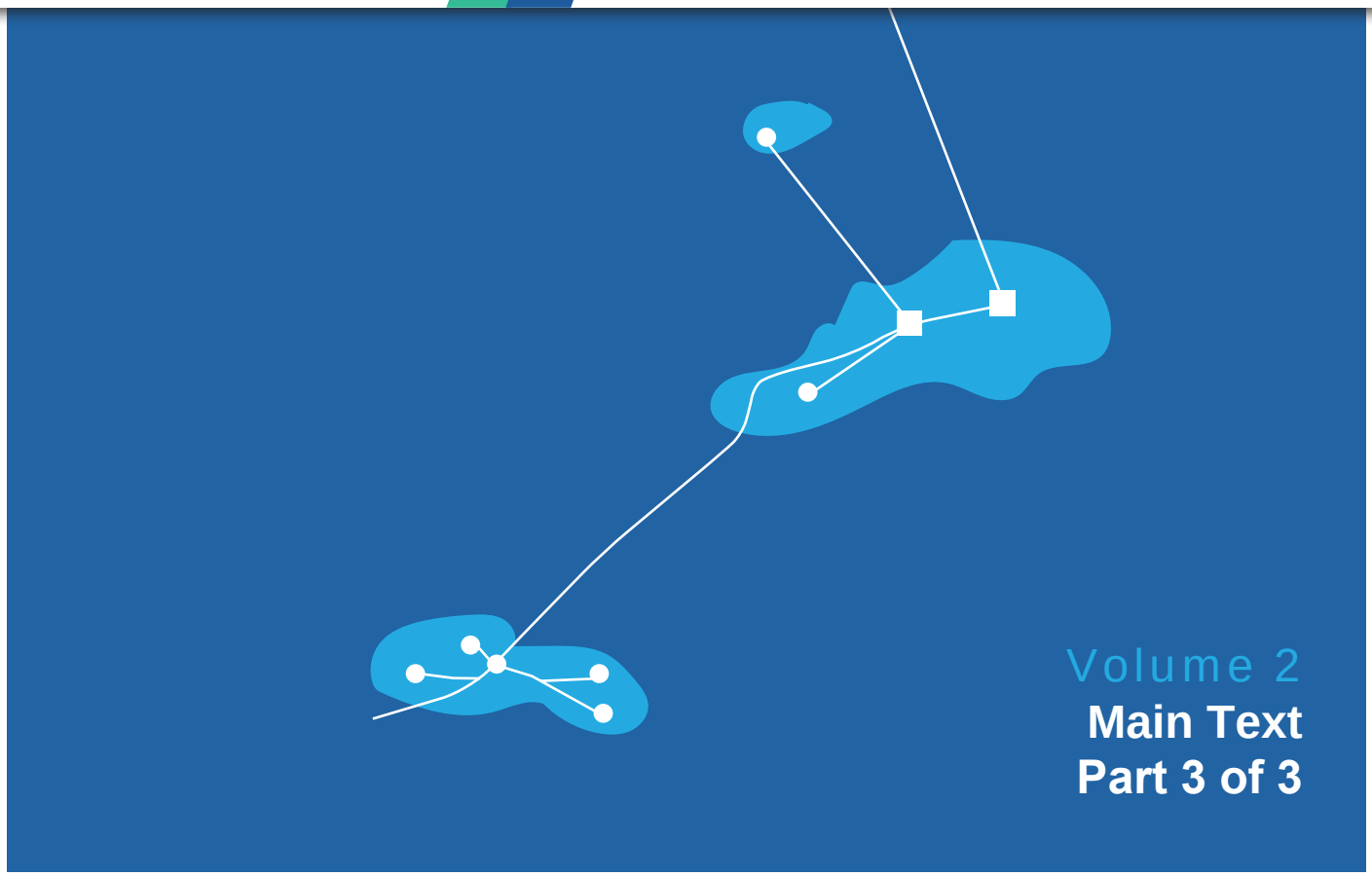
KINSALE ENERGY

Kinsale Area Decommissioning Project

Environmental Impact Assessment Report



Volume 2
Main Text
Part 3 of 3

253993-00-REP-08 | 30 May 2018

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Glossary of Terms

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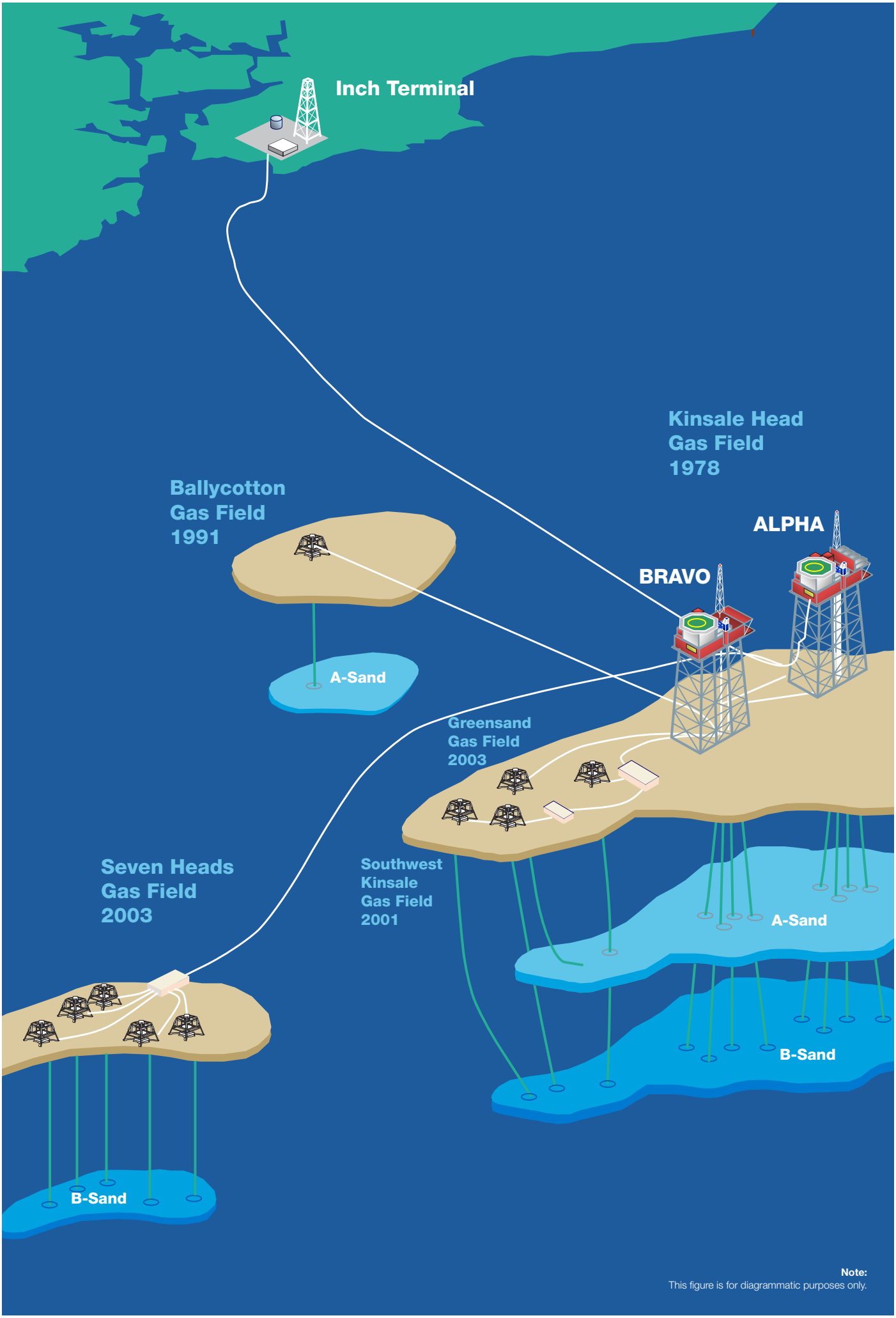
Inch Terminal
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B-Sand
Note:
This figure is for diagrammatic purposes only.

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 6

Environmental Assessment Methodology and Identification of Potentially Significant Effects

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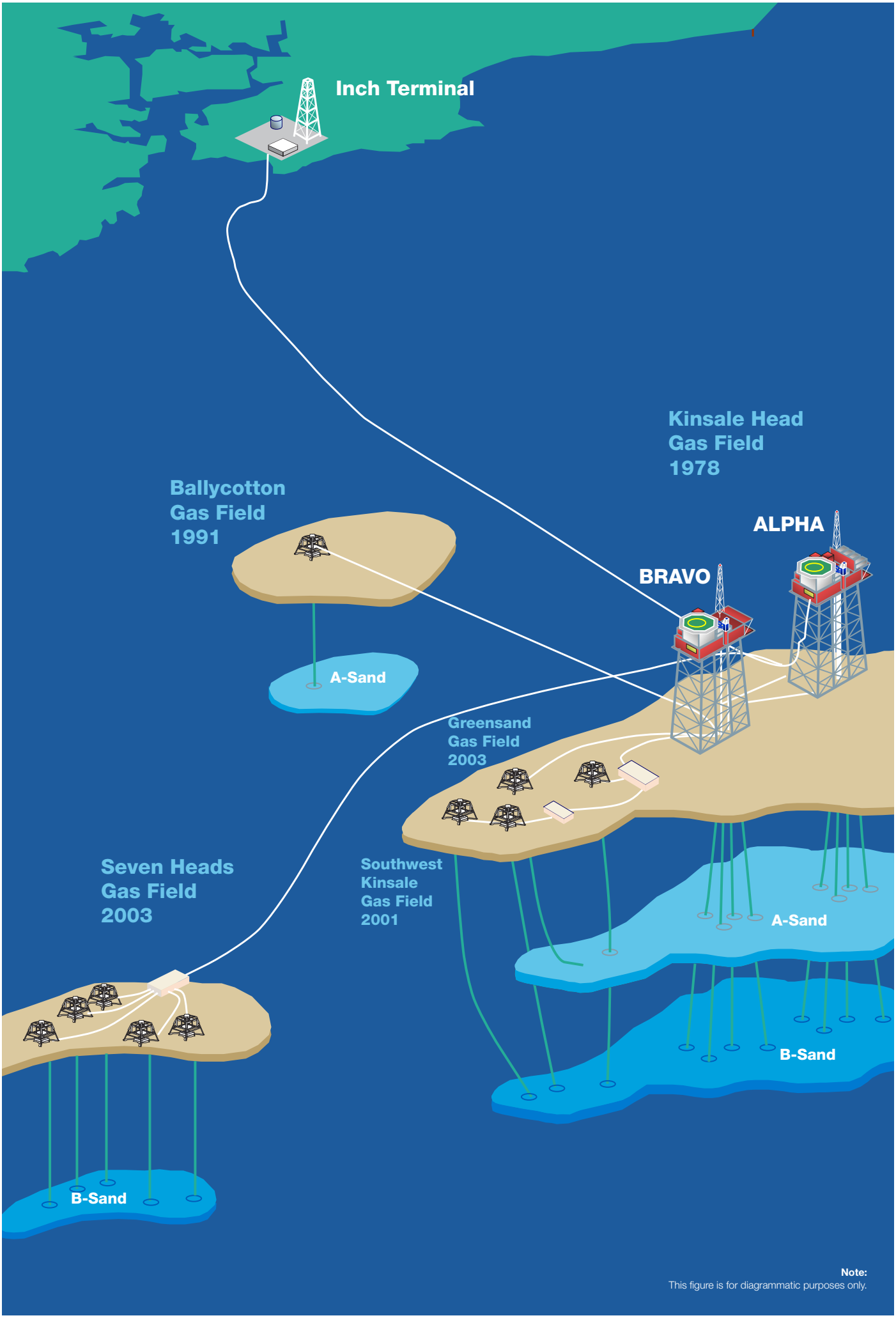
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6 Environmental Assessment Methodology and Identification of Potentially Significant Effects

6.1 Introduction

This Environmental Impact Assessment Report (EIAR) is intended to fulfil the requirements of the EIA Directive (2011/92/EU as amended by 2014/52/EU), providing an environmental appraisal of potentially direct and indirect significant effects of the KADP. The report provides the relevant information to allow the Competent Authority to undertake an Environmental Impact Assessment (EIA) and make a reasoned decision about approval of the KADP Decommissioning Plans.

