for Maritime Spatial Planning) Regulations 2016. The Regulations set out the basis for establishing marine spatial plans for Ireland on a 10 year cycle. Initially, a single plan covering all relevant areas of the Ireland's seas will be prepared, and regional plans may follow. The first plan is due to be finalised in 2020 and implemented thereafter[10].

4.5.1 Offshore Energy

No offshore wind farms are located within or in close proximity to the Kinsale Area, nor are any presently planned. The decommissioning activities will take place largely within the existing Kinsale Energy oil & gas licence areas and the infrastructure to be decommissioned represents the only oil and gas infrastructure in the area.

There are a number of standard exploration licence areas (e.g. EL1/11 and EL4/05) and licensing options (e.g. LO16/30) within oil & gas licensing quadrants 48 and 49 (**Figure 4.13**). Wells have been drilled in the exploration licence areas using semi-submersible rigs (i.e. involving anchoring and the drilling of surface holes with local seabed disturbance), and further exploration in these areas is possible.

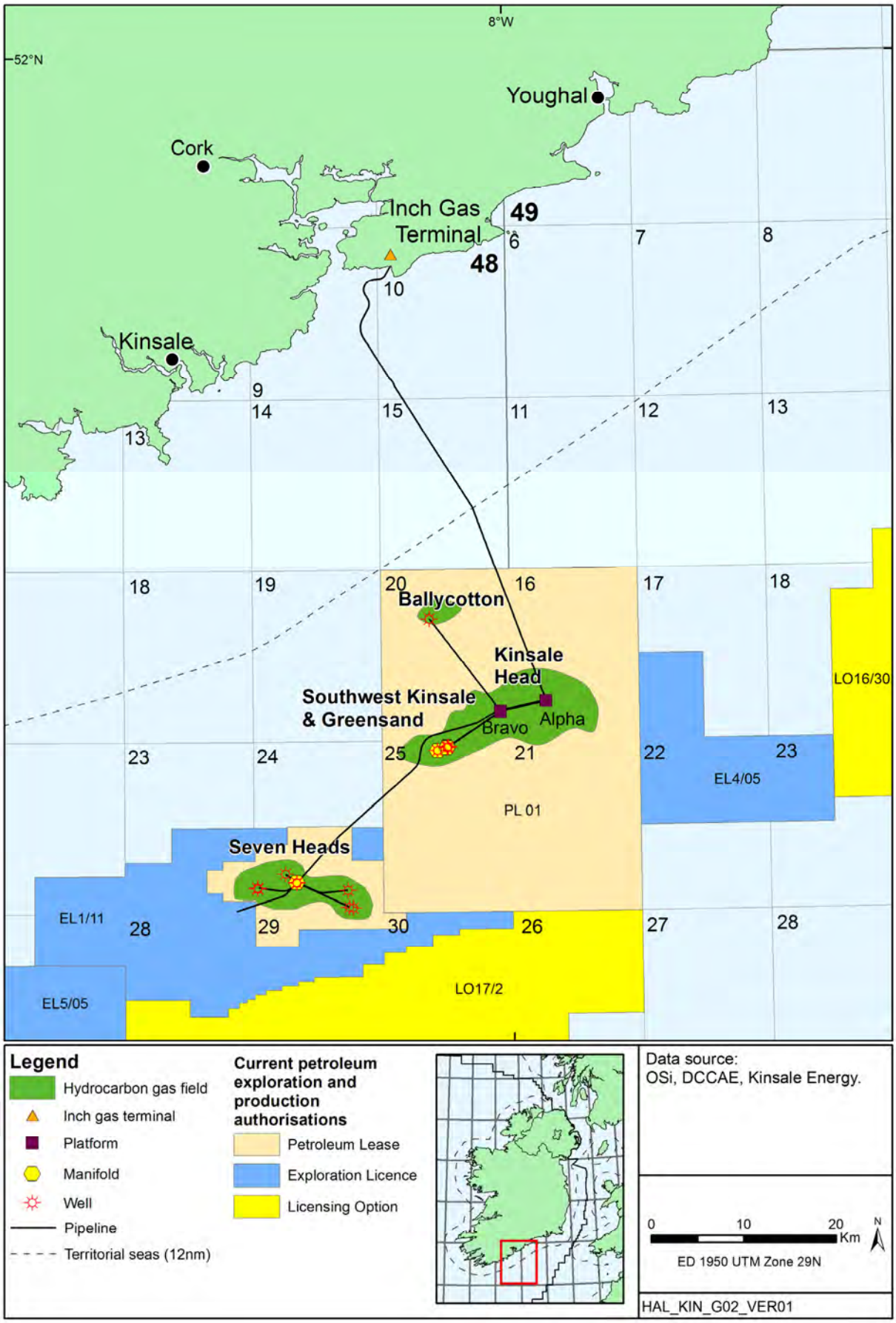
4.5.2 Ports and shipping

Ireland's shipping industry supports 7,200 jobs directly in port and maritime services, and sea-based transport accounts for 99% of all traded goods by weight (Irish Government 2012). A shipping study based on Automatic Identification System (AIS) data completed for IOSEA4 (DCENR 2011) indicated that up to 300-750 vessels per year were present in waters off the south coast of Ireland and in the vicinity of the Kinsale Area. 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 (DCENR 2011, 2015). These ports handled 9.7 and 1.5 million tonnes of goods in 2015 respectively, representing approximately 22% of goods handled by Irish ports. There were 1,174 and 437 vessel arrivals into Cork and Waterford in 2015 representing approximately 13% of Ireland's shipping by number and 9% by gross tonnage (CSO 2016). Planning permission was granted in 2015 for the redevelopment of port facilities at Ringaskiddy which are located within the wider Port of Cork area. This project recognises the strategic importance of Cork harbour and the need to maintain its competitiveness by accommodating increasingly larger vessels. Works proposed as part of the project include new container and multi-purpose berths (Ringaskiddy East), an extension to an existing deepwater berth which will include dredging works (Ringaskiddy West), road improvements, and also a public amenity area.

An anchorage area is present outside of Cork Harbour (see **Figure 4.15**) for vessels carrying hazardous cargoes, with an overall length greater than 110m to remain until they have permission to proceed to berth in the harbour (see Port of Cork Notice to Mariners No.1 of 2017[11]). Whilst not a formally charted anchorage, ships including tankers waiting to berth at Whitegate oil refinery set anchor in an area to the west of the export pipeline and generally to the north of Old Head of Kinsale. No International Maritime Organisation (IMO) routing measures are located in or close to the Kinsale Area.

[10] Towards a Marine Spatial Plan for Ireland: A Roadmap for the delivery of the national Marine Spatial Plan. http://www.housing.gov.ie/sites/default/files/publications/files/towards_a_marine_spatial_plan_for_ireland.pdf
[11] www.portofcork.ie/index.cfm/page/noticetomariners?twfId=1713&download=true

Figure 4.13: Current oil and gas licence and lease areas



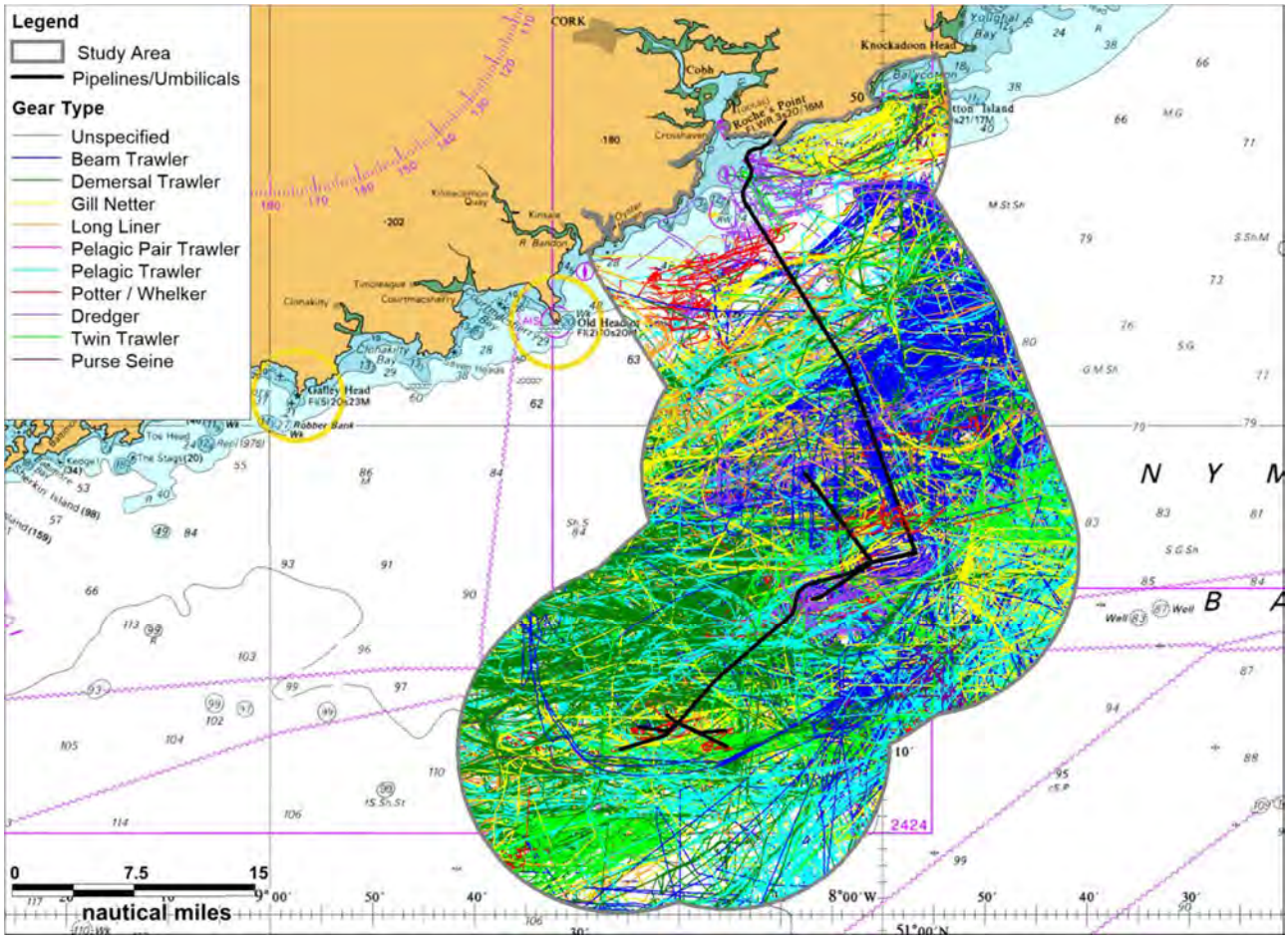
4.5.3 Commercial Fisheries

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 2016, the Irish fleet had access to 216,261 tonnes of fish at a potential value of €201 million (Marine Institute 2016). The largest ports near the Kinsale Area are Castletownbere and Dunmore East, which are both among the top four ports (by landings) in Ireland (with Castletownbere landing the greatest value of catch in Ireland in 2015) (SFPA website). Of the more local ports, the most significant are Cobh (3,848 tonnes landed at a value of €6.4 million in 2015), Union Hall (2,286 tonnes, €6.7 million) and Kinsale (1,615 tonnes, €3.2 million) (SFPA website).

The dominant fishing method in the area is demersal (otter) trawling, which is, in the waters around the Kinsale Area, mainly used to catch *Nephrops*, haddock and whiting (Gerritsen & Lordan 2014). Other gears in use in the area include pelagic trawls (predominantly targeting herring in the area), seine nets (targeting haddock and whiting) and set nets (targeting pollack and hake) (Gerritsen & Lordan 2014). Anatec (2017) conducted a survey of fishing activity within the Kinsale Area. A monthly count of fishing vessels over 2014 and 2015/16 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.

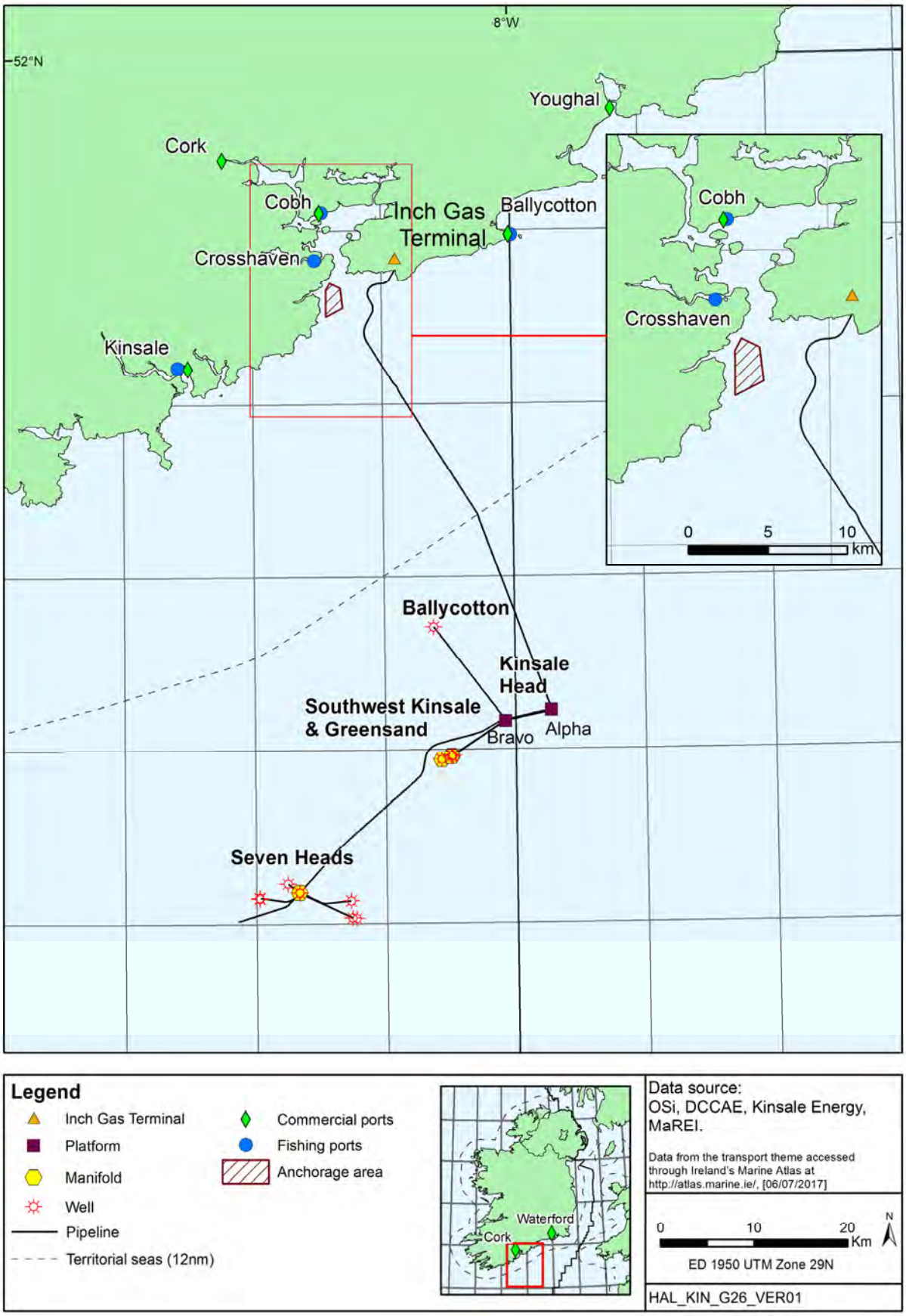
Vessels estimated to be actively fishing in the Kinsale Head area, colour-coded by gear-type, are presented in **Figure 4.14**, based on 18 months of AIS (Automatic Identification System) analysis. The majority of active fishing was from vessels with demersal gear (including single demersal trawlers, beam trawlers and dredger). On average there were approximately four demersal vessels per day actively fishing within the area highlighted on **Figure 4.14**.