Environmental issues were considered early in project planning, informed project design as part of the consideration of alternatives, and have informed the methodological options considered in this assessment. As noted in **Section 3**, decommissioning operations are also subject to a range of legally required standards and controls in respect of marine activities, all of which will be complied with.

The following environmental assessment allows for the identification (**Section 6.2**), description and assessment (**Section 7**) of the potentially significant effects of the project, along with the identification of mitigation measures (i.e. to avoid, prevent or reduce the significance of any effects), and any residual effects (**Section 8**) which would be taken forward into detailed project planning. The assessment is documented in **Section 7** and **Appendix D**, with mitigation measures described throughout as required. Responsibilities for ensuring compliance with legal standards and controls, environmental management commitments which form standard practice, and any proposed mitigation measures, are summarised in **Section 8**.

This is in accordance with the requirements of Article 3 of the EIA Directive as follows:

'1 'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:

a. Population and human health;

b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC,

c. Land, soil, water, air and climate;

d. Material assets, cultural heritage and the landscape;

e. The interaction between the factors referred to in points (a) to (d).

2 The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.'

6.2 Effect Identification

Effects likely to arise from the activities associated with the KADP (relevant to those factors within the meaning of Article 3(1), above) have been identified on the basis of the nature of the project as described in **Section 3** (including its location, physical and operational characteristics, residues, emissions and wastes), considered against the description of the environment in **Sections 4** and **5** and the understanding of impact pathways from a range of sources, including:

- Regional and site specific environmental data, including an offshore pre-decommissioning environmental survey carried out in May 2017, and a site walkover at the Inch terminal site in June 2017
- Typical drilling rig and vessel specifications (e.g. for support, heavy lifts and rock placement)
- Estimates of materials and wastes arising from the decommissioning work
- Decommissioning planning studies and indicative information provided by decommissioning contractors and engineering consultants (refer to **Section 3.4**)

- Experience of relevant aspects and operations of analogous projects in the Celtic Sea, Irish Sea, North Sea and elsewhere
- Peer reviewed scientific papers describing the effects of specific and analogous interactions (cited throughout)
- Other publicly available “grey” literature
- The Irish Offshore Strategic Environmental Assessment (IOSEA) 4 Environmental Report and Irish Offshore Strategic Environmental Assessment (IOSEA) 5 Environmental Report
- Relevant conservation site designations, potential designations, and site advice etc.
- Applicable legislation, guidance and policies
- An Environmental Impact Assessment Report workshop involving Kinsale Energy and the report authors
- Input to the EIA process through consultation with relevant stakeholders (see **Section 1.8**).

6.2.1 Effect Categorisation

The process of identifying those environmental factors likely to be significantly affected by the KADP and associated results are documented in **Tables 6.1** and **6.2**. The identification of these factors, and an initial consideration of the significance of potential effects was carried out using defined severity criteria (**Table 6.1**), primarily based on a modified version of United Kingdom Offshore Operators Association (UKOOA) Environmental Impact Assessment Guidelines (UKOOA 1998), and taking account of Advice Notes for Preparing Environmental Impact Statements (EPA Draft September 2015) and on Information to be contained in an Environmental Impact Assessment Report (EPA Draft August 2017). It allows for the consideration of effect likelihood, scale, duration and frequency (**Table 6.2**), and forms the basis for those topics described and assessed in **Section 7**. Where effects are identified which are considerd to be minor and negligible, these are considered further in **Appendix D**.

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

Table 6.2 is organised by those activities/sources of potential effect associated with the KADP; and the relevant consent applications for each activity/source of potential effect is indicated. These cover all the decommissioning activities irrespective of the final alternative methodologies selected (refer to **Section 3.5**). A summary of those activities and related sources of potentially significant effect are summarised in **Table 6.3a** and **b**.

Table 6.1: Criteria for the identification of potential effects from the Kinsale Area Decommissioning Project

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

Frequency with which Activity or Event Might Occur	Likelihood
Unlikely to occur	**Remote**
Once during decommissioning activity	**Unlikely**
Foreseeable possibly once a year	**Possible**
Once a month or regular short term events	**Likely**
Continuous or regular planned activity	**Definite**

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

	Potentially significant effects requiring assessment
	Potential positive or minor or negligible effects
	No likely effects

Notes:
1. The criteria to the left include consideration of issues of known public concern.
2. In addition to identification on the basis of these criteria, issues/interactions raised during stakeholder consultation are normally treated as requiring detailed consideration in the EIAR.

Table 6.2: Sources of potential effects, relevant environmental factors and related environmental receptors[1]

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Consent Application 1																			
Platform well decommissioning[D]																			
Treated seawater and other well decommissioning related discharges			D4	D4							C4								Returns from wells are expected to be limited to excess cement, which is likely only as a contingency, and treated seawater. All returns will be treated on the platform prior to discharge and chemical use and discharge will be subject to a Permit to Use or Discharge Added Chemicals (PUDAC) in order to limit changes in water quality and any related effect on water column biota. See **Section 7.6**.
Power generation												C4							Minor, temporary contribution to existing atmospheric emissions, and global greenhouse gas concentrations. See **Section 7.8**.
Fugitive emissions from fuel & chemical storage												D4							Emissions include those from cement tanks and diesel storage and therefore have the potential to contribute to air quality effects. These are a minor, temporary increment to existing atmospheric emissions. See **Appendix D**.

[1] See **Sections 4** and **5** for a description of the receiving environment.
[2] This topic is largely considered in the context of other environmental factors, for example effects on air quality, climate, other users, landscape/seascape.
[3] Note that interactions between individual components of the biodiversity environmental factor have also been considered, for example effects on supporting habitats of species, or on prey species of other animals.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health [2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed [A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources [B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage [C]	Landscape/seascape	
Solid & liquid wastes to shore	D4															C4		D4	Waste returns are limited but include conductors, surface casing sections, surplus cement chemicals and recovered surfactant. Materials returned to shore contribute to onshore activities such as materials processing and landfill, and may make a minor contribution to visual intrusion. See **Section 7.7**.
Platform surface noise & light							D2		D2										No significant change to current platform surface lighting (which could attract birds, for example on migration) or noise (e.g. from wireline unit). See **Appendix D**.
Mechanical cutting of and removal of surface casings		D4		D4	D4	C4	D4		C4	D4	D4								Underwater cutting will contribute to a temporary increase to overall KADP underwater noise, which is relevant to certain noise sensitive species including marine mammals. There will also be some discharge of millings to seabed. See **Sections 7.5 and 7.9**.
Removal of conductors		D4								C4	D4								Seabed disturbance and some sediment resuspension will result from the removal of the conductor and related casings to 10ft below seabed, with related interactions with benthic fauna. See **Section 7.4**.
Venting												D4							Small volumes of hydrocarbons are expected to be vented during the platform well abandonment campaign, which could contribute to localised air quality changes and global greenhouse gas loading. See **Appendix D**.
Subsea well decommissioning [D]																			
Drilling rig positioning		C4								C4	D4						C1		Seabed disturbance will be generated from anchor lay and catenary action of anchor chain, having interactions with seabed sediments and related benthic fauna. See **Section 7.4**.
Physical presence of drilling rig	C4					D4	D4						C4	D4	D4				Interactions with other users, particular fisheries, are limited by existing 500m subsea exclusion zones, though there will be the temporary presence of anchors and chain beyond these exclusion zones. See **Section 7.2**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health [2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed [A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources [B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage [C]	Landscape/seascape	
Discharge of chemicals			D4	D4							C4								Limited returns from wells are expected. All chemical use and discharge will be subject to a PUDAC, in order to limit changes in water quality and any related effect on water column biota. See **Section 7.6**.
Drilling rig power generation				D4	D4	C4						C4							Contributes to overall KADP atmospheric emissions and global greenhouse gas concentrations. See **Section 7.8**. Power generation and drilling rig will contribute to overall KADP underwater noise, of most relevance to noise sensitive species including marine mammals. See **Section 7.5**
Fugitive emissions from fuel & chemical storage												D4							Emissions include those from cement tanks, mudpits, diesel storage and cooling/refrigeration systems and therefore have the potential to contribute to air quality effects. These are a minor contribution to overall KADP atmospheric emissions. See **Appendix D**.
Drainage, sewage, treated seawater and other well decommissioning related discharges from rig			D4	D4							D4								Rig discharges will contribute to local water quality changes, and associated interactions with water column biota. Returns from wells will be primarily of treated seawater, which will be discharged. All chemical use and discharge will be subject to a PUDAC. Rig discharges will include sewage and grey water from accommodation, and deck surface drainage. See **Appendix D**.
Solid & liquid wastes to shore	D4															C4		D4	Waste returns are mainly well heads, recovered casings, surplus cement and recovered surfactant. Materials returned to shore contribute to onshore activities such as materials processing and landfill, and may make a minor contribution to visual intrusion. See **Section 7.7**.
Rig surface noise & light							D4		D4										Incremental lighting and surface noise from the rig and any additional supply trips will be temporary and not significantly add to existing lighting or noise levels. See **Appendix D**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Mechanical cutting and removal of surface casings		D4		D4	D4	C4			C4	C4	D4								Underwater cutting will contribute to overall KADP underwater noise. See **Sections 7.5 and 7.9**. Some discharge of millings to seabed and seabed disturbance from the removal of the casings to 3m below seabed. See **Section 7.4**.
Venting												D4							Small volumes of hydrocarbons are expected to be vented during the subsea well abandonment campaign, which could contribute to localised air quality changes and global greenhouse gas loading. See **Appendix D**.
Offshore facilities preparation: topsides, pipeline degassing and displacement of umbilical contents																			
Flushing and cleaning of topsides			D2							D2	D2	D2				D2			A production history of dry gas limits the potential for significant hydrocarbon content or hazard of discharge (atmospheric or liquid), which could interact with the water column and related biota, or affect air quality. Inventories (e.g. diesel, chemical) will be retained and returned to shore. See **Appendix D**.
Removal of hazardous materials (e.g. asbestos, refrigerants)																C2			Certain wastes will require specific handling and disposal methods, and will represent a minor increase in the volumes of such material. Any materials returned to shore contribute to onshore activities such as materials processing and landfill, and may make a minor contribution to visual intrusion when in transit. See **Section 7.7**.Certain wastes will require specific handling and disposal methods, and will represent a minor increase in the volumes of such material.
Removal of WEEE																D2			

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Displacement of contents of pipelines and umbilicals			D2	D2							D2								Pipeline contents and umbilical chemical lines will be displaced by seawater to subsea/platform wells. The 24" and potentially the 18" Seven Heads export pipelines will be initially filled with inhibited seawater and capped. No marine discharges will be associated with this activity (see **Appendix D**), however, the removal of spool pieces and umbilical jumpers, and release of inhibited seawater as part of other operations will result in limited discharges. These are considered against the relevant activities/sources of potential effect (subsea structure and jacket removal, legacy discharges) below.
Topsides removal[D]																			
Cutting, welding and rigging of structures to be lifted												D2							Minor, limited sources of temporary airborne noise and emissions undertaken at some distance from shore (at least 40km). See **Appendix D**.
Utilities preparation and temporary accommodation on KB											D2					D2			Limited and temporary increment to sources of domestic waste from increased personnel, which results in dischargers to sea and related interactions with water quality. See **Appendix D**.
Subsea structure decommissioning[D]																			
Mattress removal		C4		D4						C4	D4		D4			C4			Seabed disturbance and resuspension of sediment into the water column will be generated from the removal of protection materials to gain access to pipelines/umbilicals, and the cutting and lifting of spool
Cutting of spool pieces & umbilical jumpers (including at manifolds and valve skids)		C4		D4		D4			D4	C4	D4		D4						

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health [2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed [A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources [B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage [C]	Landscape/seascape	
Removal of spools pieces		C4	D4	D4						C4	D4		D4			C4			pieces. Incremental underwater noise will be generated from the cutting of pipelines/umbilicals, resulting in potential impacts for noise sensitive species, however, these are likely to be cut by hydraulic shears rather than mechanical wire or abrasive water jet methods. See **Sections 7.4** and **7.5**. Chemical discharges to sea will include hydraulic fluids from umbilicals, and possibly a minor release of surfactants from pipeline cleaning during the facilities preparation works. See **Section 7.6**.
Removal of manifolds and wellhead protection structures		C4		D4						C4	D4		D4			C4			Seabed disturbance and resuspension of sediment into the water column will result from the removal of subsea structures including related protection blocks. Materials returned to shore contribute to onshore activities such as materials processing, and may make a minor contribution to visual intrusion when in transit. See **Section 7.4**.
Consent Application 2																			
Jacket decommissioning [D]																			
Mattress removal		C4		D4						C4	D4		D4			C4			Seabed disturbance and resuspension of sediment into the water column will be generated from the removal of protection materials to gain access to pipelines/umbilicals, and the cutting and lifting of spool pieces. Incremental underwater noise will be generated from the cutting of pipelines/umbilicals, resulting in potential impacts for noise sensitive species however, these are likely to be cut by hydraulic shears rather than mechanical wire or abrasive water jet methods. See **Sections 7.4** and **7.5**. Chemical discharges to sea will include hydraulic fluids from umbilicals, and possibly a minor release of surfactants from pipeline cleaning during the facilities preparation works. See **Section 7.6**.
Cutting of spool pieces & umbilical jumpers		C4		D4		D4			D4	C4	D4		D4						
Removal of spools pieces		C4	D4	D4						C4	D4		D4			C4			

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Abrasive, high pressure water jet and other cutting (internal and external cuts)		D2		C2	D2	C2			C2	D2	D2								Cutting tools introduce a temporary source of underwater noise, additional to other sources from KADP and wider ambient noise from vessels most relevant to noise sensitive species including marine mammals. There is the potential for some seabed interaction at the cutting locations, and related disturbance. See **Sections 7.5** and **7.9**.
Excavation of piles/remediation of any stumps	C2	C2	D2	D2		C2				C2	D2		C2						Removal results in seabed disturbance, temporary sediment dispersal in the water column, and application of hard substrate (rock cover) should any pile stumps be left and require remediation. See **Sections 7.3** and **7.4**.
Marine growth removal	C2	D2	D2	D2		D2				D2	D2					C2			A quantity of marine growth will be removed offshore during cutting and lifting operations, or due to decay on transportation, however the majority will be disposed of onshore. The decay of marine growth at the yard location is likely to cause short-term deterioration in air quality (primarily odour). See **Section 7.6**.
Lift of jacket		C2	D2	C2						C2	D2		D2						The lift will generate seabed disturbance and temporary sediment dispersal in the water column. See **Section 7.4**.
Recovery of large items of debris from seabed post jacket removal		C2	D2	D2						C2	D2								Removal results in seabed disturbance and temporary sediment dispersal in the water column, See **Section 7.4**.
Physical presence of jackets in “lighthouse mode”													C4	C4	C4				The jackets may be left in “lighthouse mode” following topside removal for up to 10 years, and would retain their existing exclusion zones and be subject to aids to navigation and notices to mariners. The continued presence of the jackets, though well established, would have relevant effects for fisheries, shipping and other offshore users. See **Section 7.2**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Surface lighting							D5		D5										If placed in "lighthouse mode", aids to navigation, including lighting, will be in place for up to 10 years, but will not add to existing light levels. Continued lighting maintains the potential for interactions resulting from bird attraction. See **Appendix D**.
Pipeline and umbilical decommissioning[D]																			
Remedial rock placement	C4	C4		D4		D4			D4	C4			C4	D4	D4				There will be a legacy of pipelines/umbilicals and rock cover on the seabed following decommissioning. See Section 7.3, along with the introduction of hard substrates (rock cover). See **Section 7.4**. These will generate localised impacts on seabed habitats, and also represent a source of potential interaction for other users, for which they are providing remediation and risk reduction. There will be a contribution to KADP underwater noise, which has the potential to impact on noise sensitive species. See **Section 7.5**.
Release of inhibited seawater from export pipelines			D2	D2							C2								The 24" and potentially the 18" Seven Heads export pipelines will be initially filled with inhibited seawater and capped as part of facility preparatory works. The removal of the seaward cap if no re-use option is identified will allow the inhibited water to gradually escape over time, or else it would be discharged at sea at a later date if re-used (refer to **Section 3.5.4.2**). This discharge at reuse will have local water quality impacts, and the potential for effects on certain water column biota are also considered. See **Section 7.6**.
Pipeline and umbilical exposure	B1												B1	C1	C1				Potential third party risks resulting from the snagging of fishing gear or vessel anchors. See **Section 7.3**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Pipeline and umbilical degradation	B1		D2	D2						C1	D2		B1	C1	C1				Pipelines and umbilicals are constructed of non-toxic and relatively inert materials (carbon steel, concrete, plastics). Potential future third party risks resulting from the snagging of fishing gear or vessel anchors. See **Section 7.3**. There will be some minor "legacy" discharges as pipelines and umbilicals degrade, but these are small in volume and would rapidly disperse (see **Section 7.6**).
Post-decommissioning survey[D]																			
Post-decommissioning survey	D2			D2	D2	C2	D2		C2				D2	D3	D2			D2	The survey would include the use of noise generating equipment; including side-scan sonar and MBES and therefore contribute to overall KADP underwater noise, and the potential for impact on noise sensitive species. The physical presence of the vessel has the potential for interaction/disturbance through physical presence, of birds and marine mammal species, and other users of the sea. See **Sections 7.5 and 7.9**.
Relevant to Consent Applications 1 & 2																			
Socio-economic effects	D5																		Loss of *ca.* 60 permanent jobs (on- and offshore) and related contributions to local economy. Adverse effects on population and human health not considered likely given the job opportunities in the expanding economic base of County Cork and Ireland. Positive short term effect through provision of jobs associated with offshore decommissioning and terminal demolition work.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health [2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed [A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources [B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage [C]	Landscape/seascape	
Support and other vessels associated with the decommissioning																			
Presence in field of supply vessels, barge/ or heavy lift vessels.						C4	D4		C4				D4	D4	D4				Vessels will be present for a limited period of time, with much activity taking place in existing exclusion zones, limiting potential interactions with other users. There is the potential for interaction/disturbance through physical presence, of birds and marine mammal species. See **Sections 7.2** and **7.9**.
Transit of supply vessels, barge/ or heavy lift vessels, survey vessel and transport to shore	D4					C4	D4		C4				C4	C4	C4			D4	Vessels in transit have the potential to interact with other users and also generate temporary visual impacts. Vessels will follow established navigation routes. There is the potential for interaction with birds and marine mammals as above. See **Sections 7.2** and **7.9**.
Vessel positioning: Anchoring		C3								C3							C1		Limited anchoring envisaged, for example anchoring required for conventional HLV if used to remove platforms. Vessels will mainly use DP and therefore there will be limited seabed disturbance from anchor lay and catenary action of anchor chain. See **Section 7.4**.
Underwater noise from vessels including DP and rock placement				D4	D4	C4			C4										Vessels will contribute to overall KADP underwater noise, which has the potential to impact on noise sensitive species. See **Sections 7.5** and **7.9**.
Vessel and ancillary equipment power generation	D4											C4							Contributes to overall KADP atmospheric emissions, with the potential to impact local air quality and global greenhouse gas loading. See **Section 7.8**.
Drainage, sewage & other discharges			D4	D4							D4								Discharges from vessels will be subject to controls under MARPOL. No significant discharges. See **Appendix D**.
Litter					D4	D4				D4	D4								
Airborne noise and lighting	D4						D4											D4	Incremental lighting will be temporary and will not significantly add to existing lighting levels. Activity is concentrated at the Kinsale Head and Seven Heads locations at least 40km from shore. Helicopters will follow established routes. See **Appendix D**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health [2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed [A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources [B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage [C]	Landscape/seascape	
Potential for introduction of alien species in ballast, or as external fouling growth		C1	C1																Ballasting will be undertaken in keeping with Ballast Management Plans under the Ballast Water Management Convention. Applies to vessels and drilling rig. See **Appendix D**.
Onshore aspects of decommissioning offshore structures																			
Offloading of structures	C4													D4	D4			D4	Structures will be transported to established yards where dismantling will represent an increment to existing activity rather than a new type of activity. There is the potential for interaction with other users, and transient visual impacts, during transport to shore. See **Sections 7.2** and **7.7**.
Storage/Dismantling of structures onshore	C3											C3		D3				D3	Potential for minor incremental air quality effects from noise, dust, odour and visual intrusion, though note above that this would be incremental to ongoing activity. See **Sections 7.6** in relation to marine growth removal and **7.7**.
Refurbishment and reuse												E4		D4		E4			Minor positive effect from material reuse, offsetting use of primary raw material and avoiding waste to landfill. See **Section 7.7** and **7.8**.
Materials recycling												E4		C4		E4			
Onshore waste treatment												C3				C3			All represent a minor increment to waste handling and disposal at existing licenced facilities, and to the transport of such material to these sites for which there may be minor visual intrusion. Disposal of certain wastes may take place outside Ireland. See **Section 7.7**.
Landfill of residual waste																C3		C3	
Road transport of waste/materials	C4											D4						D4	
Hazardous materials	C4															C4			
Accidental events																			
Dropped objects	B2									B2			B2						Depending on their nature dropped objects could have localized impacts on the seabed and represent a hazard to other users. Debris clearance to take place as part of decommissioning operations. See **Sections 7.3** and **7.10**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Accidental releases to atmosphere (including refrigerants and natural gas from well blowout)												B1							The decommissioning of relevant equipment, recovery of for example refrigerants and their subsequent treatment or disposal will be carried out by appropriately certified persons and facilities. The possibility of a well blowout is extremely remote because of low reservoir pressures and the well control procedures to be in place. See **Section 7.10**.
Vessel collision	B1												B1	C1	B1				There will be limited increment in vessel traffic to the Kinsale Area during decommissioning which have the potential to interact with other users when in transit or on location. Vessels will display navigational lighting, guard vessels may be used for certain activities (subsea well decommissioning), and all activities will be communicated through Notices to Mariners. See **Section 7.10**.
Accidental spills of fuel/lubricants	C1	B1	B1	B1	B1	B1	B1		B1	B1	B1	C1	B1	B1	C1	C1			Major spills have the potential to interact with a wide range of environmental factors by their potential to spread some distance from source. The only potential source of a large spill as part of the KADP would be from the diesel tanks of the rig and large vessels such as HLVs. Appropriate handling and bunkering procedures would be in place to minimise the risk of accidental releases of fuels. See **Sections 7.9** and **7.10**.
Hydraulic fluid loss from subsea tools and equipment			D2	D2							D2								Hydraulic fluid usage will be monitored. See **Appendix D**.
Chemical spills		D2	C2	D2						D2	C2								Appropriate chemical handling and storage procedures will be in place. All chemicals chosen will be subject to a PUDAC. See **Section 7.10**.