Figure 4.14: Vessels estimated to be actively engaged in fishing (2014 & 2015/16)



Source: Anatec (2017)

Figure 4.15: Ports and anchorage areas in the Kinsale Area



The south coast of Ireland is of particular importance for smaller vessels (<15m), which tend to be local, fishing from, and landing at home ports. Between 2008 and 2012, the south coast of Ireland saw the highest catch rates of cod (with 20% of landings by vessels <15m), haddock (smaller vessels contribute 8% of landings), hake (smaller vessels contributed almost no landings) and herring (where smaller vessels operating inshore along the southern coast contributed 5% of landings). The southwest coast of Ireland was also of particular significance for ling, lemon sole, megrim, saithe, pollack, witch and whiting (Gerritsen & Lordan 2014). 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 4.6** lists the weight and value of landings from the Kinsale Area rectangles over the period 2014-2016.

Table 4.6: Weight and value of landings from ICES rectangles 31E1, 31E2 & 32E1, 2014-2016

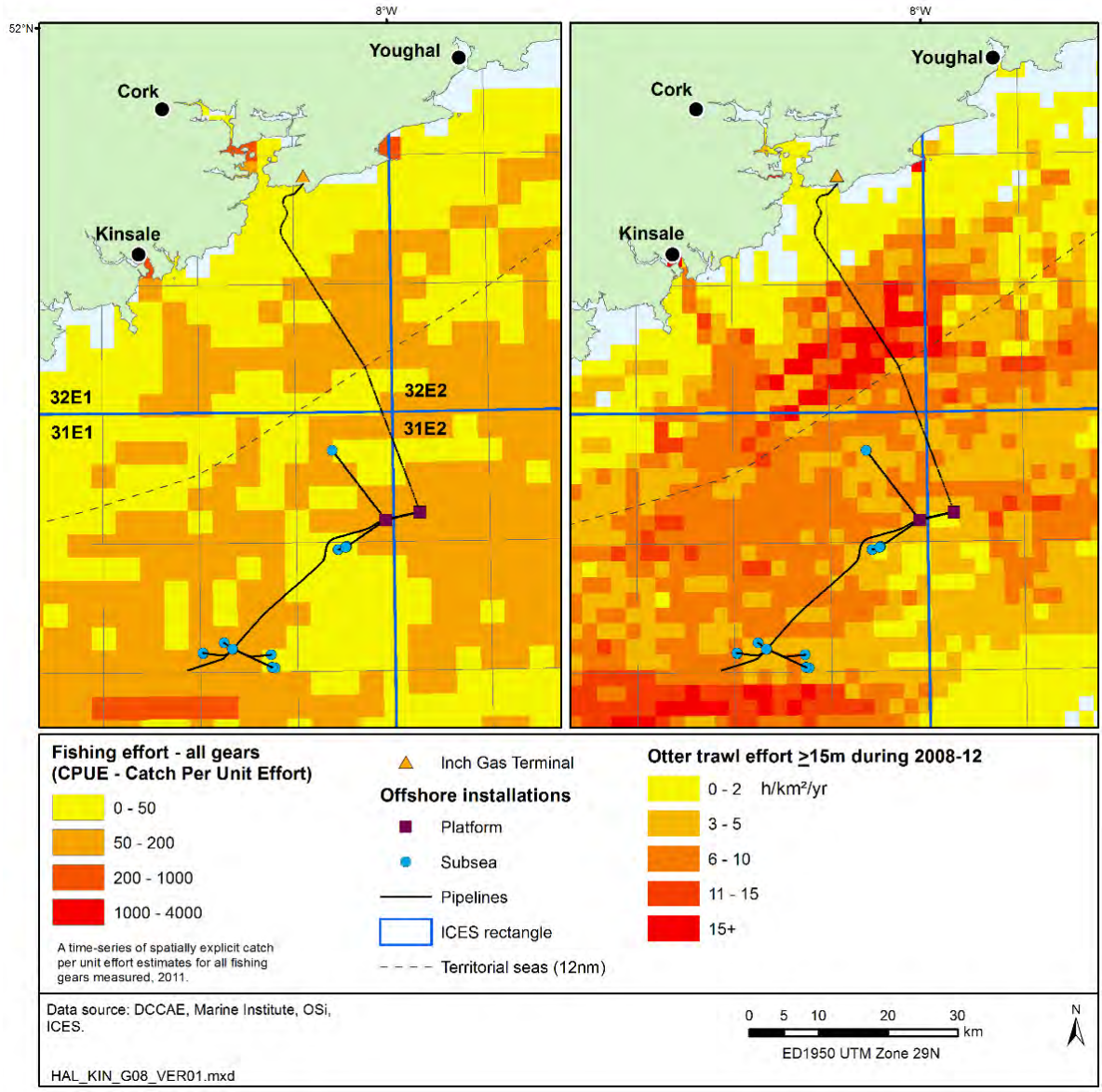
Species type	2014		2015		2016	
	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)	Live weight (tonnes)	Value (€)
31E1						
Pelagic	178	88,257	38	12,646	2	1,331
Demersal	1,407	3,127,042	1,993	4,429,025	2,244	4,866,119
Shellfish	103	705,903	128	878,350	172	1,185,287
Total	**1,689**	**3,921,201**	**2,159**	**5,320,021**	**2,418**	**6,052,738**
31E2						
Pelagic	5,458	1,779,804	1,706	558,566	84	27,951
Demersal	1,739	3,700,550	1,982	4,313,845	1,795	3,859,776
Shellfish	34	195,763	56	326,403	36	222,516
Total	**7,231**	**5,676,123**	**3,744**	**5,198,815**	**1,915**	**4,110,243**
32E1						
Pelagic	815	156,201	277	99,996	457	116,872
Demersal	511	1,152,666	325	785,269	368	817,341
Shellfish	138	950,196	130	890,759	134	875,031
Total	**1,463**	**2,259,063**	**732**	**1,776,024**	**959**	**1,809,244**
Grand Total	**10,383**	**11,856,387**	**6,636**	**12,294,859**	**5,291**	**11,972,224**

Source: Compiled from data supplied by Sea Fisheries Protection Authority (SFPA)

Over the period 2014-2016, reported landings from these rectangles were largely dominated by demersal fish species. Total landings have remained relatively similar across the three years, although there were very high catches of pelagic species (mostly herring) in ICES rectangle 31E2 in 2014 and 2015, a region where high abundances of herring and sprat are reported (O'Donnell *et al*. 2016). Lower total landings in 32E1 than in 31E1 and 31E2 may be attributed in part to the smaller available fishing area of this coastal rectangle (see **Figure 4.16**), as well as the predominance of smaller, inshore vessels in these areas. Pelagic fish are usually caught in large quantities, but at low value (a tonne of herring averages €326), while several demersal species and, particularly shellfish, attract high market values (cod may fetch €2,519/tonne, monkfish €3,326/tonne, *Nephrops* €6,920/tonne and lobster €13,781/tonne), and thus, with a slight increase in demersal landings over this period, the total value has remained very similar.

Figure 4.16 illustrates the fishing effort around the Kinsale Area. Clear areas of greater effort by otter trawl can be seen. These areas correlate with muddy sediments (**Figure 4.4**) where small but productive *Nephrops* grounds are located (Lordan *et al*. 2015, Marine Institute 2016).

Figure 4.16: Fishing effort (total and otter trawl) in the Kinsale Area, 2008-2012



The status of commercial fish and shellfish populations was considered in relation to MSFD Descriptor 3[12] 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 (2017) indicating that for 2017, 23% (17) of fish stocks were overfished and 39% (29) sustainably fished, with the remaining stocks (28) having an unknown status. Following ICES advice on the assessment of Good Environmental Status (GES) for Descriptor 3 for 2017 it was considered that 46% (16) of relevant stocks achieved GES. 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).

Aquaculture

Shellfish culture occurs within some sheltered inshore waters along the south coast of Ireland, along with a handful of small seaweed culture operations; aquaculture is more important off the west and southwest coasts.

[12] 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.

On the coastline adjacent to the Kinsale Area (**Figure 4.20**), these include oyster/clam farms in the estuaries of the rivers Bandon and Stick, Cork Harbour and Youghal Bay. Mussel culture also occurs within Cork Harbour towards the River Ballynacorra. No finfish culture takes place off the southern coast of Ireland.

4.5.4 Military activity

There are a number of military installations and firing ranges along the Irish coast, the largest of these include the naval headquarters and base at Haulbowline in Cork Harbour. Of relevance to the Kinsale Area is the Danger Area D13 which is a military firing range[13] (**Figure 4.17**). The UK air force danger area D064A to the south east of the Kinsale Area is for air combat training and high energy manoeuvres (**Figure 4.17**).

4.5.5 Subsea Cables

A number of cables traverse the Celtic Sea, many connecting Europe and the United States via the Atlantic (**Figure 4.17**). The Seven Heads pipeline and umbilical cross the active Hibernia Atlantic "D"[14] and the disused PTAT telecommunications cables. A separate Hibernia Express[15] cable crosses over the Seven Heads pipeline and umbilical to the south of these (**Figure 4.17**).

Additionally, there is a proposed 600km 320kV HVDC interconnector (the Celtic Interconnector) between Ireland and France. Feasibility studies indicate that the best performing option is for the interconnector to connect to North Brittany via East Cork, with 5 potential landfall locations in East Cork and a connection point at the existing Knockraha substation. If constructed, the interconnector could cross the Kinsale Area and with the Inch Beach landfall option described in the feasibility studies, could come close to the Kinsale gas export line landfall[16]. EirGrid applied to the Department of Housing, Planning, Community and Local Government in June 2017, and in January 2018, for Foreshore Licences to facilitate further marine investigations off the coast of east Cork, seaward of three potential landfalls (Ballinwilling Strand, Redbarn Beach and Claycastle Beach)[17]. This is in addition to previous marine surveys of other potential cable routes and landfalls at Ballinwilling Strand and Ballycroneen Beach[18]. A final decision to proceed with construction of the interconnector will happen in 2020/21 and if the project goes ahead, the interconnector would go live in 2025/26[19].

The Ireland France subsea cable (IFSC) is another subsea cable project, currently in the permitting stage, developing a fibre optic cable connecting Ireland and France[20]. A Foreshore Licence application was made in April 2017 for seabed surveys to be undertaken from Ringaskiddy, Co. Cork to the 12nm limit[21]. If the project goes ahead, the current proposals are to have the cable in-service in summer 2019.

4.5.6 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 (Sutton 2008).

[13] From ENR 5.1 Prohibited, restricted and danger areas of the Integrated Aeronautical Information Package - http://iaip.iaa.ie/iaip/IAIP_Frame_CD.htm
[14] http://www.hiberniaatlantic.com/pdf/hibernia_Brochure.pdf
[15] https://www.hibernianetworks.com/wp-content/uploads/2016/10/Express-data-sheet-May-2016-1.pdf
[16] http://www.eirgridgroup.com/site-files/library/EirGrid/194034-EirGrid-Celtic-Interconnector-Booklet.pdf
[17] http://www.housing.gov.ie/planning/foreshore/applications/eirgrid-plc-ballinwilling-strand-redbarn-beach-and-claycastle-beach
[18] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Foreshore/ApplicationsandDeterminations/EirgridPLC-Cork/ApplicationForm/FileDownLoad%2C38003%2Cen.pdf
[19] http://www.eirgridgroup.com/the-grid/projects/celtic-interconnector/whats-happening-now/
[20] https://www.ifc-1.com/
[21] http://www.housing.gov.ie/planning/foreshore/applications/ireland-france-subsea-cable-ltd

4.5.7 Marine disposal

The EPA dumping at sea register[22] indicates that permits have been granted for the disposal of up to 1.8 million tonnes of dredged material from Ringaskiddy, Cork Port as well as the Haulbowline Naval Base to the Roche's Point disposal site (marked active in **Figure 4.17**) covering the period up to approximately 2021. This disposal site is approximately 5km to the east of the 24" export pipeline with no potential interaction with decommissioning activities.

4.5.8 Recreation and tourism

The coastal landscape of Ireland supports well-kept beaches, rugged cliffs, picturesque harbours and an abundance of wildlife. These natural and developed features possess significant amenity and recreational value for the local residents in addition to major opportunities for domestic and international tourism. In a review of water-based activities in Ireland, the Marine Institute (2006) identified the most popular water-based leisure activities, relating to coastal and sea areas, as beaches, diving, marinas and sailing/boating/water sports centres, sea angling, coastal walking, whale and dolphin watching and marine-themed visitor centres (DCENR 2011).

Marine-based tourism and leisure is a large contributor to the Irish ocean economy and has historically been an important sector for the Irish coastal economy (Vega *et al.* 2015). The tourism industry contributed an estimated €7.5 billion in 2015 to the Irish economy (Fáilte Ireland 2016). Fáilte Ireland estimates that marine tourism accounts for 10% of the overall value of the tourism sector in Ireland[23] (see Vega *et al*. 2015).

With respect to the Kinsale Area, the most relevant activities are 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.