Environmental factor	Population & Human Health[2]	Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC[3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect		Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Covered in site planning permission; not relevant to Decommissioning Plan consent applications																			
Onshore (decommissioning of Inch Terminal)																			
Lighting and noise associated with dismantling works	D4							D4										D4	No nighttime working. Closest human receptor approx. 200m from main site. Compliance with TII noise limits. Site of low ecological value. See **Appendix D**.
Vehicle emissions and dust	D2							D2				D2							Closest human receptor approx. 200m from main site. Site of low ecological value Approx. 11 HGV movements per day considered negligible impact Standard construction dust minimisation plan. See **Appendix D**.
Road transport of waste/materials	D3											D2							Surrounding road network lightly trafficked Approx. 11 HGV movements per day considered negligible impact Standard demolition management plan – designated traffic routes, timing and parking arrangements. Only permitted waste hauliers used. See **Appendix D**.
Materials recycling/recovery												D2				D2			Only appropriate permitted and/or licensed waste facilities used. Demolition Resource and Waste Management Plan – segregate at source, etc. See **Appendix D**.
Landfill of residual waste																D2		D2	Only appropriate permitted and/or licensed waste facilities used. Demolition Resource and Waste Management Plan – segregate at source, etc. Only residual waste to landfill. See **Appendix D**.

Environmental factor		Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC [3]								Land, soil, water, air, climate			Material assets, cultural heritage and landscape						Summary consideration
Activity/Source of Potential Effect	Population & Human Health[2]	Benthic Fauna	Plankton	Fish & Shellfish	Marine Reptiles	Marine Mammals	Waterbirds & Seabirds	Onshore habitats/species	Conservation sites/species	Soils & Seabed[A]	Water Quality	Air & climate	Fisheries/aquaculture	Other Uses & Resources[B]	Shipping	Waste Treatment & Landfill resource onshore	Cultural Heritage[C]	Landscape/seascape	
Reinstatement to original land condition	E5																	E5	Positive long term impact. See **Appendix D**. With regard to the onshore elements of the KADP, there will be no physical disturbance to the land around the pipeline and there will be no works at Inch Beach. All works on the terminal site will be confined to within the boundary of the site and no works will go below the depth of the existing development. This will result in no likely effects on existing onshore cultural heritage.

Notes:

A. Includes natural seabed features.

B. Includes amenity, cables, oil and gas, aggregate and other dredging, military, renewables etc.

C. Includes underwater archaeology and wrecks

D. Vessels which could be used under all decommissioning methods noted in Section 3.5 are considered separately under the heading, "Support and other vessels associated with the decommissioning"

6.3 Potential Effects to be Considered Further

The potential for significant effects were identified in relation to environmental factors for a number of KADP activities (**Table 6.2**). The major sources of potentially significant effect have been grouped against those decommissioning activities identified as likely to, directly or indirectly, affect one or more relevant environmental factors (and interactions between these). These have been listed by consent application in **Tables 6.3a and 6.3b,** and are described and assessed in detail in **Section 7**.

Appendix D includes a summary description and assessment of those activities/sources of potential effect (positive or negative) which are identified to be minor and negligible (also identified in **Table 6.2**). This includes all of those impacts identified for the Inch Terminal decommissioning.

The potential for cumulative or transboundary effects associated with the KADP are considered in **Sections 7.11** and **7.12**, taking into account the assessment made in **Sections 7.2-7.10** and **Appendix D** of all potential effects (significant, minor, negligible; positive and negative).

Table 6.3a: Consent Application 1: Potential significant environmental effects described and assessed in Section 7

Environmental Factor	Activity/Source of Potential Significant Effect	Relevant Section
a. Population and human health	**Physical presence: decommissioning operations**: physical presence in field and in transit of supply vessels, barge/or heavy lift vessels.	7.2
	Waste: materials recycling, reuse and disposal: Offloading and storage/dismantling of offshore structures onshore, road transport and hazardous material handling.	7.7
	Accidental events: dropped objects, vessel collision, accidental spills of fuel/lubricants.	7.10
b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;	**Physical presence: decommissioning operations**: physical presence in field and in transit of supply vessels, barge/ or heavy lift vessels.	7.2
	Physical disturbance: drill rig positioning and vessel anchoring. Mattress removal, cutting of spool pieces and umbilical jumpers and their subsequent removal. Removal of manifolds and wellheads.	7.4
	Underwater noise: mechanical cutting and removal of surface casings. Rig and vessel noise, including DP.	7.5
	Discharges to sea: cementing and other chemicals associated with well abandonment operations. Hydraulic fluid release during umbilical cutting.	7.6
	Accidental events: accidental spills of fuel/lubricants and chemical spills.	7.10
c. Land, soil, water, air and climate;	**Physical disturbance**: drill rig positioning and vessel anchoring. Removal of well conductors and surface casings, mattress removal, cutting of spool pieces and umbilical jumpers and their subsequent removal. Removal of manifolds and wellheads.	7.4
	Discharges to sea: cementing and other chemicals associated with well abandonment operations. Hydraulic fluid release during umbilical cutting.	7.6
	Waste: materials recycling, reuse and disposal: storage/dismantling of structures onshore, onshore waste treatment.	7.7
	Energy use and atmospheric emissions: power generation (rig and vessel).	7.8
	Accidental events: dropped objects, accidental releases to atmosphere (including natural gas blowout), accidental spills of fuel/lubricants and chemical spills.	7.10

Environmental Factor	Activity/Source of Potential Significant Effect	Relevant Section
d. Material assets, cultural heritage and the landscape;	**Physical presence: decommissioning operations**: physical presence of drilling rig and vessels	7.2
	Physical disturbance: drill rig positioning and vessel anchoring.	7.4
	Waste: materials recycling, reuse and disposal: solid and liquid wastes to shore, removal of hazardous materials, materials recycling, onshore waste treatment, landfill of residual waste/materials, hazardous material handling.	7.7
	Energy use and atmospheric emissions: materials recycling.	7.8
	Accidental events: dropped objects, vessel collision, accidental spills of fuel/lubricants.	7.10
the interaction between the factors referred to in points (a) to (d).	**Physical presence: decommissioning operations**: none identified.	n/a
	Physical disturbance: effects on supporting habitats of species.	7.4
	Underwater noise: disturbance of prey species of other animals (including those which are subject to legal protection).	7.5
	Discharges to sea: none identified.	n/a
	Waste: materials recycling, reuse and disposal: none identified	n/a
	Energy use and atmospheric emissions: though emissions are minor, their addition to greenhouse gas loading is relevant to the issue of climate change which is relevant to all environmental factors.	7.8
	Accidental events: effects on prey species of other animals (including those which are subject to legal protection), effects on fisheries resulting from effects on commercially relevant species, possible loss of tourism income.	7.10

Table 6.3b: Consent Application 2: Potential significant environmental effects described and assessed in Section 7

Environmental Factor	Activity/Source of Potential Significant Effect	Relevant Section
a. Population and human health	**Physical presence: decommissioning operations**: physical presence in field and in transit of supply vessels, barge/ or heavy lift vessels.	7.2
	Physical presence: legacy materials (left *in situ*): pipeline and umbilical exposure, pipeline and umbilical degradation	7.3
	Waste: materials recycling, reuse and disposal: Offloading and storage/dismantling of offshore structures onshore, road transport.	7.7
	Accidental events: dropped objects, vessel collision, accidental spills of fuel/lubricants.	7.10
b. Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;	**Physical presence: decommissioning operations**: physical presence in field and in transit of supply vessels, barge/ or heavy lift vessels.	7.2
	Physical disturbance: Vessel anchoring. Excavation of jacket piles/leg stump remediation and lift of jacket. Recovery of large items of debris from the seabed. Remedial rock placement.	7.4
	Underwater noise: cutting of jacket legs and structural members. Vessel noise, including DP. Rock placement. Post-decommissioning survey.	7.5
	Accidental events: accidental spills of fuel/lubricants and chemical spills.	7.10

Environmental Factor	Activity/Source of Potential Significant Effect	Relevant Section
c. Land, soil, water, air and climate;	**Physical disturbance**: vessel anchoring. Excavation of jacket piles/leg stump remediation and lift of jacket. Recovery of large items of debris from the seabed. Remedial rock placement.	7.4
	Discharges to sea: release of inhibited seawater from export pipelines.	7.6
	Waste: materials recycling, reuse and disposal: storage/dismantling of structures onshore, onshore waste treatment.	7.7
	Energy use and atmospheric emissions: power generation (vessels).	7.8
	Accidental events: dropped objects, accidental spills of fuel/lubricants and chemical spills.	7.10
d. Material assets, cultural heritage and the landscape;	**Physical presence: decommissioning operations**: physical presence of vessels.	7.2
	Physical presence: legacy materials: Pipeline degradation and exposure, including freespans (left *in situ*).	7.3
	Physical disturbance: Excavation of jacket piles/leg stump remediation, remedial rock placement, vessel anchoring.	7.4
	Waste: materials recycling, reuse and disposal: materials recycling, onshore waste treatment, landfill of residual waste/materials.	7.7
	Energy use and atmospheric emissions: materials recycling.	7.8
	Accidental events: dropped objects, vessel collision, accidental spills of fuel/lubricants.	7.10
the interaction between the factors referred to in points (a) to (d).	**Physical presence: decommissioning operations**: none identified.	n/a
	Physical presence: legacy materials: none identified.	n/a
	Physical disturbance: effects on supporting habitats of species.	7.4
	Underwater noise: disturbance of prey species of other animals (including those which are subject to legal protection).	7.5
	Discharges to sea: none identified.	n/a
	Waste: materials recycling, reuse and disposal: none identified	n/a
	Energy use and atmospheric emissions: though emissions are minor, their addition to greenhouse gas loading is relevant to the issue of climate change which is relevant to all environmental factors.	7.8
	Accidental events: effects on prey species of other animals (including those which are subject to legal protection), effects on fisheries resulting from effects on commercially relevant species, possible loss of tourism income.	7.10

KINSALE ENERGY

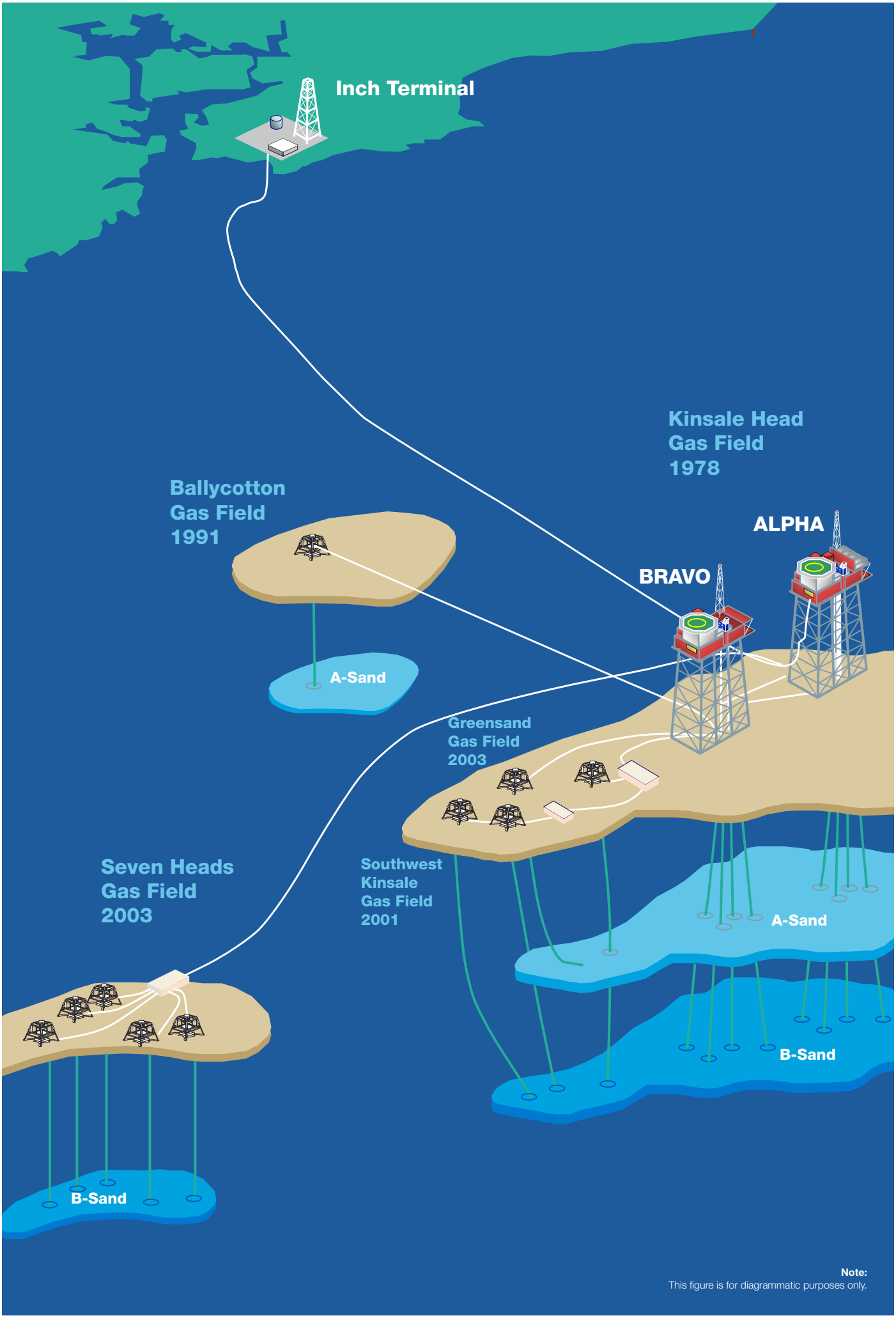
Kinsale Area Decommissioning Project

Section 7

Consideration of Potential Significant Effects

Hartley Anderson

ARUP


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.

7 Consideration of Potential Significant Effects

7.1 Introduction

The following section presents a description and assessment of those potential significant environmental effects identified in **Section 6**. The assessment has been undertaken on the basis of the chosen decommissioning alternatives, as described in **Section 3**. These include a worst case assessment (e.g. in terms of vessel timings and seabed interactions), such that those effects described below will not be exceeded, regardless of the final methodology selected.

The assessment makes reference to the relevant project consent application as appropriate, but concentrates on the effects of the project as a whole.

Environmental management actions (including proposed mitigation measures) and residual effects for the decommissioning activities are identified throughout the assessment and are summarised in **Section 8**.

7.2 Physical Presence: Decommissioning Operations

The key sources of physical presence effects associated with the decommissioning operations split by consent application are shown below, with reference to the relevant environmental factors detailed in the EIA Directive (see **Section 6.1**).

Facility	Activity/Source of Potential Effect	Relevant Environmental Factors
Consent Application 1		
Offshore facilities preparation	Presence in field of support/supply vessels, and transport to shore	*Population and human health; Biodiversity, Material assets, cultural heritage and the landscape*
Platform wells	Presence in field of support/supply vessels, and transport to shore	
Subsea wells	Physical presence of the drilling rig or LWIV Presence in field of support/supply vessels, and transport to shore	
Topsides removal	Presence in field of supply vessels, barge and HLV Transit of supply vessels, barge and HLV, and transport to shore of topsides	
Subsea structures	Physical presence in field and in transit of vessels, and transport to shore of subsea structures, protection materials, spool pieces and umbilical jumpers	
Consent Application 2		
Jackets	Presence in field of supply vessels, barge and HLV Transit of supply vessels, barge or HLV, and transport to shore of jackets, protection materials, spool pieces and umbilical jumpers	*Population and human health; Biodiversity, Material assets, cultural heritage and the landscape*
Pipelines and umbilicals	Physical presence in field and in transit of vessels, mainly rock fall-pipe vessel and post-decommissioning survey vessel	

The potential for effects from physical presence were identified in **Section 6** for the broad environmental factors; population and human health, biodiversity (including conservation sites and species) and material assets, cultural heritage and landscape (**Tables 6.3a** and **6.3b**). More specifically, the potential for effects was identified for fish, marine mammals and birds, other users of the sea (including fisheries, shipping and recreational boating) and landscape (and by association population and human health). A description and assessment of the potential effects is provided below.

7.2.1 Potential effects on other users

Regardless of the alternative methodologies selected to decommission the Kinsale Area offshore facilities, there will be rig, supply and other vessel presence/movements (e.g. HLV, barge, tugs, AHV, CSV, guard vessel, survey vessel), including when in transit and when operating within the Kinsale Area. The timing of vessel operations, by consent application, is outlined in **Section 3.5** and an overall project schedule is provided in **Section 1.6**. The decommissioning programme of works is expected to take 12-18 months to complete. However, these operations may not be continuous with an overall schedule of up to 10 years for all the work to be completed.

The physical presence of the vessels has the potential to affect other users of the sea through disruption of their activities, including shipping, fishing and recreational boating. The scale of the effect on shipping and recreational boating is limited by the nature of shipping traffic in the area (to/from Cork), the bulk of which passes to the northeast of the Kinsale Area (DCENR 2011, also see **Section 4.5**), and despite coastal waters being popular for recreational angling and sailing off the south of Ireland (**Section 4.5.8**), the Kinsale Area is beyond the daily operational radius of most such vessels from adjacent harbours such as Kinsale and Cork. Occasional yachts in passage are likely to be the only recreational vessel movements in the wider Kinsale Area and significant effects on these users is therefore not predicted. The Kinsale Area represents an area of high use and importance to Irish commercial fisheries (see **Section 4.5.3**). There are no foreseeable impacts or effects on military practice and exercise areas and International Maritime Organization ship routeing measures as there is no spatial overlap between KADP operations and these.

Potential effects on shipping and fishing activity are restricted to temporary spatial conflict, particularly in areas outside of existing exclusion zones, including when the vessels are in transit, and where vessels are involved in pipeline works (i.e. rock placement on exposed sections/freespans not within existing exclusion zones, and the post-decommissioning survey). All other activities are to take place within pre-existing surface or subsea exclusion zones (see **Section 3.2**) from which either shipping (surface zones) and fishing activity (surface and subsea zones) is prohibited. This includes platform (topsides and jackets) removal, well decommissioning (with the exception of previously abandoned wellhead removal, however statutory surface exclusion zones would apply for any rig involved in well decommissioning) and the removal of subsea structures. The jackets would retain 500m surface exclusion zones following topsides removal and implementation of “lighthouse mode” Aids to Navigation (AtoN) until their removal (within 1-10 years) under the second consent application. The potential for interactions with other users from jacket removal compared to their existing level of exclusion is limited to vessels in transit during removal operations.

Activity outside of exclusion zones (transit between subsea well locations for subsea well decommissioning, pipeline decommissioning for pipeline sections outside of exclusion zones and post-decommissioning survey) will represent a short-term increment in vessel presence (typically 3-6 vessels per operation) over that which the area normally receives through field operations (approximately one supply round trip every 28 days) and wider commercial shipping (see **Section 4.5.2**), and it is not considered that these minor and temporary impacts will result in a significant effect on other sea users.

Additionally, following decommissioning, former exclusion zones will be open to fisheries; initially an area of *ca.* 12.2km^2 on decommissioning of subsea structures (consent application 1) and a further *ca.* 0.2km^2 following jacket removal (consent application 2), representing a small increment in seabed area (in economic terms) which may be fished. Moreover, the removal of the topsides and jackets also removes these surface components of the Kinsale area facilities, and therefore any potential interaction with commercial or recreational shipping.

Visual intrusion from vessel presence will be limited to activities within viewable distance of the shore, which would only be associated with work on the export pipeline should any rock cover remediation be undertaken in the nearshore area (consent application 2), transiting vessels and shoreside offloading, storage and dismantling (following either consent application). There are locally important landscapes with which transiting vessels may interact (see **Section 4.7**) but this would be temporary, and minor within the wider context of existing moderate vessel traffic, and effects would not be significant. As noted above, the location of the offshore facilities are beyond the daily operational radius of most recreational angling and sailing vessels, however works may be visible from a small number of transiting yachts, though this is considered to be minor in the context of existing infrastructure and vessel presence, and the temporary nature of the works. The transport of materials to shore (including those from well abandonment, pipeline/umbilical and platform topside and jacket decommissioning) may be to yards beyond Irish waters, but the use of established yards would represent an increment to existing activity rather than a new type of intrusion affecting landscape or communities, and would therefore be within the normal scale of intrusion at such sites, such that effects are not considered to be significant.

7.2.2 Potential effects on sensitive species

7.2.2.1 Birds

The physical presence of vessels associated with the decommissioning activities may potentially cause displacement and/or other behavioural responses in birds (see **Section 4.4.6** for coverage of those considered). Most species from relevant Special Protection Areas (SPAs) within foraging range of the Kinsale Area have been judged to have a low to moderate sensitivity to disturbance by shipping traffic (e.g. gannet, fulmar, kittiwake, gulls, auks; Old Head of Kinsale SPA 25km distant; Saltee Islands SPA 116km distant; see Garthe & Hüppop 2004). Few SPAs designated for more sensitive species, e.g. divers, scoters which generally forage in coastal waters of ≤20m depth (Fox *et al*. 2003), are located near the Kinsale Area (e.g. Cork Harbour SPA and Courtmacsherry Bay SPA are between 37km and 42km distant from the KADP offshore works, see **Section 4.4.4.8**). Cork Harbour SPA is ~4km from the offshore export pipeline and contains cormorant, a coastal species judged to be highly sensitive to disturbance by shipping (Garthe & Hüppop 2004). However, the KADP will result in a small increase in vessel traffic within the Cork harbour and wider Kinsale Area and is anticipated to cause no more than temporary and localised disturbance, which is not predicted to result in significant effects. While rafting birds may move in response to vessels in transit, such effects are of low magnitude and short duration, and will represent negligible additional disturbance over routine vessel movements. Significant effects on bird species are therefore not considered to be likely.

7.2.2.2 Fish and marine mammals

In addition to potential disturbance to birds, the physical presence of the vessels may influence the distribution and movements of sensitive species in the water column, namely protected migratory fish and marine mammals. As hearing specialists, any displacement of marine mammals is most likely associated with acoustic disturbance, which is discussed in **Section 7.5**. There may also be responses from marine mammals and fish to the general physical presence of infrastructure and vessels (Sparling *et al.* 2015), along with the risk of collisions from vessels in transit.