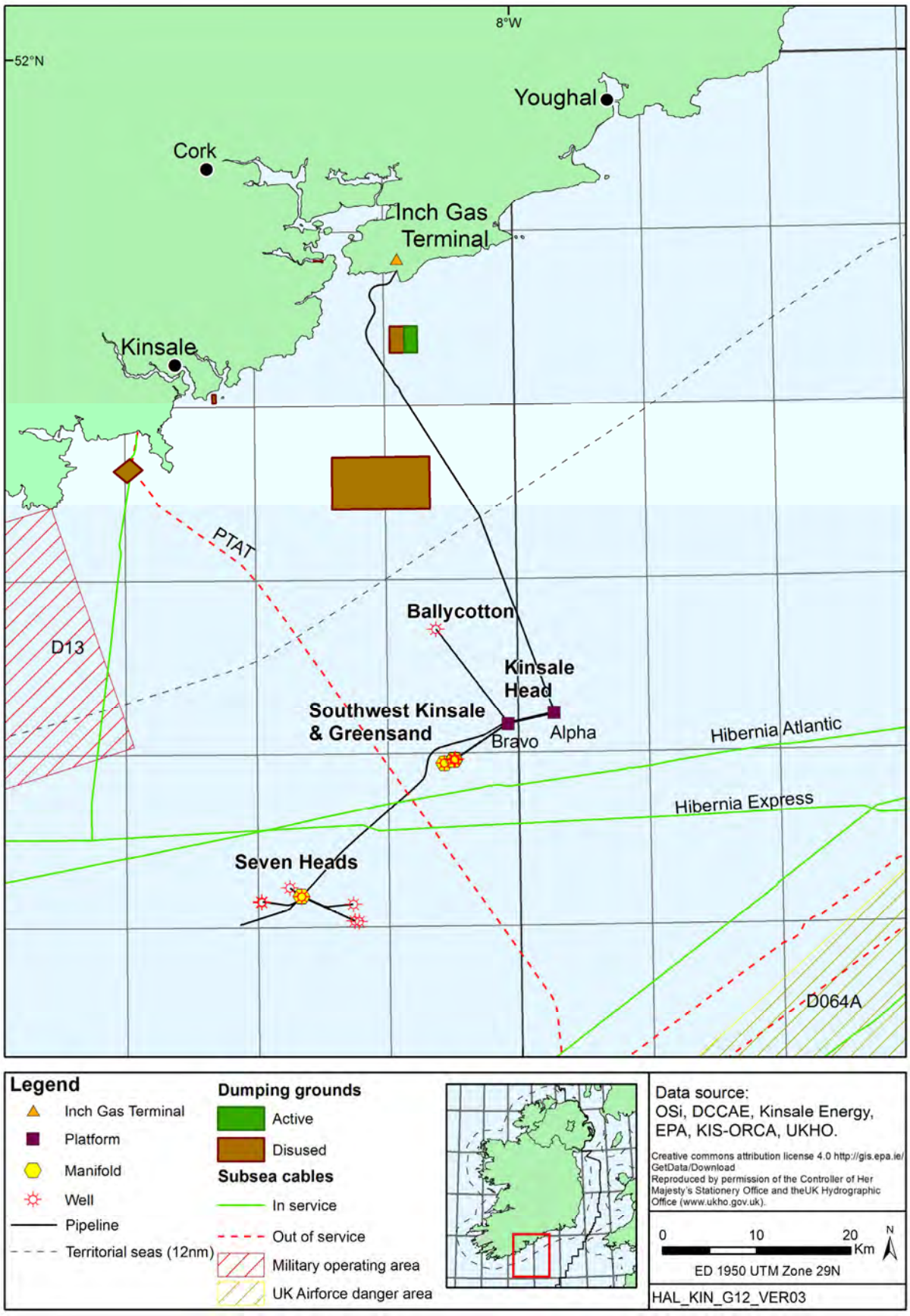
An online review of sea angling charter operators in the region (see Ramboll 2017a, b) indicated that most offered half-day to one-day trips (i.e. angling, wreck, reef and shark angling) and were generally licensed to operate within a 30 nautical mile (56km) radius of the harbour, with only a few companies 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[24].

Sailing is a major coastal activity in the south of Ireland (DCENR 2011). The Irish Sailing Association indicates that there are a number of sailing clubs and centres associated with Cork Harbour (6) and the Kinsale (4) region[25] with the number of moorings within the Cork Harbour area in 2009 estimated at just over 1,000 with another 1,000 berths proposed (The Port of Cork Company 2009). 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.

Whale, dolphin and seal watching tours are also available in Kinsale and the wider County Cork area, however the trip duration tends to be limited to three to four hours and they tend to run along the coast (Ramboll 2017a, b).

[22] http://www.epa.ie/pubs/forms/lic/das/dumpingatsearegister.html
[23] Fáilte Ireland estimates for marine tourism in Ireland, 2011-2020, using the wide definition of marine tourism, which refers to marine and coastal tourism water based activities as well as the activities and services adjacent to the coastline
[24] http://www.fishinginireland.info/sea/index.htm
[25] https://www.sailing.ie/map/?clubs

Figure 4.17: Telecommunication cables, military activity areas and dumping sites



4.6 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 as was the case with the wreck of the *RMS Lusitania* lost off the Old Head of Kinsale in 1915 and located over 20km to the west of the Ballycotton field. UHOs can also be used to designate areas of seabed to more clearly define and protect wreck sites and archaeological objects[26].

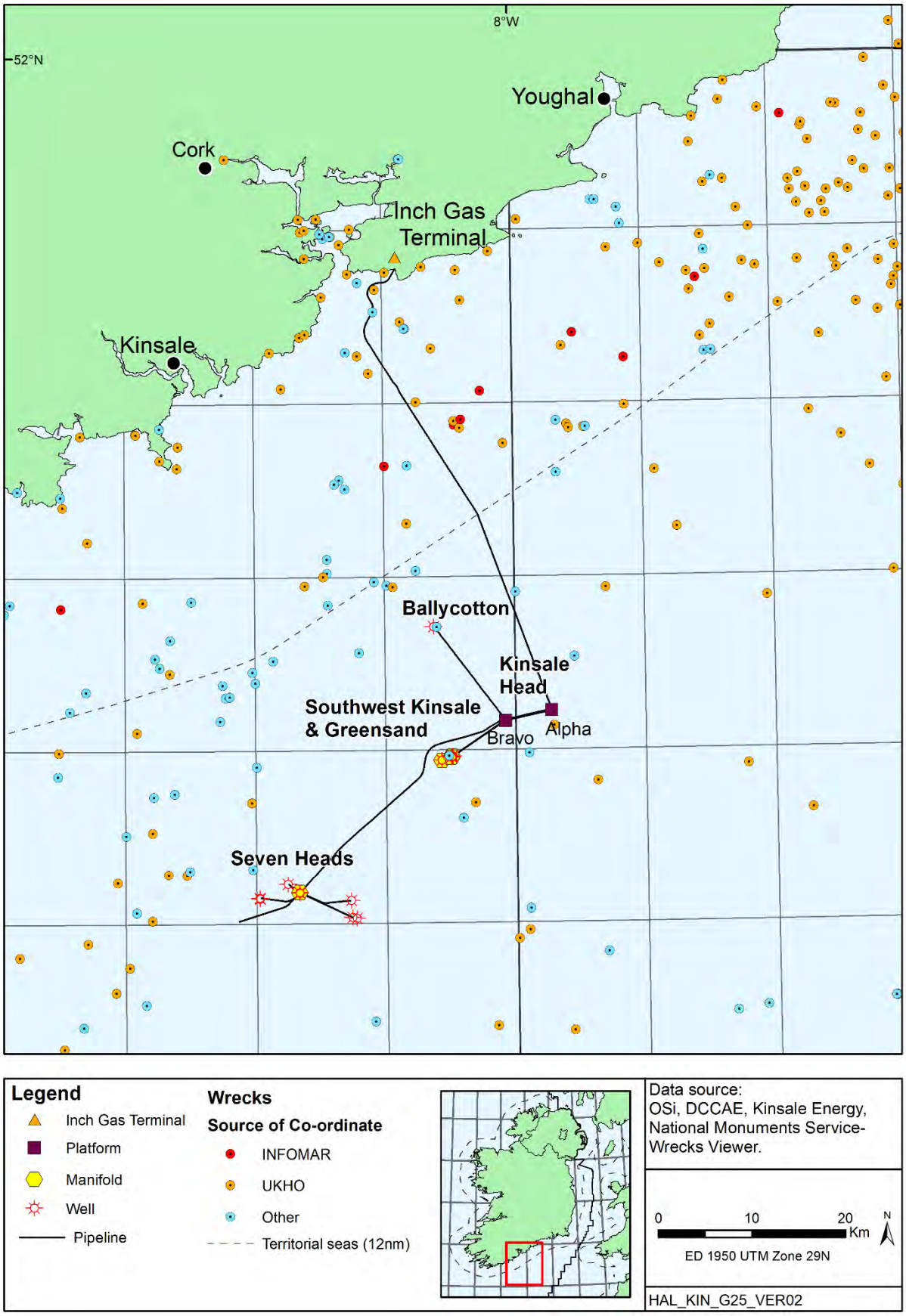
A number of ship wrecks are known in the area, particularly in coastal waters and at the mouth of Cork Harbour, including two sunken U-boats (UC42 and U-58) which were highlighted by the INtegrated Mapping FOr the Sustainable Development of Ireland's MArine Resource (INFOMAR) (http://infomar.ie/) survey (Figure 4.18). The closest of these wrecks is UC42 which is designated by UHO and located within 200m of the export pipeline to the Inch Terminal and 5.5km south east of Roches Point[27]. The shipwreck of the Elizabeth Jane, sunk in 1916, is also noted to be located approximately 560m from the export pipeline (Ramboll, 2017b). Additionally, a number of other charted shipwrecks are located throughout the wider Celtic Sea area, as are a number of other wrecks, the positions of which are approximate[28]. No prehistoric or archaeological remains are known in the immediate vicinity of the Kinsale Area infrastructure.

The Kinsale Area Decommissioning Project (KADP) involves the decommissioning of the existing Kinsale area installations and does not involve the addition of any new facilities to the already developed footprint of the various sites. All of the facilities, which were installed between 1977 and 2003, were approved and permitted under the Petroleum and other Minerals Development Act 1960 and were subject to the appropriate assessment at the time of construction. As part of the installation planning and construction works, and as part of ongoing field inspection activities, the seabed of the fields and pipeline routes has been the subject of several previous geophysical investigations using side scan sonar, sub-bottom profiler, swathe bathymetry and magnetometer. These surveys were targeted at identifying surface and subsurface features of relevance to drilling rig location, pipelaying and other subsea facility installation. Shipwrecks and other features of note would have been expected to be identified during the interpretation of survey results. A list of all previous offshore surveys and development plan submissions is contained in **Appendix B2**. Given the shallow depth of sediments overlying bedrock over much of the KADP site, evidence from existing extensive seabed mapping and other investigations of the seabed carried out during previous developments, it is not regarded that there is any significant potential for archaeological remains. Proposed offshore activities resulting in seabed disturbance will take place within areas of previous installation and construction works.

The Pleistocene period (2.58 million-11,700 years before present, BP) was characterised by successive glacial and interglacial periods. During glacial periods, sea levels were substantially lower than in interglacial periods (like the present day) due to the amount of water from the world's oceans being held as ice in terrestrial environments (Fairbanks 1989, Long & Roberts 1997, Long et al. 2004, Brooks et al. 2011). The Celtic Sea would have been largely beneath the British and Irish Ice Sheet (BIIS) during the last glacial maximum, but following ice retreat, which began approximately 20,000 years ago, a low-lying and intermittent sub-aerial exposure of the Celtic Sea between Britain and Ireland would have taken place (Brooks *et al.* 2011), existing until approximately 15,000 years ago (Brooks *et al.* 2011, Montgomery *et al.* 2014). This exposure would not have formed a land-bridge, with the coast unlikely to have been more than 30km from its present position (Brooks *et al.* 2011) making the precise route by which people reached Ireland obscure (Westley & Edwards 2017). Exposed areas are likely to have been only a few metres above its contemporary sea level and would have been flooded quickly by glacial meltwater (Lambeck & Purcell 2001, Brooks *et al.* 2011). Therefore the age and location of potential finds are therefore likely limited to those of Palaeolithic and later by the extent of the BIIS during the last glacial maximum (however the potential for earlier finds should not be entirely discounted, see Flemming *et al*. 2012), and by the high energy conditions in the area (Westley & Edwards 2017). This suggests that there is limited scope for prehistoric submerged archaeology to be present in the Kinsale Area.

[26] https://www.archaeology.ie/underwater-archaeology
[27] http://www.infomar.ie/data/Shipwrecks/Box37/pdfs/UC42_Final.pdf
[28] https://www.archaeology.ie/underwater-archaeology/wreck-viewer

Figure 4.18: Shipwrecks relevant to the Kinsale Area and vicinity



4.7 Land and seascape

The Cork County Draft Landscape Strategy (2007) identified three landscape character types of relevance to the coast adjacent to the Kinsale Area (**Figure 4.19**), all of very high landscape value and sensitivity.

Landscape character type 1: City harbour and estuary. The landscape of Cork city and harbour area comprises a mix of rural and intensely urban areas, combined with a large expansive harbour. To the south of the city, the western side of the harbour supports major industrial development, while on higher ground telecommunication masts or water storage towers punctuate the skyline. The rural areas around much of the greater harbour area are now characterised by a prevalence of infrastructure such as roads, bridges and electricity power lines and some urban sprawl. Population increase is associated with this landscape type and this has been especially true in Metropolitan Cork, a central hub for employment, entertainment, education and retail.

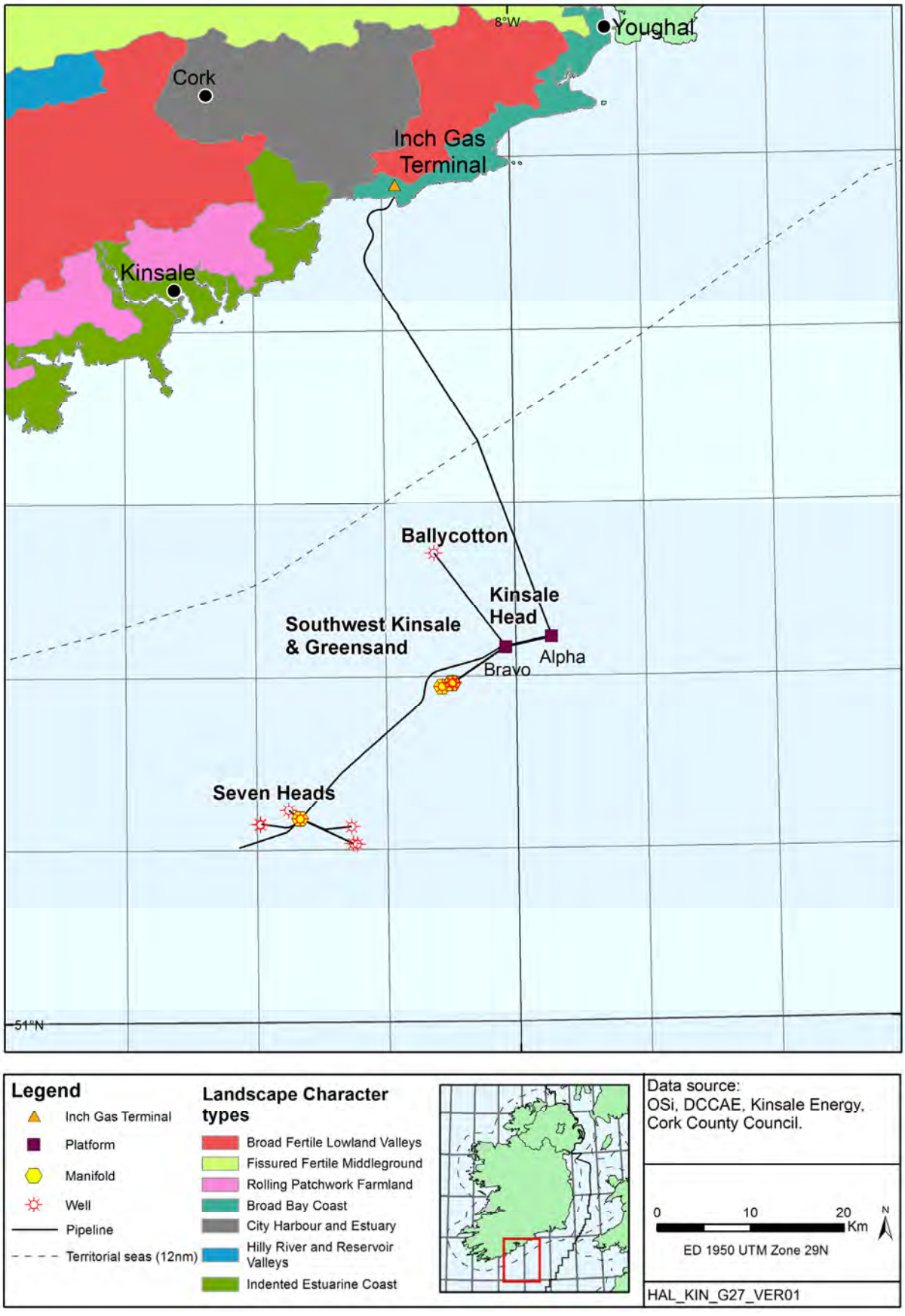
Landscape character type 2: Broad bay coast. This landscape type stretches along the coast from the mouth of Cork Harbour in the west to the eastern boundary of County Cork at Youghal. The coastline sweeps in broad bays flanked by low promontories, terminating along the shore with low cliffs, and a combination of rocky shores and long crescent shaped bays, such as Ballycotton Bay and Youghal Bay. The tourist industry has long been associated with this landscape due to the natural beauty and plentiful supply of beaches and there is pressure on the landscape from tourist related development including caravan parks, hotels and holiday homes.