Activities covered in the consent applications for the KADP will result in a small increase in vessel traffic within the wider Kinsale Area (typically 3-6 vessels per operation), being present during the programme of works over a 12-18 month period, though not necessarily continuously. The Kinsale Area is known to be frequented by several marine mammal species and its adjacent coast supports important habitat for migratory fish species (see **Sections 4.4.4-4.4.8**). However, the physical presence of the decommissioning activities, including large, slow-moving vessels around areas of existing activity, and the temporary presence of anchored barges/rigs, are anticipated to cause no more than temporary and localised low-level behavioural responses similar to those from normal operations, such that significant effects are not predicted.

7.2.2.3 Seabed habitats and species

The removal of the exclusion zones will result in an area being open to fisheries which was closed during field life (total area *ca.* 12.4km^2). Though pressures from fisheries (that is seabed disturbance from towed fishing gear) will be expected in these areas following their removal (as noted in Anatec 2017), the area is small relative to that widely fished in the Kinsale Area and Celtic Sea (see **Section 4.5.3**) and significant effects on seabed habitats and species are not considered to be likely. See Marine Institute & the Department of Housing, Planning and Local Government (2013) for a wider consideration of fisheries pressure in Irish waters.

7.2.3 Interactions between environmental factors

No foreseeable interactions were identified between the environmental factors for which potential effects associated with physical presence were identified in **Section 6** – see **Tables 6.3a** and **6.3b**.

7.2.4 Environmental management, mitigation and residual effects

The description and assessment of potential physical presence effects associated with decommissioning operations assumes that activities are undertaken in adherence to relevant legally required standards and controls, which include:

- Notices to Mariners will be issued to cover decommissioning work associated with each consent application to communicate the nature and timing of the activities to relevant other

users of the sea. Guard vessels or standby vessels will be used during well abandonment to monitor statutory 500m zones and minimise the potential for interaction between decommissioning vessels and other users.

- All vessels used in the decommissioning operations will meet applicable national and international standards (e.g. in terms of signals and lighting).
- Lighting and marking of the jackets if left in "lighthouse mode", for a period, will be agreed with the Commissioners for Irish Lights to establish new AtoN to be installed until their removal. An up to date Navigational Risk Assessment with traffic analysis will be undertaken to inform the Commissioners of Irish Lights to set the AtoN requirements, all lighting and marking will comply with IALA Recommendation 0-139 on the Marking of Man-Made Offshore Structures (2013), and Notices to Mariners will communicate the new lighting and marking arrangements (see **Section 3.5.2.3**).

No further specific mitigation measures in relation to physical presence were identified, and any residual negative effects of vessel presence (visual or physical, either on other users or biodiversity) are considered to be **minor and temporary**. Environmental management commitments 1, 3, 4 are relevant to this topic and are described in **Section 8.2**.

7.2.5 Summary and conclusion

The majority of the decommissioning operations covered in both consent applications will be focussed in areas from which other vessels are already excluded (particularly fisheries) and therefore disruption of other vessels is only likely during transit and transport to shore of materials (consent applications 1 and 2), the decommissioning of previously abandoned subsea wells (consent application 1), and for pipeline works and post-decommissioning survey (consent application 2). The increase in vessel traffic associated with the decommissioning operations will be minor and temporary, and following the completion of decommissioning work, existing exclusion zones around subsea and surface structures will be opened to fisheries and shipping.

The nature of effects on other users is predicted to be minor and temporary, and no additional project-specific mitigation has been identified. Significant effects on marine fauna or sensitive bird species are not predicted.

7.3 Physical Presence: Legacy Materials Left *In Situ*

There are a number of aspects of the proposed decommissioning operations, which will result in legacy materials being left *in situ* with the potential for longer term effects.

The key sources of potential effect associated with legacy materials left *in situ* are shown below with reference to the relevant environmental factors detailed in the EIA Directive (see **Section 6.1**). These are long-term impacts following decommissioning, and relate to the activities proposed as part of consent application 2.

Facility	Activity/Source of Potential Effect	Relevant Environmental Factors
Pipelines and umbilicals	Third party interaction with pipelines when left *in situ*	*Population and human health; Material assets, cultural heritage and landscape*
	Long term degradation	
	Grout filling on onshore section of pipeline	
Jackets	Potential presence of jacket leg "stumps" if cutting below seabed level is not possible	

The potential for effects from physical presence of legacy materials were identified in **Section 6** for the broad environmental factors; population and human health, and material assets, cultural heritage and landscape (**Tables 6.3a and 6.3b**). More specifically, the potential for effects was identified for other users of the sea (fisheries and shipping), in terms of third party risks from leaving material *in situ*. Note that legacy discharges from pipelines and umbilicals (i.e. those which may take place gradually some time after decommissioning,

resulting from losses from the open ends of pipelines/umbilicals, or as pipeline/umbilicals degrade) are considered in **Section 7.6**, Discharges to Sea. A description and assessment of these potential effects is provided below.

7.3.1 Potential effects associated with legacy materials: pipelines & umbilicals

Bottom trawling close to subsea facilities carries the risk of fishing gear snagging with potential loss of gear, or in extremely remote circumstances, the vessel. Snagging is considered to be the main potential effect of leaving the pipelines and umbilicals *in situ*. Vessels fishing the seabed include demersal trawlers, beam trawlers and dredgers, which make up almost half of all fishing vessels using the Kinsale Area (see **Section 4.5.3**). Snagging occurs when the trawl gear becomes "stuck" under the pipeline and this is most likely to occur where freespans have developed between the seabed and the pipeline, creating potential snags for trawl otter boards (of wood and/or steel and up to 1.5 tonnes each) used to hold open a demersal trawl net.

As noted in **Section 3.4.6**, the pipelines and umbilicals were subject to a Comparative Assessment (CA), a systematic review of safety, environmental, technical, social and cost criteria against a series of decommissioning options (alternatives). The preferred decommissioning option for the pipelines and umbilicals involves leaving these *in situ* with rock cover used to remediate freespans and pipeline ends, including over any concrete mattresses left on the remaining pipeline end sections to reduce future risks to third parties.

An alternative option to apply rock cover to all exposed sections of the pipelines and umbilicals (noting that the interfield pipelines are already largely buried, see **Section 3.2**) is also considered in this assessment in view of the conclusions of the CA that additional rock placement could be preferable for certain pipelines to further reduce 3rd party risks (see **Section 3.5.4,** and also **Section 3.2** which details the burial status of the pipelines). Note, this option would also have incremental effects on other environmental factors including biodiversity (from seabed disturbance, see **Section 7.4**) and land, soil, water, air and climate (from atmospheric emissions, see **Section 7.8**).

There have been two instances of anchors from large vessels dragging the 24" export pipeline in the vicinity of an area used for anchorage outside of the limits of the Port of Cork Authority (see **Section 4.5.2**). These occurred in 1994 and 2017 and rectification works have been undertaken. Vessel monitoring arrangements have been put in place with the Cork Port Authority while the pipeline remains operational. The risks to large vessels anchoring following decommissioning are considered to be remote as the pipeline will be gas free and filled with inhibited seawater.

7.3.1.1 Third party risk: fisheries

A fisheries study (Anatec 2017) was commissioned to understand the present level, type and crossing frequency of fishing activity within 10nm of the Kinsale Area subsea infrastructure. The study considered the fisheries activity against the current baseline situation (i.e. pipeline type and burial status as recorded in the most recent 2017 inspection survey) and a series of options broadly comparable to those being considered in this EIAR and in the CA.

The study used Automatic Identification System (AIS) data covering 18 months (April-September 2014 and May 2015-April 2016), with validation using Vessel Monitoring System (VMS) data[4]. The data was considered representative of current fishing activity for vessels meeting the requirements to carry AIS or VMS systems (those over 15m and 12m in length respectively). Fishing activity is dominated by demersal and pelagic trawlers, and gill netters, with the majority of the demersal vessels in the 20-23m size range. Vessels under 15m registered to south coast ports were factored into the analysis through consideration of vessel capabilities with respect to bottom trawling and the distance of their home port from the Kinsale area.

An estimation of snagging risk for each pipeline and decommissioning option, expressed as Potential Loss of Life (PLL), was made based on crossing frequency of the infrastructure, angle of crossing, and data relating to

[4] AIS refers to the vessel tracking system which is a requirement under International Maritime Organisation (IMO) regulations for all ships of >300 gross tonnage engaged on international voyages, all cargo ships of >500 gross tonnage and all passenger ships irrespective of size. Council Regulation 1224/2009 places a requirement on fishing vessels >15m to use AIS. VMS refers to a vessel tracking system specific to EC fisheries, and is presently required on vessels >12m in length.

the risk of accidents or fatalities from fishing gear snagging incidents on the UKCS. PLL represents the total risk associated with fishing activity on a particular pipeline, and is expressed as an annual fatality frequency.

The following two sections describe and assess the risk and effect from decommissioning large pipelines, and small pipelines and umbilicals respectively. The PLL frequencies for the various pipelines are presented in **Tables 7.1a** and **7.1b** which display the figures for the following cases:

- Base Case: The base case figures represent the current situation and include fishing exclusion zones in place (around the Kinsale Head Alpha and Bravo platforms, around the South West Kinsale and Western Drill Centre, the Ballycotton well, and Seven Heads manifold and subsea wells).
- Removal of Exclusion Zones: these figures represent the change in risk levels due to the effect of removing the exclusion zones, which would open the areas up to fishing.
- Decommissioning Options: these figures show the risk levels following implementation of rock placement options.

A subsequent Fishing Risk Assessment study (Anatec 2018) estimated the risk to fishermen in terms of Individual Risk Per Annum (IRPA) for each of the large diameter pipelines. These values are dependent both on the PLL described above, and on the number of fishermen exposed to the hazards (i.e. the decommissioned pipelines). The number of fishermen exposed was calculated taking into consideration the type of vessels and typical crew numbers for those vessels related to the crossings used to calculate the PLL values. Note that the average IRPA will vary for fishermen on different vessels. In addition, the IRPA values relate to a particular sea area and hazard (i.e. pipelines) and that the same fishermen will be exposed to other hazards during the course of their working year which are not considered in these calculations. The IRPA results are presented in **Table 7.1a**.By definition, the risk to any single individual in a year (IRPA) will be significantly lower than the PLL.

Large pipelines

Referencing the PLL data in Table 7.1a, the risk associated with the inter-platform pipelines was estimated to increase significantly following removal of the exclusion zones, without any remediation, due to the limited existing protection of these pipelines. The decommissioning options considered would reduce the risk levels, albeit with a more variable impact than for the smaller pipelines and umbilicals, due to the varying degrees of exposure and the presence of freespans on some but not all pipelines.

The preferred option of pipeline end and free span remediation would reduce PLL levels to between $2.66x10^{-4}$ to $1.29x10^{-3}$ compared to the baseline scenario following removal of the exclusion zones for all pipelines. Risk reduction for the 18” Seven Heads export pipeline however does not change. This can be accounted for by a lack of freespans on the 18” export pipeline to remediate which otherwise reduced PLL values for the other pipelines. The decommissioning option to rock cover all exposed sections of the 18” Seven Heads export pipeline would reduce the PLL further to $4.95x10^{-4}$.

Average IRPA values range from $3.2x10^{-7}$ (less than one in three million) for the option to rock cover the ends and all exposed sections of the 12” inter-platform pipeline, to $8.1x10^{-6}$ (less than one in one hundred thousand) for the option to rock cover pipeline ends and freespans for the 18” export pipeline. As the IRPA values are averages, they will vary for fishermen depending on the vessel (e.g. one which fishes for a longer duration over a particular pipeline). Due to the nature of fishing activity over the 18” and 24” export pipelines (single individual vessels fishing for longer periods and therefore accounting for a substantial portion of the overall risk), “worst case” IRPA figures have been calculated for the 24” and 18” export pipelines. These range from a minimum of $3.9x10^{-6}$ for the option to rock cover the ends and all exposed sections of the 24” export pipeline to a maximum of $6.6x10^{-5}$ for the option to rock cover pipeline ends and freespans for the 18” Seven Heads export pipeline. Risks were more evenly distributed between vessels for the inter-platform pipelines.

Either decommissioning methodology will result in reductions in the risk (expressed either as PLL or IRPA) associated with the pipelines and umbilicals such that the potential risk of significant effects on fisheries is remote. The 18” Seven Heads export pipeline however requires the option to rock cover all exposed sections to generate further risk reduction, due to the lack of freespans on this line.

Table 7.1a: PLL and IRPA results for surface laid pipelines and proposed decommissioning options

Pipeline	Fishermen exposed*	Base case PLL	Removal of exclusion zones PLL	Decommissioning options considered by Anatec (2017, 2018)			
				Pipe ends and freespans rock covered		All exposed sections rock covered	
				PLL	Average IRPA	PLL	Average IRPA
12" Inter-platform	96	$4.34x10^{-7}$	$4.05x10^{-4}$	$2.78x10^{-4}$	$2.9x10^{-6}$	$3.06x10^{-5}$	$3.2x10^{-7}$
24" Inter-platform	96	$2.32x10^{-6}$	$3.90x10^{-4}$	$2.66x10^{-4}$	$2.8x10^{-6}$	$3.97x10^{-5}$	$4.1x10^{-7}$
18" Seven Heads export	160	$1.09x10^{-3}$	$1.30x10^{-3}$	$1.29x10^{-3}$	$8.1x10^{-6}$	$4.95x10^{-4}$	$3.1x10^{-6}$
24" Export	156	$8.86x10^{-4}$	$9.05x10^{-4}$	$6.03x10^{-4}$	$3.9x10^{-6}$	$1.03x10^{-4}$	$7.0x10^{-7}$

Source: Anatec (2017, 2018)

Note: for the purposes of calculating IRPA.*

Small pipelines and umbilicals

A summary of the PLL frequencies for the smaller pipelines (8-12") and umbilicals which are currently buried or rock covered, is given in **Table 7.1b**. For the smaller diameter pipelines, the base case PLL figures presented are lower than for the larger diameter pipelines due to the shorter lengths and reduced exposure of these lines.

Following decommissioning, it is anticipated that there would be a minor increase in fishing activity within former exclusion zones, reflected in slightly increased PLL figures for some pipelines if no remedial options are implemented. However, the PLL figures following implementation of the preferred or alternative decommissioning options would be very low, ranging from $9.53x10^{-7}$ to $1.06x10^{-4}$.

Table 7.1b: PLL results for smaller well protected pipelines and decommissioning options

Pipeline	Base case	Removal of exclusion zones	All exposed sections rock covered
12" South West Kinsale	$1.69x10^{-5}$	$2.99x10^{-5}$	$2.06x10^{-5}$
12" Western Drill Centre	$4.64x10^{-7}$	$5.52x10^{-6}$	$4.11x10^{-6}$
10" Greensand	$1.63x10^{-5}$	$2.81x10^{-5}$	$1.94x10^{-5}$
10" Ballycotton	$5.79x10^{-5}$	$7.20x10^{-5}$	$2.36x10^{-5}$
10" Ballycotton umbilical	$9.29x10^{-5}$	$1.06x10^{-4}$	$8.08x10^{-5}$
8" Seven Heads well 48/24-5A (A)[1]	$5.31x10^{-6}$	$5.31x10^{-6}$	$2.00x10^{-6}$
8" Seven Heads well 48/24-6 (B)	$9.53x10^{-7}$	$9.53x10^{-7}$	$9.53x10^{-7}$
8" Seven Heads well 48/24-8 (D)	$1.33x10^{-5}$	$1.33x10^{-5}$	$3.93x10^{-6}$
8" Seven Heads well 48/24-9 (E)	$9.36x10^{-6}$	$9.36x10^{-6}$	$1.51x10^{-6}$
8" Seven Heads well 48/23-2 (F)	$2.26x10^{-6}$	$2.26x10^{-6}$	$2.26x10^{-6}$

Source: Anatec (2017)

Note: [1]letters refer to the notation used in Anatec (2017) to allow for cross referencing

Comparing the range of PLL figures in **Table 7.1b** for small diameter pipelines to the PLL figures for the decommissioning options for larger diameter pipelines in **Table 7.1a**, it is evident that the IRPA to fishermen associated with the smaller diameter pipelines is lower (less risk) than that calculated for the large diameter pipelines.

Vessel Anchoring

In addition to fisheries, the two anchor snagging incidents associated with the 24" export pipeline noted above reflect the use of an inshore area to the west of the pipeline as an anchorage by large vessels waiting to berth. Whilst the application of rock cover in the area may deflect some anchors, this is not likely to be effective against embedded anchors[5]. The pipeline is a well charted feature, having been installed in 1977, and Admiralty Charts (sheet 1765) indicate that it is not advised to anchor or trawl in proximity to such pipelines. The risks to large vessels anchoring following decommissioning are assessed to be remote as the pipeline will be gas-free and seawater filled.

Other potential future uses in the area have also been identified, particularly subsea cables (see **Section 7.11**). Awareness will be raised about the proposed pipeline decommissioning options with relevant stakeholders which will include relevant marine authorities and fisheries organisations.

7.3.1.2 Offshore pipeline and umbilical degradation

The Kinsale Area pipelines and umbilicals are constructed of non-toxic and relatively inert materials (carbon steel, concrete, plastics). Carbon steel pipelines degrade at very low rates once cathodic protection has expired, at between 0.05-0.1mm/year when exposed directly to seawater or 0.01-0.02mm/year when buried, such that corrosion and collapse of the pipeline would likely take centuries (OGUK 2013). Where protective coatings are used, the degradation period may be longer; the coatings on the Kinsale Area pipelines variously include coal-tar epoxy and concrete, 3LPP and FBE (see **Table 3.4**).

OGUK (2013b) indicates that the primary source of degradation of the concrete coatings following decommissioning is likely to be internally from pipeline steel corrosion, and similarly, 3LPP coatings have a low degradation rate (1.1-10% breakdown over 30 years); polymers associated with these are likely to be persistent in the marine environment because of very slow degradation rates, though are non-toxic.

The potential for buried or rock covered pipelines in the Kinsale area to become exposed and to pose a risk to, for example towed fishing gear, is deemed minimal given that the degree of exposure of such pipelines has not changed significantly since their initial burial or rock covering.

The umbilicals contain polymers, including PP and PVC, steel in the form of armour wires and copper wire cores. The polymers and copper are highly resistant to degradation and corrosion, and the key mechanisms for the degradation of polymers (e.g. thermal, photodegradation, microbial biodegradation and mechanical damage) are limited as the umbilicals are buried in the seafloor (e.g. see Andrady 2015 and OGUK 2013b). The steel armour wires will degrade when exposed to seawater, and where this happens complete degradation within approximately 70 years is estimated.

The degradation of the pipelines and umbilicals (over decades to centuries) will eventually lead to minor releases of inhibited seawater, surfactants from pipeline cleaning or hydraulic fluid from umbilicals; this is assessed in **Section 7.6**, Discharges to Sea.

7.3.1.3 Onshore pipeline: grout filling

The onshore pipeline will be left *in situ* and initially filled with inhibited seawater as part of offshore preparatory works to maximise its potential for a possible future use; alternatively it will be filled with grout, see **Section 3.5.4.2**. When the pipeline is filled with inhibited seawater, this will be pumped through the pipeline from Kinsale Alpha, and the pipeline will be mechanically isolated at each end.

In the event that no re-use option for the pipeline is identified during the timeframe of decommissioning, any inhibited water would be discharged offshore (this would be a gradual release rather than a pressurised discharge **Section 7.6**) and the onshore section of pipeline will be filled with grout from within the terminal site,

[5] HSE (2009). Guidelines for pipeline operators on appropriate measures to protect against anchor damage.

with the grout transported in by road. No activity will take place within the footprint of the onshore pipeline section outside of the terminal area, and there are no foreseeable significant effects associated with its decommissioning.

7.3.2 Jacket legs

As indicated in **Section 3.5.2**, it is planned that the platform jackets will be cut from the pile foundations at seabed level using an internal pile cutting tool, however, in the worst case where internal cutting is not possible a short (< 1m) section of platform structure may be left exposed, and rock cover would be applied to reduce the potential for effects that could result from interaction of the remaining stumps with other sea users, including the snagging of fishing gear. For the purposes of the assessment, the worst case is that none of the legs can be cut internally resulting in eight short leg sections being left exposed at each jacket location. Rock cover remediation applied to each exposed leg section is likely to result in a small mound of *ca*. 1.5m in height and 6m diameter, occupying an area of *ca*. 60m^2. The worst case scenario will therefore result in eight rock mounds under each platform occupying 480m^2 (~0.0005km^2).

The risk associated with the small sections of the platform legs that might remain under a worst case platform removal scenario were not assessed as part of the Anatec report. However, given their location, appropriate rock cover remediation and small seabed footprint they are considered to represent a low level of risk (see **Table 7.1a**) and there is no foreseeable significant effect.

7.3.3 Interactions between environmental factors

No foreseeable interactions were identified between the factors for which potential environmental effects from the physical presence of legacy materials were identified in **Section 6** – see **Tables 6.3a** and **6.3b**.

7.3.4 Environmental management, mitigation and residual effects

It is planned that rock cover remediation will be used to reduce the potential snagging risk associated with decommissioning pipelines and umbilicals left *in situ* (see **Section 7.3.1.1**) or with any potential protruding jacket leg stumps. The following measures will be implemented as part of the rock placement programme:

- The remediation of all pipeline/umbilical end sections and freespans using overtrawlable rock berms, with the option to rock cover all exposed pipeline sections to further reduce risks to third parties.
- Accurate rock-placement will be assured by the use of an ROV-guided fall pipe system on the rock-placement vessel.
- On-going consultation with fisheries representatives and maritime authorities.
- All infrastructure decommissioned in situ will be surveyed post-decommissioning to accurately record their location and status. This information will be included on navigational charts and also passed to representatives of the fishing community.
- Standard overtrawling surveys will also be undertaken where wellheads, spoolpieces etc., are removed to confirm the area is clear of debris and snagging hazards.

While all risk cannot be eliminated from leaving material *in situ*, the potential for significant negative effects on fisheries from legacy materials left *in situ* following the proposed decommissioning options, including mitigation, is assessed to be **minor, and significant residual effects are not predicted**. See environmental management commitments 1, 3, and 10, and mitigation measures 2 and 3 in **Section 8.2**.

7.3.5 Summary and conclusion

The Kinsale Area pipelines have been present on the seabed for between 14 and 40 years, are charted features, and to date there have been few offshore shipping related incidents (none resulting in vessel damage), and no fisheries related incidents. It has been estimated that the risk of snagging by fishing gear (expressed in PLL values above) can be reduced on decommissioning through the remediation of all

pipeline/umbilical end sections and freespans using rock cover, with the option to rock cover all exposed pipeline sections needed to further reduce risk relating to the 18" Seven Heads export pipeline. The potential for significant effects on fisheries from legacy materials left *in situ*, following this mitigation, is assessed to be remote, and significant effects are not predicted. In the event that the jacket legs cannot be cut at the seabed, remedial rock placement would also be undertaken to mitigate the risk of these becoming a snagging hazard.

No significant environmental effects have been identified as a result of the gradual degradation of the legacy materials left *in-situ* over time.

The mitigation measures have been identified as part of project alternative considerations and therefore have been built into the options considered in the assessment (i.e. the application of rock cover to remediate areas of umbilical and pipeline to reduce risks to other users).