Landscape character type 3: Indented estuarine coast. This landscape type stretches from Baltimore in the west to the mouth of Cork Harbour, in the east. It comprises gently undulating topography incised by shallow river estuaries or 'drowned' valleys formed by glacial activity. The coastline is punctuated by a series of these promontories, such as Old Head of Kinsale, Seven Heads, Galley Head and Toe Head, which recede to bays, such as Kinsale Harbour. While many of the areas along this landscape type are remote, the presence of a viable tourist industry has sustained and steadily increased the population.

A seascape assessment as part of the Strategic Environmental Assessment (SEA) of the Offshore Renewable Energy Development Plan in the Republic of Ireland (AECOM & Metoc 2010), reviewed landscape character types in the context of their relationship with coastline and sea to formulate seascape types with shared dominant characteristics. The seascape type proposed for the relevant coastal area between Toe Head and Crosshaven, County Cork is described below.

Seascape type 4: Low-lying coastal plain and coastal estuarine landscape, low lying islands and peninsulas. The seascape is diverse and changeable, ranging from large to medium scale. The seascape is exceptionally flat and often exposed with generally wide, open views extending far out to sea, often with a high degree of intervisibility between sea and land.

Figure 4.19: Landscape types of relevance to the Kinsale Area



4.8 Population and human health

The World Health Organization definition of health is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” (http://www.who.int/about/mission/en/). A health outcome is a change in the health status of an individual, group or population which is attributable to a planned activity, and determinants of health are the range of personal, social, economic and environmental factors which determine the health status of individuals or populations. The offshore elements of the KADP are not visible or audible from land, and do not entail the use of hazardous or noxious materials (those e.g. present in topsides structures are subject to strict identification, handling and disposal requirements, see **Section 7.7**).

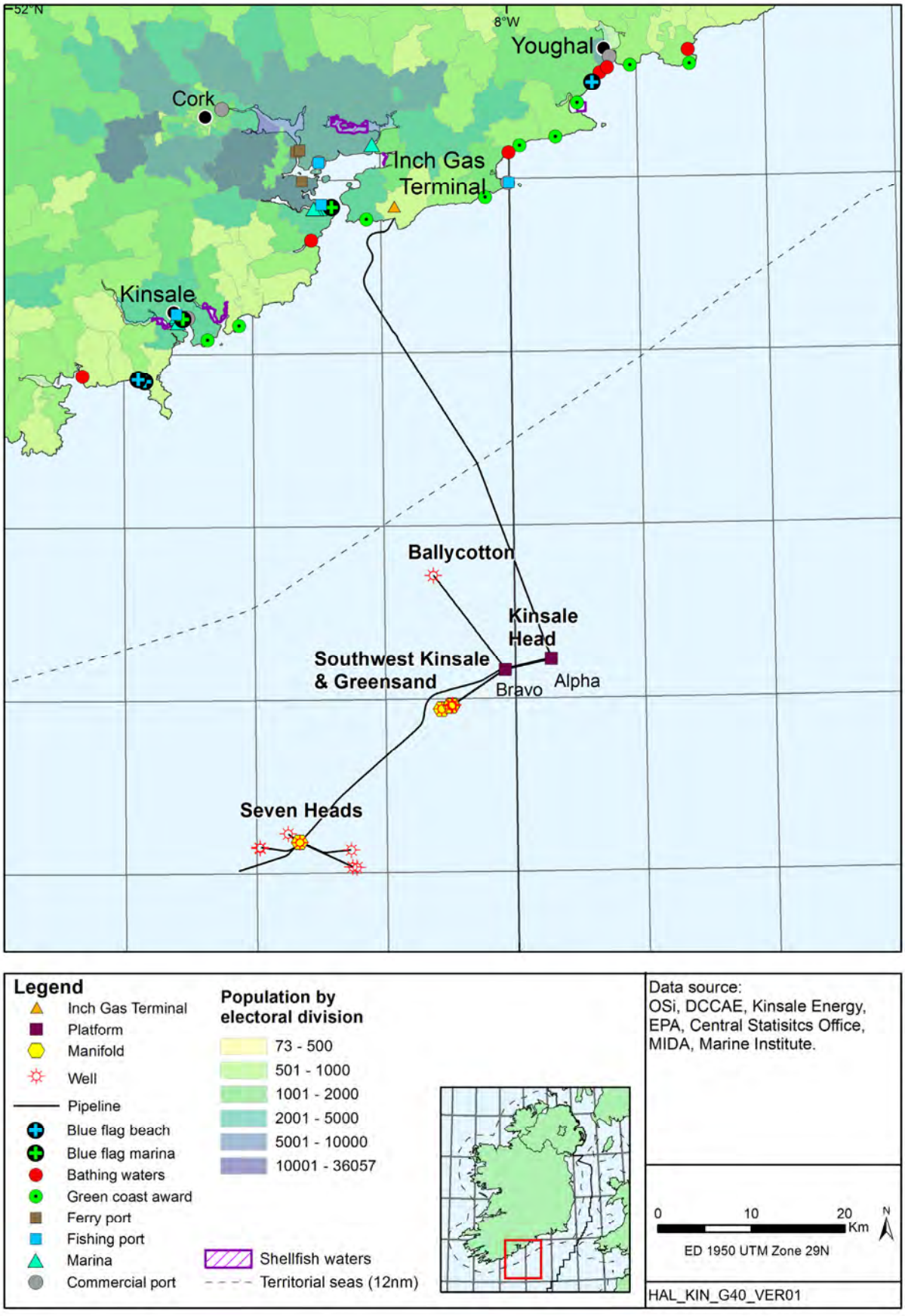
Preliminary results for the 2016 Census estimated a population of 542,196 for Cork County as a whole, a 4.5% increase on the 2011 Census figure. Excluding Cork city (population of 125,622), the 2016 population of the county area was estimated at 416,574, an increase of 4.2% on the 2011 Census figure (http://www.cso.ie/en/releasesandpublications/ep/p-cpr/censusofpopulation2016-preliminaryresults/copc/). In general, the coast adjacent to the Kinsale Area is rural and of low population density (**Figure 4.20**). Refer to **Section 5.10** for further details on population and human health in the vicinity of the Kinsale Area.

In terms of relevant aspects of human health, Section 4.2 indicated that air quality metrics for 2015 (e.g. NO_2, particulates) for rural coastal areas (zone D) and Cork city (zone B) were within EU limit values (O’Dwyer 2016) and are therefore unlikely to represent a significant health risk.

The ecological status of the western Celtic Sea waterbody covering surface waters along much of the Cork coast was described as high for 2010-2012 (EPA 2015c). Other relevant coastal waterbodies were of good (e.g. Kinsale Harbour, Outer Cork Harbour) or moderate (Courtmacsherry Bay, Clonakilty Bay) ecological status (EPA 2015c). The water quality status of identified bathing waters (**Figure 4.20**) adjacent to the Kinsale Area in 2015 was generally described as sufficient (e.g. Coolmaine, Fountainstown), good (e.g. Garretstown) or excellent (e.g. Garrylucas White Strand), with only Youghal Front Strand Beach described as poor (EPA 2016). Blue Flag beaches in the area include Garretstown, Garrylucas and Redbarn (**Figure 4.20**).

Relevant shellfish production areas (**Figure 4.20**) are for oysters and mussels and have a B classification (http://www.sfpa.ie/Seafood-Safety/Shellfish/Classified-Areas) implying that shellfish should undergo purification in a class A area before being placed on the market or be cooked by an approved method (SFPA 2017).

Figure 4:20: Population of electoral districts (2011), blue flag beaches and shellfish waters



KINSALE ENERGY

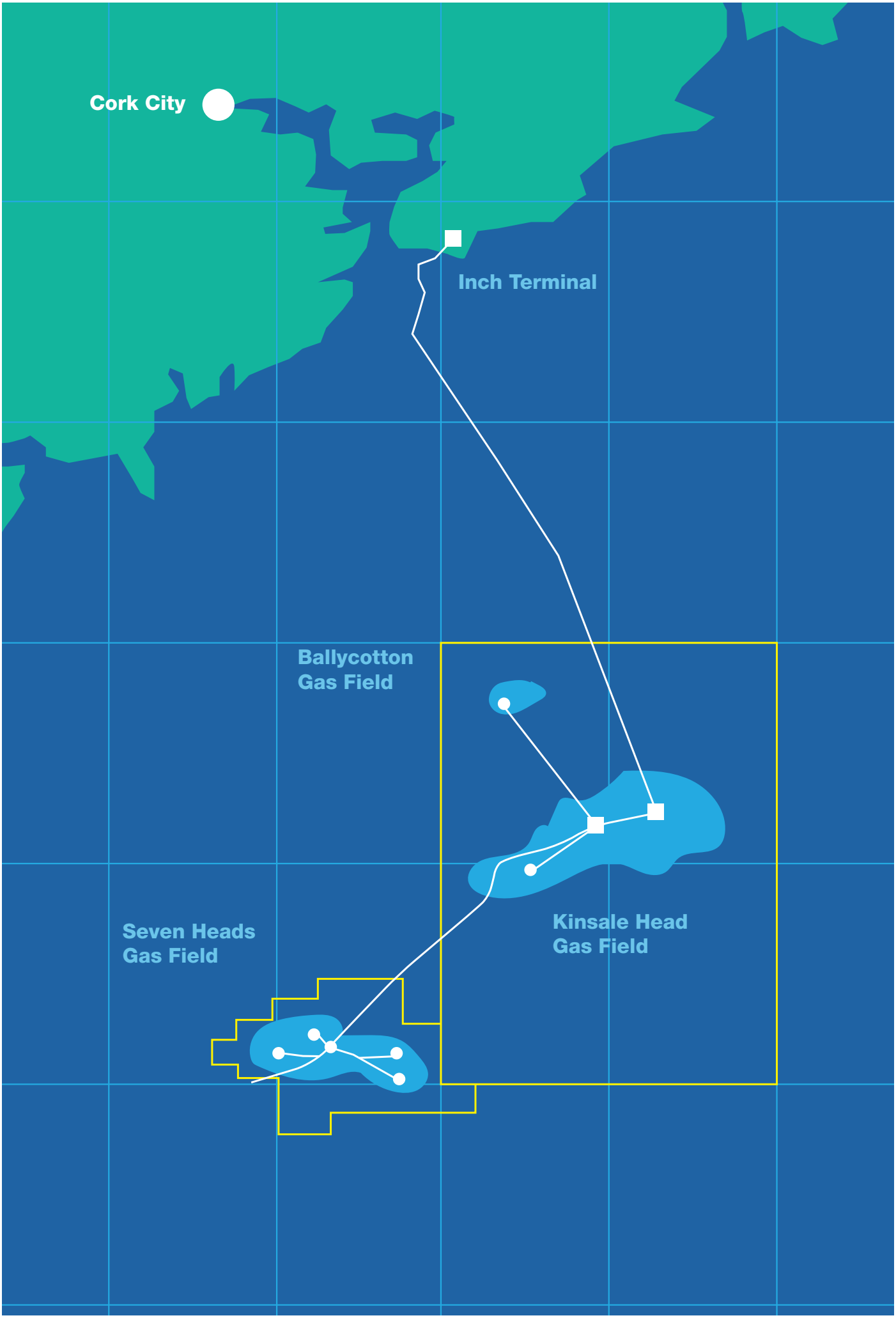
Kinsale Area Decommissioning Project

Section 5

Characteristics of the Terrestrial Environment

Hartley Anderson

ARUP


Cork City
Inch Terminal
Ballycotton
Gas Field
Kinsale Head
Gas Field
Seven Heads
Gas Field

5 Characteristics of the Terrestrial Environment

While most of the project comprises works in the marine environment, the KADP also includes elements of decommissioning work onshore at Inch terminal. This section describes the characteristics of the terrestrial environment in the vicinity of the proposed works.

5.1 Location

The Inch terminal is located at Inch, Co. Cork. Inch is a small townland located in the East Cork Municipal District, approximately 4.3km southeast of the village of Whitegate and 22km southeast of Cork city centre. The location of the Inch Terminal site is shown in **Figure 5.1 and Figure 5.2**. An aerial photo illustrating the extent of the on-shore study area is outlined in **Figure 3.9.**

Figure 5.1: Site Location (Site indicated with red place mark. Source: www.osi.ie)

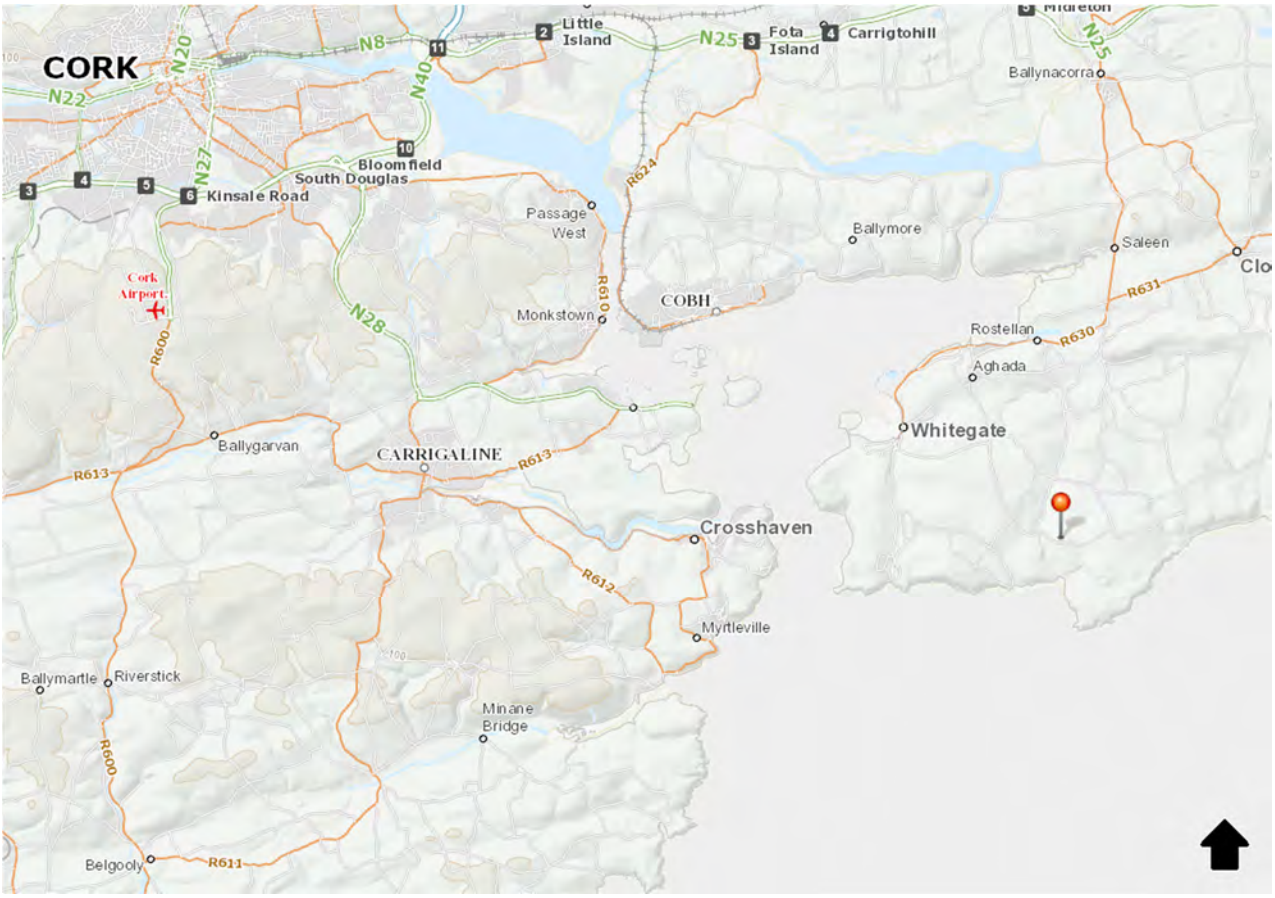
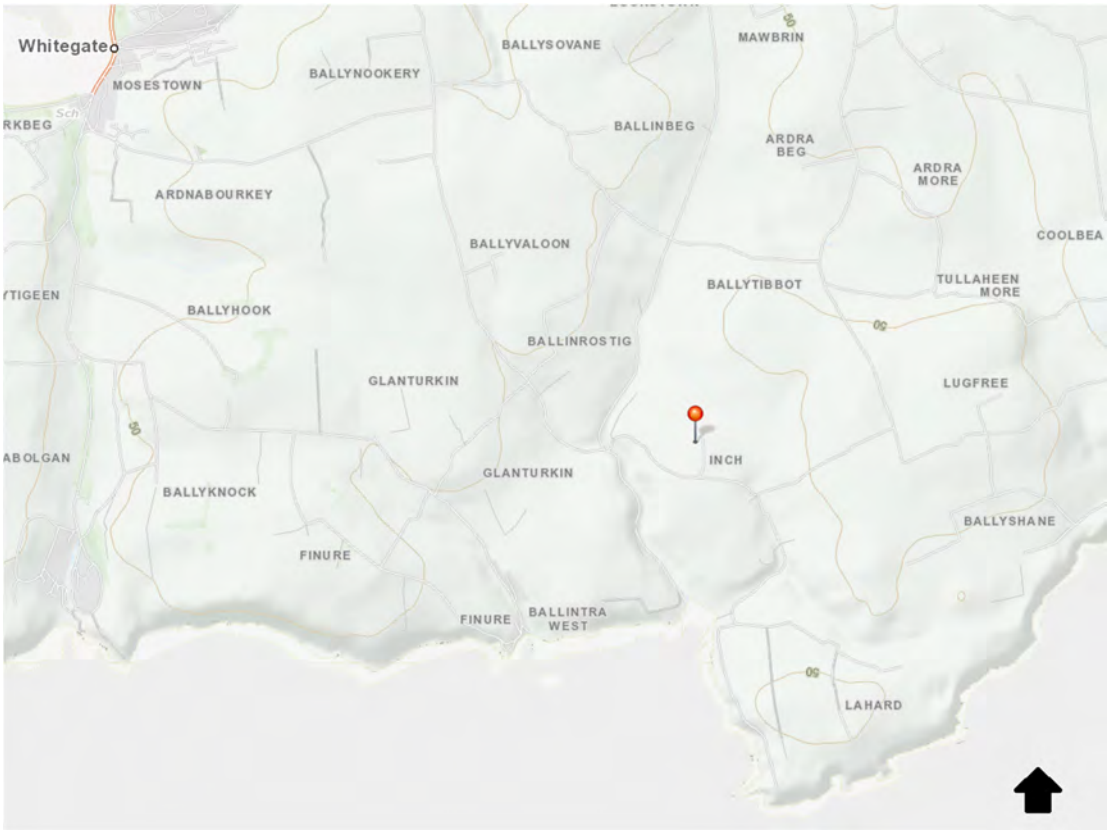


Figure 5.2: Site Location (Site indicted with red place mark. Source: www.osi.ie)



5.2 Material assets

This section provides an overview of the existing material assets at the Inch Terminal site.

As outlined in Section 3.2.6 and Table 3.7, the Inch terminal site includes a number of buildings, onshore gas terminal equipment, as well as supporting infrastructure including a main access road, internal access roads, a communications tower, an unused helipad, a groundwater well, in addition to a vent stack, tanks and drainage infrastructure.

Inch Terminal is serviced with three-phase mains (ESB) supply to its main electrical distribution board. The main distribution board supplies the terminal with 415VAC, 3 Phase, 50 Hz. In the event of a failure of the ESB mains supply the terminal is fitted with a 35 kvA emergency diesel electrical generator.

An EIR telecommunications cable connects to the terminal facility. The electrical and telecommunications supply will be disconnected prior to mobilisation of the demolition contractor.

Potable water is provided to the terminal from the on site groundwater well, which is also used for firewater. This water supply will be plugged and capped as part of the demolition scope of works.

5.3 Land and Soils

This section provides an overview of the existing soils and sub-soils, bedrock geology, geological heritage and other land uses at the Inch Terminal site.

5.3.1 Soils and Sub-Soils

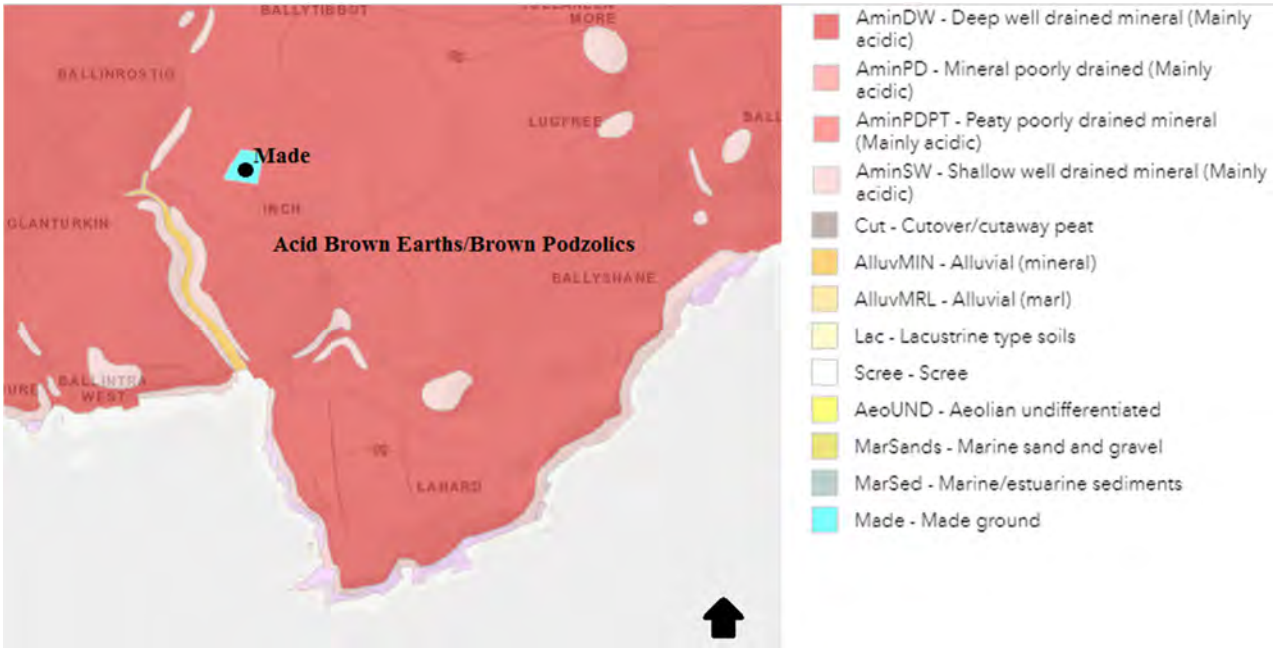
According to the Teagasc soils map, EPA (2009), Made Ground dominates the Inch Terminal site, which is consistent with the presence of the terminal at this location.

Other subsoils in the region which are likely to underlie the made ground, include Acid Brown Earths/ Brown Podzolics.

Most Acid-Brown Earth soils occur on lime-deficient parent materials and are therefore acidic in nature, relatively mature and well drained. Brown Podzolics are usually formed from calcareous parent material which counteracts the effects of leaching and can be light to heavy textured.

This soil type generally provides a mix of productive and moderately productive soils enabling grassland and crop production with the main agricultural use being grassland and cereal crops. Refer to **Figure 5.3** for details of the underlying soils at the Inch terminal site.

Figure 5.3: Soils Map (Site indicated as black dot. Source: Geological Survey of Ireland (2017))



5.3.2 Bedrock Geology

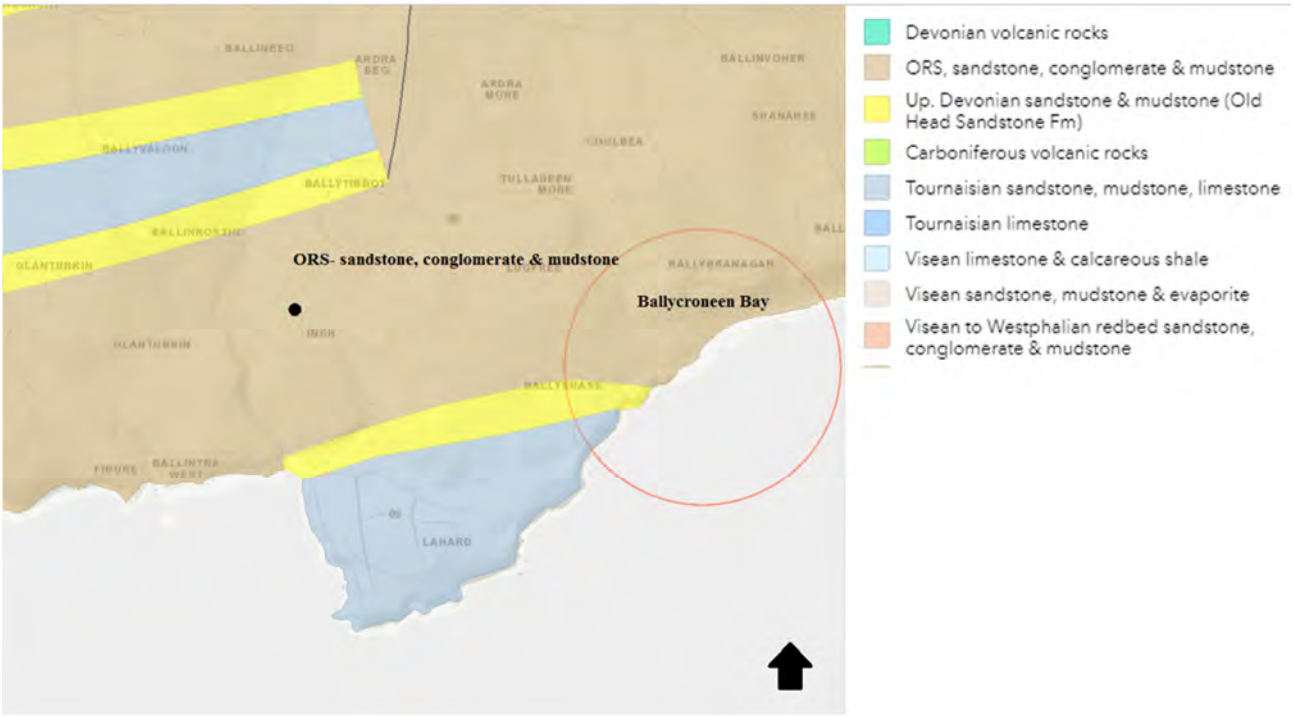
The study area is underlain by Old Red Sandstone, which is comprised of sandstone, conglomerate & mudstone. Refer to **Figure 5.4** for details of the underlying bedrock geology.

Old Red Sandstones, which constitutes the oldest rock of this district, consist of alternating bands of sandy and clayey composition, of which the prevalent tints are various shades of dull red, brown and green.

The Old Red Sandstone Formation stretches over the greater part of County Cork, where it forms the Magillicuddy Reeks and the mountainous tracts of the Iveragh promontory in County Kerry. It also forms the hilly ground lying between Kenmare River and Bantry Bay, and the minor promontories, which in Cork extend south-westward into the Atlantic.

The Formation is usually described in two divisions, namely Lower and Upper Old Red Sandstone. The reason for the distinction is not obvious in the County of Cork however, as throughout the county the rocks form a continuous series which passes up by regular sequence into the strata of the Carboniferous system.

Figure 5.4: Bedrock Geology Map (Site indicated as black dot, source: Geological Survey of Ireland (2017))



5.3.3 Geological Heritage

There are 143 sites of geological heritage interest in County Cork which are afforded protection under the County Development Plan. Some of these sites are also designated as Natural Heritage Areas under national legislation.

There are no geological heritage sites located within the study area. The closest geological heritage site is located approximately 2km to the east - Ballycroneen Bay. Refer to **Figure 5.4.** Ballycroneen Bay is designated for its widely occurring till deposited by the Irish Sea glacier.

5.3.4 Other Uses of the Land

Land use in the area surrounding the Inch Terminal site comprises a variety of uses, as illustrated in **Figure 5.5**. The site is located in a rural area of large farms in pasture and tillage, with dispersed farms and dwellings.

The CORINE Land Cover (CLC) inventory is a Pan-European landuse and landcover mapping programme. It supplies spatial data on the state of the European environmental landscape and how it is changing over time. CORINE Land Cover mapping classifies land cover under various headings. Land use in the vicinity of the Inch Terminal site is illustrated on **Figure 5.6.** According to the CORINE inventory, the main land-use in the study area is ‘pastures’ and ‘non-irrigated land.’

The tourist industry has long been associated with the study area due to the natural beauty and plentiful supply of beaches associated with the coastal landscape. These natural and developed features possess significant amenity and recreational value for the local residents in addition to major opportunities for domestic and international tourism. Inch beach is used for bathing in summer and, year round, for surfing. Swell Surf School is located on Inch Beach, which is approximately 1.14km from the Terminal site.

The study area continues to be in demand for tourist related development including caravan parks, hotels and holiday homes. Inch Hideaway, which is an Eco Sustainable camping facility is situated <1km from the Terminal site.

Figure 5.5: Land Use at the Study Area (Site indicated as red dot. Source: www.google.ie)

Figure 5.6: CORINE Land Use (Site indicated as black dot. Source: EPA (2017b) http://www.envision.ie/)

5.3.5 Zoning

The Cork County Development Plan 2014 came into effect on 15th January 2015. It is expected to remain in force (subject to any interim variations that the Council may make) until late 2020.

It is a six year development plan that attempts to set out, as concisely as possible Cork County Council's current thinking on planning policy looking towards the horizon year of 2022. The plan also sets out the overall planning and sustainable development strategy for the county which must be consistent with the National Spatial Strategy 2002-2020 and the South West Regional Planning Guidelines 2010-2022.

The Development Plan is the county's principle strategic planning policy document. Detailed land-use zoning maps for the main settlements of the county are contained in the Electoral Area Local Area Plans and the Special Local Area Plans. The Inch Terminal site and area surrounding are located within the Greater Cork Ring Strategic Planning Area as outlined in the Bandon/Kinsale Local Area Plan.

The Inch terminal and surrounding area is not currently designated zoning in the Development Plan or the Local Area Plan for any particular land use.
As outlined under Objective ZU 2-3: Land Use Zoning of Other Lands in the Cork County Development Plan 2014:

"Where lands have not been explicitly zoned, in either the adopted Local Area Plans or the adopted Special Local Area Plans, the specific zoning shall be deemed to be that of the existing use of the lands (if such a use is not an unauthorised use under the Planning Acts) or, if such a use is unauthorised, that of the most recent authorised use of the lands"

The land surrounding the Inch Terminal is currently being used as agricultural land.

5.4 Water

This section provides an overview of the existing hydrology, water quality and hydrogeology within the study area surrounding the Inch terminal site and onshore pipeline.

5.4.1 Hydrology

Since 2000, Water Management in the EU has been directed by the Water Framework Directive 2000/60/EC (WFD). The second River Basin Management Plan (RBMP) which was launched on 17th April 2018 outlines the new approach that Ireland will take as it works to protect its rivers, lakes estuaries and coastal waters over the next four years. Building on the lessons learned from the first river basin management planning cycle, the government is now planning on the basis that Ireland is defined as a single River Basin District. This is due to the fact that the structure of the multiple River Basin Districts did not prove effective, either in terms of developing the plans efficiently or in terms of implementing those plans (River Basin Management Plan 2018-2021, 2018).

Surface water features in the vicinity of the Inch Terminal site are shown on **Figure 5.7.**

Figure 5.7: Water features in the Study Area (Site indicated as black dot. Source: EPA (2017b) http://www.epa.ie/)

5.4.2 Water Quality

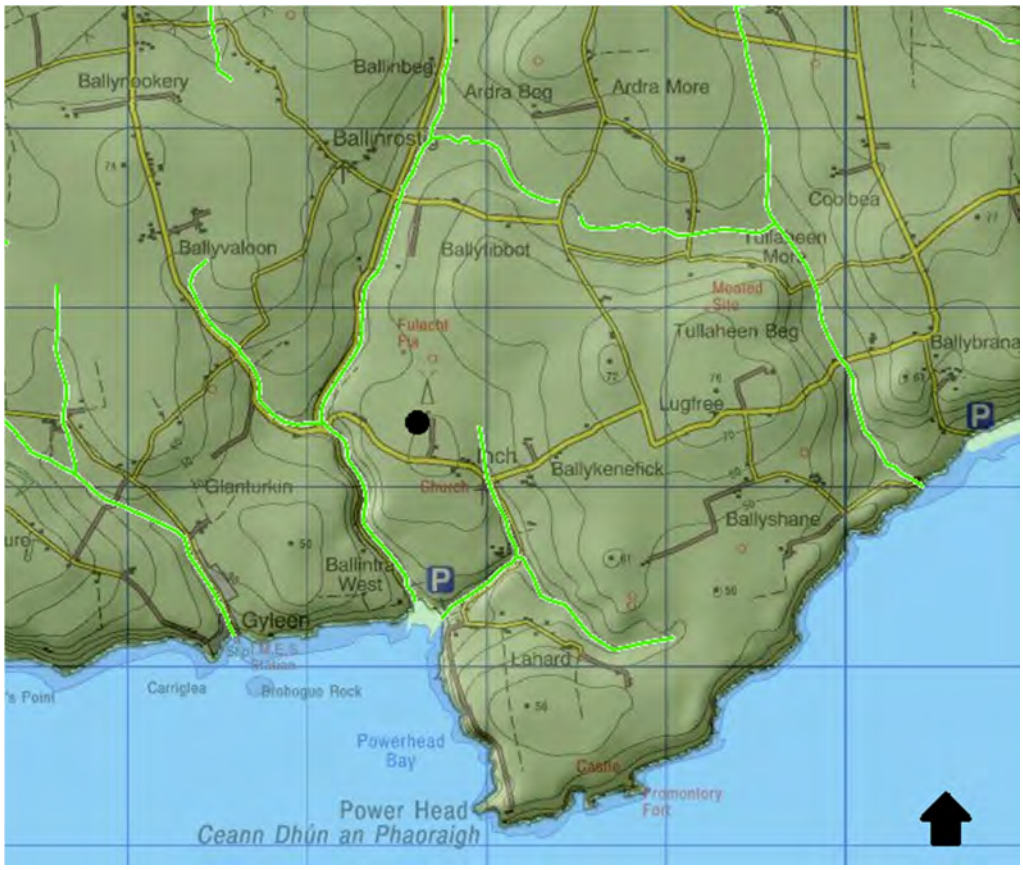
The WFD has been transposed into Irish legislation by the European Communities (Water Policy) Regulations 2003 (SI No. 722 of 2003). The WFD requires that all member states implement the necessary measures to prevent deterioration of the status of all waters - surface, ground, estuarine and coastal - and protect, enhance and restore all waters with the aim of achieving good status by 2015.

As part of the implementation of the WFD, a baseline risk assessment was completed of the water bodies within the vicinity of the Inch Terminal site. These assessments were made using water pollution indicators, point and diffuse pollution sources, water abstractions and detail on commercial activities. The risk assessment assigned a water quality status to each waterbody and indicated a risk status namely, whether the water body would meet the criteria for “good status” or would be considered “at risk” of not meeting the standards by 2015.

The West Ballintra River and the Lahard Stream, which are located in close proximity to the Inch Terminal site have been classified as having an ‘unassigned’ WFD water quality status. They are however classed as “not at risk” of not achieving “good status” by 2015 under the WFD risk score system in 2010. The WFD Risk Status for river water bodies within the study area is shown on **Figure 5.8**.

There are no ‘Nutrient Sensitive’ rivers identified near the terminal site. Nutrient Sensitive Waters comprise nitrate vulnerable zones designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive under the Urban Waste Water Treatment Directive (91/271/EEC).

Figure 5.8: WFD Risk Scores within the Study Area (Site indicated as black dot. Source: EPA (2017b))



Note: "Not at Risk" is indicated by the green waterbody features.

5.4.3 Hydrogeology

The Inch Terminal site is underlain by a bedrock aquifer which is classified by Geological Survey Ireland (GSI) as a 'locally important' aquifer, which is 'moderately productive only in local zones.' The WFD risk status for groundwater quality in the aquifer is of 'good status.'

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability in the study area is classified as being of 'extreme' vulnerability by the GSI. The Extreme vulnerability class is defined by a soil thickness of 1–3 m.

Groundwater aquifers in the vicinity of the study area are shown in **Figure 5.9** and groundwater vulnerability in the vicinity is shown in **Figure 5.10**.

A groundwater abstraction well is located on the terminal site which is currently used to supply drinking water to the terminal.

Figure 5.9: Groundwater aquifers (Site indicated as black dot. Source: Geological Survey of Ireland (2017))

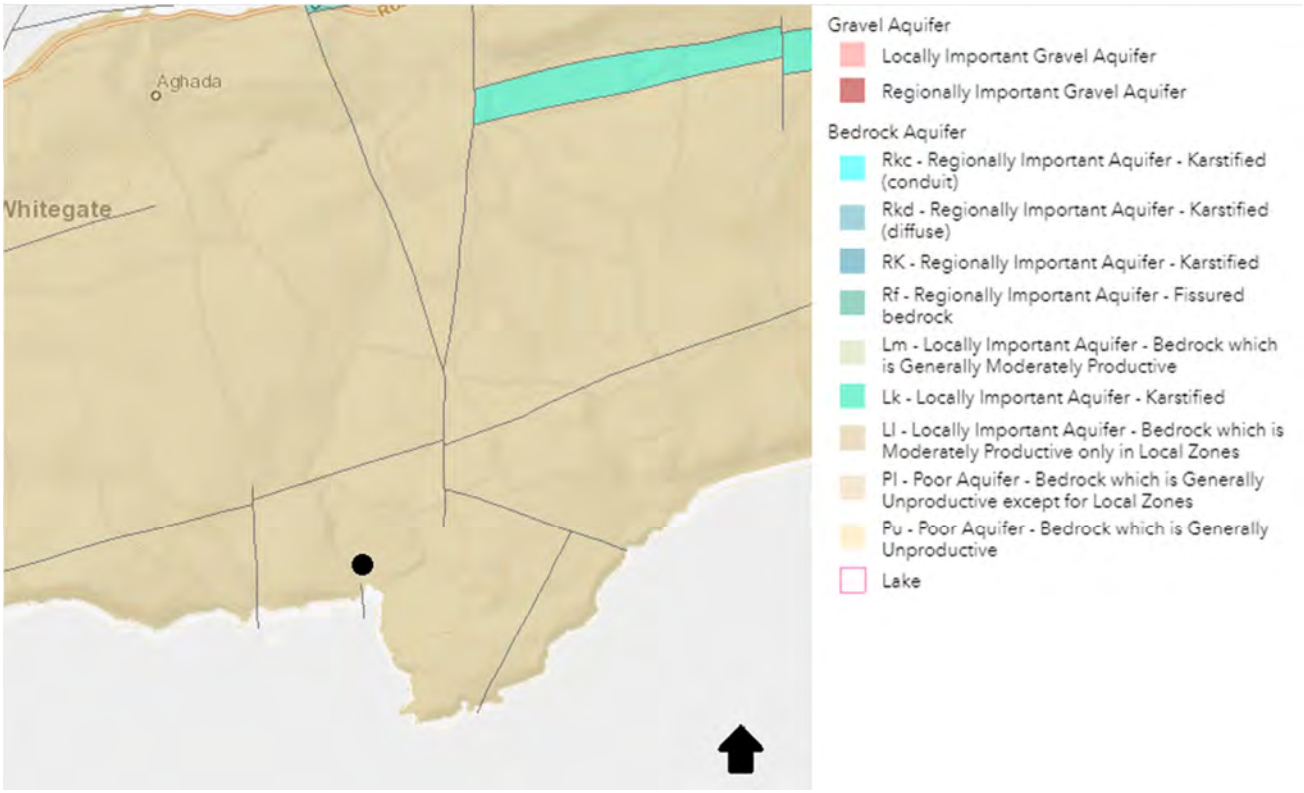
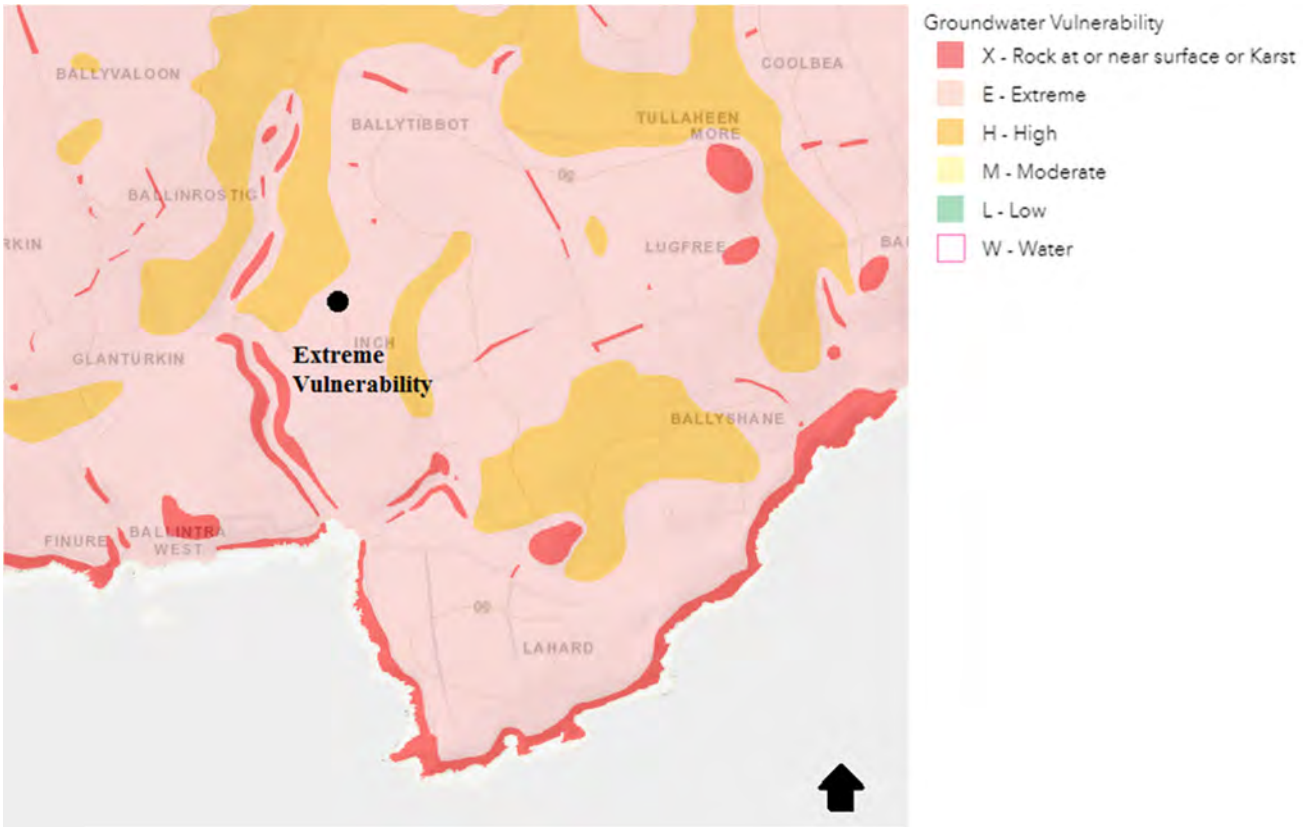


Figure 5.10: Groundwater Vulnerability (Site indicated as black dot. Source: Geological Survey of Ireland (2017))



5.5 Air Quality and Climate

This section provides an overview of the existing air quality and climate in the vicinity of the Inch Terminal site.

5.5.1 Air Quality

The Environmental Protection Agency (EPA) measures the levels of a number of atmospheric pollutants throughout Ireland in order to measure compliance with Air Quality Standards Regulations, 2011 (S.I. No. 180 of 2011). For the purposes of monitoring in Ireland, four zones are defined in the Regulations:

- Zone A: Dublin Conurbation;
- Zone B: Cork Conurbation;
- Zone C: Other Cities and Large Towns; and
- Zone D: Rural Ireland which is the remainder of the State excluding Zones A, B and C.

The study area is located in Zone D. **Table 5.1** outlines the monitoring data provided by the EPA for Zone D during the years 2013-2015, EPA (2015d).

Table 5.1: Annual Average Pollutant Concentrations 2013 – 2015 for Zone D

Pollutant / Year	NO2 (µg/m3)	NOx (µg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)	CO (Mg/m3)	Benzene (µg/m3)
2013	11.0	13.0	5.0	16.0	0.3	0.5
2014	5.5	10.3	5.0	7.5	0.5	0.1
2015	6.3	12.3	8.0	7.3	0.5	0.1
Average	7.6	11.9	6.0	10.3	0.4	0.2
Air Quality Standard	40	30	40	20	10	5

All baseline levels measured in Zone D are in compliance with air quality standards set by the EPA.

5.5.2 Climate

According to the Met Éireann Monthly Data (2015-2018), the mean temperature at Roche's Point meteorological station (the nearest meteorological station to the Terminal site at approximately 5km away) is 6.8˚C in January and 15.6˚C in July. The mean temperature annual average is 10.7˚C. The mean annual rainfall is 976mm. The mean annual wind speed is 6.3m/s.

The study area has a mild maritime climate with mean air temperatures varying between approximately 6-7°C in winter and 15-16°C in summer (seasonal mean temperatures for 1981-2010, Walsh S (2012)). Wind direction is predominantly from the southwest, particularly in winter and summer, although wind direction is more variable in spring and autumn, UKHO (1997). The frequency of days experiencing gale force winds per month is approximately 25% in January, dropping to 2-5% in July. 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.

National climate observations identified in the National Adaptation Framework (DCCAE, 2018) highlight historic changes and trends in aspects of the Irish climate including:

- Temperatures have increased by about 0.8°C since 1900, an average of 0.07°C per decade;
- The number of annual frost days has decreased whilst the number of warm days has increased;
- Average annual national rainfall has increased by approximately 60mm or 5% in the period 1981 to 2010, when compared to the 30-year period 1961 to 1990;

- Concentrations of greenhouse gases including methane (CH4), nitrous oxide (N2O) and carbon dioxide are significantly high;
- Increasing annual mean river flows have been observed at 40 measurement sites around the country; and
- The growing season is occurring more than a week earlier than it was in the 1970s which is linked to a rise in average spring temperature.

The National Adaptation Framework (DCCAE, 2018) has also drawn on regional climate modelling to develop mid-century climate projections (for the period 2041 -2060 in comparison to a baseline period of 1981 – 2000) for Ireland. The climate projections include the following:

- Mean annual temperatures will increase by 0.90 - 1.7°C, with the largest increases seen in the east of the country;
- Hot days (i.e. the top 5% maximum daily temperature) will get warmer by 0.7 – 2.6˚C;
- Cold nights (i.e. the bottom 5% of minimum daily winter temperature) will get warmer by 1.1-3.1°C;
- The number of frost days (i.e. a day when the minimum temperature is less than 0°C) is projected to decrease by over 50%;
- The average length of the growing season will increase by over 35 days per year;
- Precipitation: results show significant projected decreases in mean annual, spring and summer precipitation amounts by mid-century. The projected decreases are largest for summer, with reductions ranging from 0% to 20%;
- Heavy rainfall events will increase in winter and autumn;
- The energy content of the wind is projected to decrease during spring, summer and autumn. The projected decreases are largest for summer, with values ranging from 3% to 15%;
- The frequency of storms will decrease but the intensity of storms will increase;
- Increased incidences of high and low flow periods are likely for surface water bodies;
- Regional sea level rise (allowing for isostatic components) , of c.40cm south west Ireland estimated by c.2080- 2100 and;
- Coastal erosion and flooding currently pose a serious risk to coastal areas. Key impacts include inundation of coastal areas, increase in the intensity of cyclones which will result in more extreme storm activity and an increase in coastal erosion.

5.6 Noise and Vibration

The Inch Terminal site is located in a very rural area, with low ambient noise levels. The nearest sensitive receptor (i.e. residential property) is approximately 200m to the south of the Inch terminal site, adjacent to the main site access road.

5.7 Biodiversity

This section provides an overview of the existing flora and fauna at the Inch Terminal site.

5.7.1 Habitats

A site inspection was carried out on 14 June 2017 by Dixon Brosnan Environmental Consultants to identify the habitats, flora and fauna present at the site. The survey consisted of walking systematically through the Inch Terminal site and surrounding area within Kinsale Energy's ownership (as illustrated in **Figure 5.12**) and recording habitats, plant species and fauna.

The terrestrial and aquatic habitats were classified using the classification scheme outlined in the Heritage Council publication *A Guide to Habitats in Ireland* (Fossitt, 2000) and cross referenced with Habitats Directive Annex 1 Habitats where required. No notable species were identified, nor are they expected to occur given that the habitats within the study area are generally common and modified. Habitat mapping was carried out in line with the methodology outlined in the Heritage Council Publication, Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011).

Habitat maps are included as **Figure 5.11 and Figure 5.12** and the habitats recorded on site are described below. The ecological value of habitats has been classified in accordance with the classification scheme outlined in the Guidelines for Assessment of Ecological Impacts of National Road Schemes (National Roads Authority, 2009).

Habitats identified within the terminal site consist of:

- Buildings and artificial surfaces (BL3) – Local importance (Lower value)
- Spoil and bare ground (ED2) – Local importance (Lower value)
- Recolonising bare ground (ED3) – Local importance (Lower value)
- Amenity grassland (improved) (GA2) – Local importance (Lower value)
- Hedgerows (WL1) – Local importance (Moderate value)
- Treelines (WL2) – Local importance (Lower value)

A large proportion of the site has a gravel aggregate covering, which has resulted in a highly modified habitat with low species diversity. Species identified include Willowherb (*Epilobium spp*.), Scarlet Pimpernel (*Anagallis arvensis*), Prickly Sow-thistle (*Sonchus asper*), Ragwort (*Senecio jacobaea*), Daisy (*Bellis perennis*), Dandelion (*Taraxacum officinale agg*.) and Spear Thistle (*Cirsium vulgare*) along with sapling Sycamore (*Acer pseudoplatanus*) and Cotoneaster (*Cotoneaster spp*.).

Situated around the perimeter of the site is a narrow band of amenity grass. This is an example of a highly modified habitat with limited value for local wildlife. A small treeline of Common Alder (*Alnus glutinosa*), Sycamore (*Acer pseudoplatanus*) and Maple (*Acer spp.*) is found along the eastern boundary of the terminal site. The entire complex is bordered by hedgerow habitat from adjoining agricultural fields with a small section of a coniferous treeline within the northern boundary.

The habitats identified within the Inch terminal site are predominately man-made artificial habitats which are of negligible ecological value. No invasive species were recorded. The terminal site consists of solid concrete buildings along with steel frame platforms, metal piping and tanks and a large metal telecommunication tower. Large areas of the site are covered in a loose gravel aggregate, with both internal and external perimeter and security fencing.

Figure 5.11: General overview of habitats recorded within the Inch Terminal site.

Kinsale Energy owns a number of the surrounding fields and also an area of deciduous woodland in the vicinity of the terminal site (**Figure 5.12**). Other habitats identified within the adjoining land owned by Kinsale Energy are as follows:

- Scrub (WS1)
- Mixed deciduous woodland (WD1)
- Eroding river (FW1)
- Arable crops (BC1)
- Dry meadows & grassy verges (GS2)
- Ornamental/non-native shrub (WS3)
- Amenity grassland (improved) (GA2)
- Treelines (WL2)

These surrounding fields are cultivated and managed for Barley (*Hordeum vulgare L.*). Bounding each of these fields are hedgerow habitats. The majority of these hedgerows are of a similar form and composition. Species noted include Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinose*), Gorse (*Ulex europaeus*), Bramble (*Rubus fruticosus agg.*), Bracken (*Pteridium aquilinum*), Cleavers (*Galium aparine*), Nettle (*Urtica dioica*), Creeping Buttercup (*Ranunculus repens*), Docks (*Rumex obtusifolius & crispus*), Hedge Woundwort (*Stachys sylvatica*), Cut-leaved Crane's-bill (*Geranium dissectum*), Thistles (*Cirsium arvense & vulgare*), Hedge Bindweed (*Calystegia sepium ssp. Sepium*), Honeysuckle (*Lonicera periclymenum*), Bush Vetch (*Vicia sepium*), Alexanders (*Smyrnium olusatrum*), Hogweed (*Heracleum sphondylium*), Prickly Sow-thistle (*Sonchus asper*), Foxglove (*Digitalis purpurea*) and Silverweed (*Potentilla anserine*).

An area of deciduous woodland (WD1) exists to the west of the terminal site. The structure of the woodland is relatively poor and it generally lacks large mature trees and a diverse ground flora. Species noted within the woodland include Ash (Fraxinus excelsior), Common Alder (*Alnus glutinosa*), Italian Alder (Alnus cordata), Sycamore (*Acer pseudoplatanus*), Hawthorn (*Crataegus monogyna*) and Willow (*Salix spp.*).

Figure 5.12: General overview of habitats within Kinsale Energy land ownership boundary

5.7.2 Aquatic Ecology

The terminal site is not located in close proximity to any prominent surface water features. The site is located east of the West Ballintra River, and northwest of the Lahard Stream in the Farrannamanagh Sub-Catchment. Surface water features in the vicinity of the Inch Terminal site are shown on **Figure 5.7.**

A small stream is located 85m north of the terminal site, and flows in a westerly direction through a woodland and agricultural land (See **Figure 5.12**). The stream is heavily shaded in sections and primarily composed of glides and riffles with some pools. It was approximately 60cm in width and 10cm in depth, during the time of the survey. The stream bed substrate is largely composed of gravel in areas of riffles but other areas are heavily silted with high levels of sediment and organic debris. The stream has minimal fish potential.

5.7.3 Birds

Sea 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 presence 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 (https://www.npws.ie/research-projects/animal-species/birds/wintering-waterbirds). There are numerous SPAs (Special Protection Areas) along the coast which offer protection to species or aggregations of seabirds and waterbirds, however, none are in close proximity to the Inch Terminal site (see **Section 4.4.8**). 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) have recorded seabird sightings in the area.

Details of the seabirds and waterbirds found in the area are provided in **Section 4.4.6.**

Terrestrial birds

A bird survey was carried out in conjunction with the habitat survey in June 2017. Birds species listed in Annex I of the Birds Directive are considered a conservation priority. No such birds were recorded. BirdWatch Ireland and the Royal Society for the Protection of Birds have identified and classified bird species by the rate of decline into Red and Amber lists. Green listed species are regularly occurring bird species whose conservation status is currently considered favourable. Three Amber Listed species (*Erithacus rubecula* (Robin), *Carduelis cannabina* (Linnet), *Larus argentatus* (Herring Gull)) and three Red Listed species (*Anthus pratensis* (Meadow Pipet), *Carduelis chloris* (Greenfinch), *Hirundo rustica* (Barn Swallow)) were recorded during the site survey. These species were recorded within the surrounding area within KEL's ownership (and not within the Inch terminal site). The birds noted during site surveys, which are generally common in the Irish landscape, are listed in **Appendix C.1**.

A large telecommunication tower exists within the terminal site. The tower was inspected for bird usage, particularly nesting peregrines or gull species. No signs of past or present bird usage of the tower were identified.

Overall, the terminal site is of minimal value for birds. The landownership area is of local value for terrestrial bird species that are relatively common in the Irish countryside. A number of these species were recorded breeding in the area; however none were recorded breeding within the terminal site or in its immediate vicinity.

5.7.4 Mammals

Badgers

Badgers and their setts are protected under the provisions of the Wildlife Acts 1976 and 2000. It is an offence to intentionally kill or injure a protected species or to wilfully interfere with or destroy the breeding site or resting place of badgers. The density of badgers in Ireland is approximately one social group per km^2 in lowland areas with a high component of pasture. In upland areas where feeding is scarce, badgers are generally found at lower densities. Badger setts are formed by a complex group of interlinked tunnels and therefore works in proximity to setts can potentially cause considerable damage. The presence of badgers can be recognised by feeding signs, paths, latrines and setts.

Dixon Brosnan Environmental Consultants surveyed the Inch Terminal area in August 2010 and recorded feeding activity and latrines at one location within the surrounding area within KEL's ownership and a potential sett was located, though not confirmed. No signs of badger were recorded during the site visit in June 2017.

Bats

Bats are protected by law in the Republic of Ireland under the Wildlife Act 1976 and subsequent amendments. In addition to domestic legislation, bats are also protected under the EU Habitats Directive (92/43/EEC) with all bat species listed in Annex IV of the Habitats Directive. Lesser Horseshoe Bat are also listed on Annex 2 of the Habitats Directive. For all bats it is an offence to disturb, injure or kill bats or disturb or destroy their roosts. The Irish government is a signatory to the 1979 Bonn Convention (Convention on the conservation of migratory species of wild animals) and the 1982 Bern Convention (Convention on the conservation of European wildlife and natural habitats), and has a commitment to the 1991 Eurobats agreement (Agreement on the conservation of bats in Europe).

The external walls of the buildings within the terminal site were inspected for any signs of bats. Evidence of bat activity associated with potential roost sites includes bat droppings, urine staining, feeding remains, scratch marks and dead/alive bats. Indicators that potential roost locations and access points are likely to be inactive include the presence of cobwebs and general detritus within the apertures. Upon inspection no evidence, or indicators of bats, were recorded nor were any potential roost sites identified within the concrete and metal structures within the terminal site.

Otters

Otters, along with their breeding and resting places are protected under the provisions of the Wildlife Act 1976, as amended by the Wildlife (Amendment) Act, 2000. Otters have additional protection because of their inclusion in Annex II and Annex IV of the Habitats Directive which is transposed into Irish law in the European Communities (Natural Habitats) Regulations (S.I 94 of 1997), as amended. Otters are also listed as requiring strict protection in Appendix II of the Bern Convention and are included in the Convention on International Trade of Endangered species (CITES).

No evidence of otters was found in the Inch Terminal site and it was determined that no suitable habitat exists within the landownership boundary. Potential habitat for otter may exist in the streams to the east and west of the site and in the coastal habitats to the south.

Other Protected Mammals

The National Parks and Wildlife service has records for six terrestrial mammal species (Fallow Deer, Hedgehog, Otter, Stoat, Red Squirrel and Pymy Shrew) from grid square W86, within which the Terminal is located. Red squirrel occur at a density of 0.2 per hectare of deciduous woodland, where the species are present. Sufficient area of habitat may be present within the landownership area, however the available habitat is suboptimal. No signs of red squirrels were observed. Hedgehog, stoat and pygmy shrew are widely distributed and could occur within the wider landownership area. No evidence of these species were recorded. Similarly no evidence of Fallow Deer was recorded.

Evidence of Irish Hare was recorded in June 2017 in proximity to the Inch terminal and Irish Hare were also recorded during previous surveys in 2010. The Irish hare is listed on Appendix III of the Bern Convention, Annex V(a) of the Habitats Directive and as an internationally important species in the Irish Red Data Book, Wildlife Service Ireland (1988). Irish Hares usually prefer semi-natural grassland with tussocks of rushes or similar cover vegetation and occasionally will shelter in hedgerows.

A stoat track was recorded at the edge of an arable field to the south of the terminal. Irish stoats occur in most habitats with sufficient cover, including urban areas.

Reptiles and amphibians

The common newt and common frog are protected species under the Wildlife Act 1976 and 2000. Neither species have been observed at the terminal site.

5.7.5 Conservation Sites and Species

Details on the conservation sites in proximity to the Kinsale Area are outlined in **Section 4.4.8**.

5.8 Cultural Heritage

This section provides an overview of the existing archaeology and architectural and cultural heritage at the Inch Terminal site.

5.8.1 Archaeology

5.8.1.1 Archaeological and Historical background

Cartographic and placename evidence is included in **Appendix C.2.1.** Details of the archaeological and historical background is provided in **Appendix C.2.2.**

5.8.1.2 Record of Monuments and Places

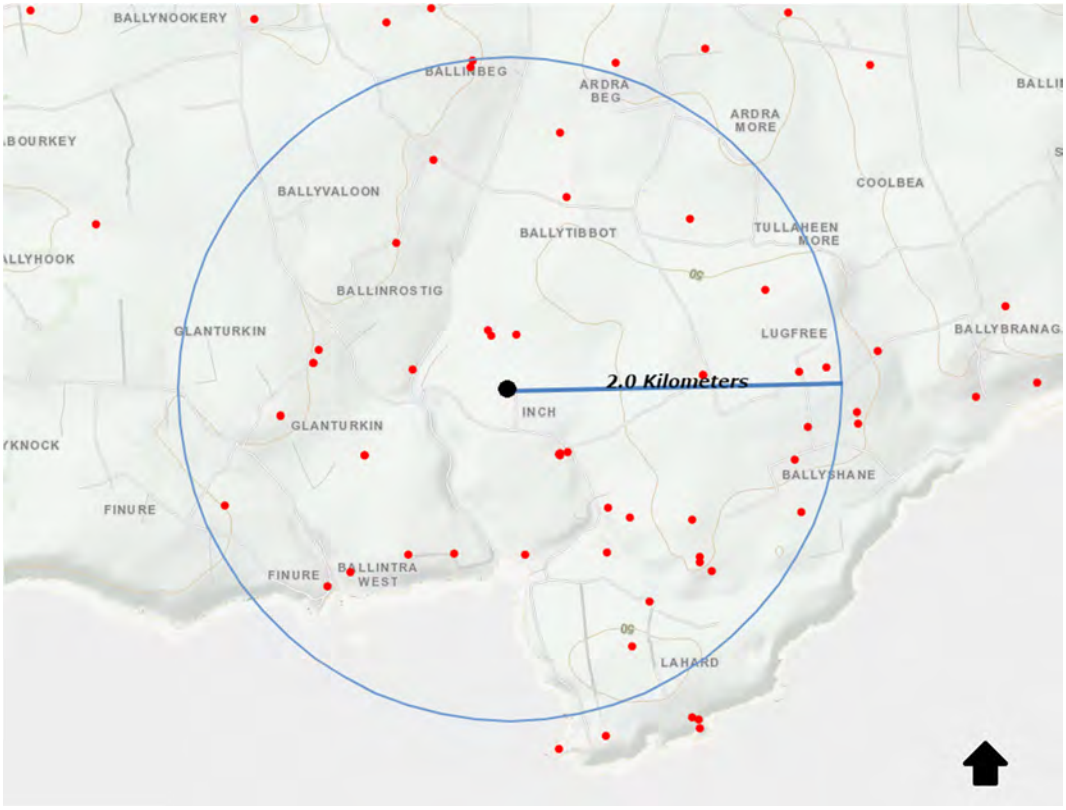
A record of archaeological heritage is maintained on the 'Record of Monuments and Places' (RMP) which was established under Section 12 of the National Monuments (Amendment) Act, 1994 (No. 17 of 1994). Structures, features, objects or sites can be listed in the RMP.

The RMP comprises a list of recorded monuments and places and accompanying maps on which the listed items are shown for each county. The National Monuments Service of the Department of Culture, Heritage and the Gaeltacht advise on the protection applying to any particular monument or place under the National

Monuments Act by reason of it being listed in the RMP and should be consulted if there is any doubt as to the status of the site.

According to the database, the terminal site and onshore pipeline is located in an area of high archaeological significance, with a number of listed items in the RMP present in the area, including two fulacht fiadh and a ringfort. There are also numerous listed items on the RMP present within 2km of the study area, as illustrated in **Figure 5.13**. **Appendix C.2.3** details all the listed items on the RMP present within 2km of the terminal site. The chronological range and diversity of these sites appears to indicate that the area has been subject to continuous occupation since Mesolithic times. The nature and form of sites vary from prehistoric flint scatters found at Lahard, Inch and Ballykenefick to vernacular houses and a Coastguard Station at Ballinrostig and Ballintra East, respectively. This large variety of sites also includes seven ringforts, one medieval castle, an Iron Age promontory fort and a church and graveyard.

Figure 5.13: Recorded Monuments within 2km of the Inch Terminal Site | Source: www.myplan.ie | Not to scale



5.8.2 Architectural and Cultural Heritage

As defined by the Heritage Act, 1995, 'architectural heritage' includes all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest.

The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999.

The purpose of the NIAH is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Culture, Heritage and the Gaeltacht to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).

According to the NIAH, there are no protected structures in the immediate vicinity of the terminal site. There are eight protected structures within 2km of the terminal site, as indicated in **Figure 5.14** below.

Figure 5.14: Protected structures within 2km of the Inch Terminal Site | Source www.myplan.ie | Not to scale

5.9 Landscape

This section provides an overview of the landscape character types, views, prospects and scenic routes in the vicinity of the Inch Terminal site.

5.9.1 Landscape Character Type

Section 4.7 of this report outlines three landscape character types of relevance in the area of Inch, all of very high landscape value and sensitivity. One of these Landscape Character Types covers the Inch Terminal site; Landscape Character Type 2: Broad Bay Coast (Refer to **Figure 5.15**). This is defined in **Section 4.7**. According to the Draft Landscape Strategy, Cork County Council (2007), Landscape Type 2 is classified as 'Very High Value Landscape' with regards the value and sensitivity. Landscape Character Type 2 is also classified as being of 'County Importance.'

This Landscape Character Type is characterised by a sweeping coastline flanked by low promonotories, rocky shores and low cliffs at the seaside whilst further inland moderately sized fertile fields are bounded by hedgerows. Isolated cottages are also common in this part of the landscape character type.

Specifically, there are three Landscape Character Areas within Landscape Type 2 and the Inch Terminal site is located in Landscape Character Area 22 - Power Head (Undulating Fertile Patchwork Coastline).

Figure 5.15: Landscape Character Area 2: Broad Bay Coast (Site indicated as black dot. Source: Cork County Draft Landscape Strategy (2007)

5.9.2 Views, Prospects and Scenic Routes

County Cork contains many vantage points from which views and prospects of great natural beauty may be obtained over both seascape and rural landscape. This scenery and landscape is of enormous amenity value to residents and tourists and constitutes a valuable economic asset. The protection of this asset is therefore of primary importance in developing the potential of the County. The Cork County Development Plan 2014-2020, Cork County Council (2014), identifies specific 'Scenic Routes' consisting of important and valued views and prospects within the County.

There is one Scenic Route located in close proximity to the Inch Terminal site- '**S50** Road between Inch and Aghada', which is illustrated in **Figure 5.16**.

It is an objective of the Cork County Development Plan to:

'*protect the character of those views and prospects obtainable from scenic routes and in particular stretches of scenic routes that have very special views and prospects identified in this plan.'*

With regards development along Scenic Routes, it is also an objective of the County Development Plan to:

'*a) Require those seeking to carry out development in the environs of a scenic route and/or an area with important views and prospects, to demonstrate that there will be no adverse obstruction or degradation of the views towards and from vulnerable landscape features. In such areas, the appropriateness of the design, site layout, and landscaping of the proposed development must be demonstrated along with mitigation measures to prevent significant alterations to the appearance or character of the area.*

b) Encourage appropriate landscaping and screen planting of developments along scenic routes which provides guidance in relation to landscaping.'

Figure 5.16: Scenic Routes in the Study Area (Site indicated as black dot. Source: Cork County Council (2017))

5.10 Population and Human Health

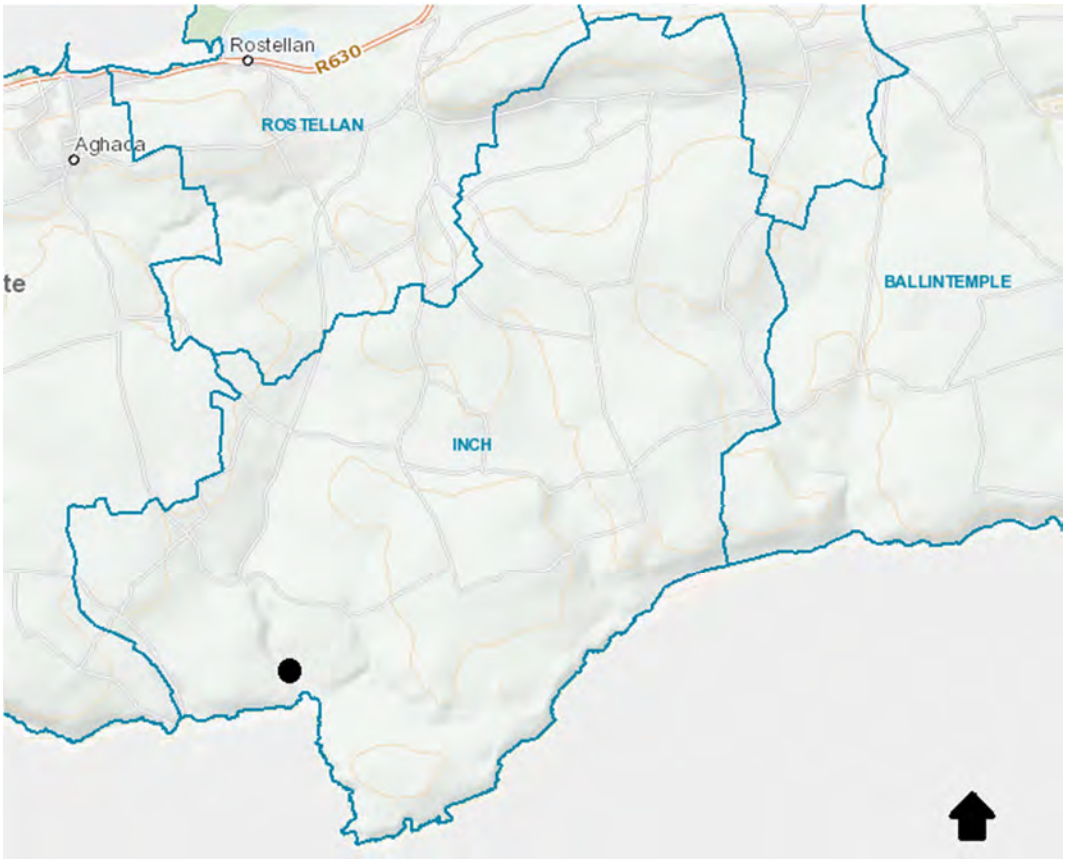
This section provides an overview of the population and human health in the vicinity of the Inch Terminal site.

5.10.1 Population

Preliminary results for the 2016 Census estimated a population of 542,196 for Cork County as a whole, a 4.5% increase on the 2011 Census figure. Excluding Cork city (population of 125,622), the 2016 population of the county area was estimated at 416,574, an increase of 4.2% on the 2011 Census figure (CSO website).

The Inch Terminal site is located in Inch Electoral Division (ED), the boundary of which is outlined in **Figure 5.17.** According to preliminary 2016 Census data, Inch ED has population of 525 persons.

Figure 5.17: Inch Electoral Division Boundary



Whilst Inch is a rural sparsely populated area, it is located within commuting distance of Cork city, which is a central hub for employment, entertainment, education and retail. Thus population increase on the basis of the above is evident. The 2016 census data represents a population increase of 13.5% since 2011.

According to the preliminary 2016 census data, there are 225 dwellings in the Inch ED, including 16 vacant dwellings. The area is dominated by tourist related development and it is difficult to ascertain from a visual assessment if the majority of houses are occupied on a temporary or permanent basis. It is clear however, that there is a significant rise in visitor numbers evident during the summer months.

Tourist influxes during the summer months create pressure on public infrastructure and roads in a number of locations and can interfere with the residential amenity of the local population. However, the economic benefits are substantial and the influx of people can create a sense of energy that in turn can make towns and villages more desirable places to live and visit.

Analysis of Census 2016 data for the Inch ED indicates that labour force participation is relatively high. Specifically 59.6% of the labour force in the Inch ED are at work and unemployment is relatively low for the area at 3.8%. Agriculture is a key economic activity throughout the ED both in terms of direct farming of land and in food processing. Tourism, an oil refinery and power stations and other services together with more traditional manufacturing are also significant employers in the area. (census.cso.ie, 2016)

5.10.2 Human Health

Health in the local population is relatively good with 68.4% of the population in the Inch ED classifying their general health as ‘Very Good’ and a further 22% classifying their general health as ‘Good’.

In terms of relevant risks to public health, **Section 5.5.1** indicates that air quality metrics for 2015 (e.g. NO2, particulates) for rural coastal areas (zone D) and Cork city (zone B) were within EU limit values (O’Dwyer 2016) and are therefore unlikely to represent a significant health risk.

As detailed in **Section 5.4.2**, in terms of water quality and relevance to human health, the study area is underlain by a bedrock aquifer which is classified by the GSI as a ‘locally important’ aquifer, which is ‘moderately productive only in local zones.’ Groundwater quality in the aquifer is of ‘good status.