7.4 Physical Disturbance

The key sources of physical disturbance associated with the decommissioning operations split by project consent application are shown below with reference to relevant environmental factors detailed in the EIA Directive (see **Section 6.1**).

Facility	Activity/Source of Potential Effect	Relevant Environmental Factors
Consent Application 1		
Platform wells	Seabed disturbance from removal of conductors	*Biodiversity; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape.*
Subsea wells	Seabed disturbance from removal of conductors Seabed disturbance from drilling rig positioning	
Topsides removal	Seabed disturbance from vessel positioning: Anchoring	
Subsea structures	Seabed disturbance generated by removal of manifolds and wellhead protection structures, mattress removal, cutting and removal of pipeline spool pieces & umbilical jumpers (including at manifolds and valve skids).	
Consent Application 2		
Jackets	Seabed disturbance generated by mattress removal, cutting and removal of pipeline spool pieces & umbilical jumpers Seabed disturbance from excavation of piles/remediation of any stumps, lift of jackets and vessel anchoring Seabed disturbance from recovery of large items of debris post jacket removal, if identified during the post-decommissioning survey	*Biodiversity; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape.*
Pipelines and umbilicals	Seabed disturbance generated by remedial rock placement on freespans/exposed areas	

The potential for effects from physical disturbance were identified in **Section 6** for the broad environmental factors; biodiversity (including conservation sites and species), land, soil, water, and air and climate and material assets, cultural heritage and the landscape (**Tables 6.3a** and **6.3b**). More specifically, the potential for significant effects was identified for benthos, and soils and seabed with minor or negligible effects relevant to water quality and water column fauna (e.g. from sediment re-suspension). A description and assessment of these potential effects is provided below.

7.4.1 Potential effects associated with physical disturbance

7.4.1.1 Anchoring

Anchors will be used for the positioning of the semi-submersible rig over subsea wells, and also should an anchored HLV be selected for topsides and jacket removal. An indicative anchoring scenario for each of these vessels is 8-12 anchors with the number used and arrangement pattern subject to a detailed mooring study. Each will produce a linear scar on installation in the order of 50m length, with additional disturbance

generated by surface scrape as a result of catenary contact of the anchor chain with the seabed. The total seabed area affected by semi-submersible anchoring is partly a function of water depth, for example an area of seabed 0.032km^2 was affected by anchoring a rig in ~140m of water (see BP 2010). The area to be affected at each deployment of the rig would be less than the above given the depths over the wells to be plugged and abandoned (*ca.* 90-100m). There are 10 subsea wells that may be decommissioned using a mobile drilling rig (refer to **Section 3.5.1**), which given their relative location is likely to require 8 rig moves (the rig can skid between the Southwest Kinsale and Greensand wells, and those at the Western Drill centre), and therefore a total physical footprint in the order of 0.26km^2 is expected. The footprint of anchoring the HLV will be considerably smaller (*ca*. 0.13km^2) given the need for up to 2 anchor placements at each of the KA and KB platforms for topsides and jacket removal, split between activities relating to both project consent applications.

7.4.1.2 Subsea structure removal

The *in situ* pipeline decommissioning options assume that concrete mattresses and grout bag materials are removed only when necessary to allow access to the tie-in facilities (e.g. to subsea structures and jackets) and to remove related pipeline spool pieces or umbilical jumpers underneath. Where mattresses or grout bags remain under or on top of pipeline or umbilicals sections which are not proposed to be removed, these will be left in place and remediated with rock cover. It is estimated that approximately 445 concrete mattresses will be removed across the Kinsale Area, 134 at the jackets and 311 at all other subsea structures (see **Sections 3.5.2.3 and 3.5.3.1**). The four kennel-type protection structures (assumed dimensions of 5x3m) which form a 20m tunnel over the Ballycotton tree tie-in spools will also be removed. Based on the largest mattress size (6x3m) and a contingency buffer of 2m around each mat (including kennel-type structures) to account for potential disturbance during their removal, an estimated seabed area of *ca*. 0.031km^2 will be disturbed during their removal.

Sections 3.5.2.3 and 3.5.3.1 indicate that for the purposes of assessment, spoolpiece and umbilical jumper sections will be recovered from a total distance of *ca*. 100m from platforms and 50m from all other subsea structure tie-ins. It is estimated that approximately 1.5km of pipeline will be recovered and if a contingency buffer of 3m either side of the pipeline is included, an estimated seabed area of *ca*. 0.009km^2 will be disturbed during their recovery.

The cutting and removal of tie-in spools and umbilical jumpers at the manifolds and platforms is likely to occur within the seabed area previously occupied by the concrete mattresses which protected them. Therefore, significant additional physical disturbance associated with their removal is unlikely.

Section 3.5.3 describes the subsea structures (e.g. manifolds, valve skids, wellhead protection structures) to be decommissioned and from information in **Table 3.6**, the total seabed area physically disturbed by the removal of the subsea structures and the associated concrete protection blocks would be *ca*. 0.0027km^2 (assuming a 3m contingency buffer around each structure to account for potential disturbance during their removal). If a 3m contingency buffer is also added to each of the other subsea wellheads to be decommissioned (i.e. those not protected by wellhead protection structures, but for which the wellheads and related surface casings will be removed), the total area of seabed disturbance would not increase appreciably (approximately 0.003km^2).

7.4.1.3 Jacket removal

The removal of the platform jackets will cause some seabed disturbance primarily within their physical footprint. Based on a contingency buffer of 3m around each jacket, it is estimated that a seabed area of up to *ca*. 0.008km^2 will be disturbed during their removal. This area is taken to cover any excavation that could be required associated with the cutting of jacket leg/piles should an internal cutting tool not be able to reach the seabed (see **Section 3.5.2.3 and 7.3.1**), and that which will be disturbed by the removal of platform conductors and related casings.

Following removal of the jackets, and informed by the post-decommissioning survey (see **Section 3.5.5**), any large items of debris located on the seabed will be removed using an ROV and grab. The removal of such items will represent a minor increment to seabed disturbance generated during jacket decommissioning.

7.4.1.4 Rock cover

As described in **Section 3.5.4.1**, rock cover remediation proposed as part of the *in situ* decommissioning options is estimated to impact between 0.023-0.312km^2 depending on the option selected (see **Table 7.2**).

Table 7.2: Seabed area affected by rock cover remediation associated with proposed *in situ* decommissioning options

Pipeline	Seabed area (km^2) affected by rock cover remediation	
	Pipe ends and freespans	All exposed sections
24" export pipeline	0.010	0.192
24" KA to KB pipeline & 12" KA to KB Pipeline	0.003	0.047
12" SW Kinsale pipeline & 12" Western Drill centre & 10" Greensand & 10" Ballycotton & all associated umbilicals	0.003	0.009
Seven Heads 18" export pipeline and main control umbilical	0.002	0.060
Seven Heads 8" flowlines & umbilicals to wells	0.005	0.005
Total (km^2)	**0.023**	**0.312**

Source: based on Fugro (2017)

7.4.1.5 Total seabed area affected

In light of the information presented above, it is estimated that decommissioning operations could collectively cause direct physical disturbance to between 0.46-0.75km^2 of seabed (**Table 7.3**), which represents 0.04-0.06% of the currently leased area (Petroleum Lease No 1 and Seven Heads) shown in **Figure 1.1**. Rig and HLV anchoring represents the largest potential source of impact (0.39km^2, or 51-85% of the total seabed area impacted depending on which pipeline decommissioning option is selected).

Table 7.3: Total seabed area estimated to be affected by decommissioning operations

Decommissioning operation	Estimated seabed disturbance (km^2)	
Relevant to consent application 1		
Anchoring of rig	0.256	
Removal of platform topsides (HLV anchoring)	0.064	
Spool pieces and umbilical jumpers recovered from distance of 100m from platforms and 50m from subsea structures	0.009	
Removal of concrete mattresses	0.031	
Removal of subsea structures	0.003	
Relevant to consent application 2		
Removal of platform jackets (HLV anchoring and disturbance from lift)	0.072	
Pipeline and umbilical decommissioning options	**Pipe ends and spans**	**All exposed sections**
Rock placement remediation	0.023	0.312
Total for both applications (km^2)	**0.458**	**0.747**

7.4.2 Assessment of effects

Physical effects of seabed disturbance may include mortality to benthic fauna as a result of physical trauma, smothering by re-suspended sediment, and habitat modification due to changed physico-chemical characteristics, including from the introduction and removal of hard substrates.

Anchor scars will be formed by the placement of a rig or HLV, but these are not expected to be persistent features with rapid recovery of the seabed habitat through natural mobility of the sandy/gravelly sediment. A combination of sediment type (sand and gravel thinly overlaying chalk bedrock), and weak to moderate near bottom water currents together with oscillatory currents during storm events, would cause periodic mobilisation of surface sediments which will infill the anchor scars over time.

Similarly, seabed habitats are expected to recover rapidly from the limited extent of surface abrasion associated with the removal of concrete mattresses and subsea structures, and also disturbance from removal of the jackets and wellheads.

Any sediment resuspension into the water column during anchoring, or on removal of protection material, pipeline ends/spools or wellheads would be expected to be short-lived and with rapid resettlement.

The duration of effects on benthic community structure are related to individual species' biology and to successional development of community structure. The majority of seabed species recorded from the European continental shelf are known or believed to have short lifespans (a few years or less) and relatively high reproductive rates, indicating the potential for rapid population recovery, typically between 1 to 5 years (Jennings & Kaiser 1998), such that any effect will be temporary. The relatively impoverished heterogeneous benthic habitats of the area reflect the dynamic nature of the sedimentary environment; such habitats have a low sensitivity to physical damage at the scale predicted. Moreover, multiple seabed surveys have reported no indication of Annex I or other sensitive habitats or species present. In all cases, the scale of changes to the seabed and its fauna are such that effects on higher trophic levels (e.g. fish and marine mammals), and any related effect on species of commercial interest are not predicted.

Surveys of the Seven Heads field and along the pipeline route to the Kinsale Head field reported well-developed fauna on hard substrates (Hartley Anderson 2003) and considerable marine growth is present on jacket structures. It can be expected that all introduced hard substrates (i.e. wellhead infrastructure, pipelines and protection materials) support epifaunal assemblages of various densities and compositions. While removal of these items will remove their associated fauna, this will represent the return of the area to conditions more representative of its natural state, and effects are predicted to be minor.

It is estimated that between 7,300m^3 and 84,900m^3 of rock cover remediation may be required over a seabed area of up to 0.3km^2 (representing 0.027% of the currently leased area) depending on the *in situ* decommissioning option (**Section 3.5.4**). Previous rig site and pipeline route surveys as well as the most recent 2017 survey indicate that the existing areas of rock cover and exposed concrete pipe have been colonised by a wide range of epifaunal species. It is likely that further introduction of hard substrate on the scale estimated will result in the modest expansion of these existing communities rather than the introduction of communities not already present in the area.

A common concern during the decommissioning of offshore facilities is the potential disturbance to the seabed associated with displacement of accumulated drill cuttings. Oil based drilling muds were not generally used in the drilling of wells in the Kinsale Area, and none were discharged, with all material being returned to shore. The seabed mapping undertaken in 2017 has shown cuttings piles are absent in the Kinsale Area. It is therefore considered that in the absence of historical OBMs discharges, there is no potential for persistent contamination of sediments in the Kinsale Area from cuttings. The 2017 pre-decommissioning survey results do not indicate accumulations of fine sediments at the base of the platforms or subsea wells associated with the discharge of drill cuttings. Consequently, decommissioning activities will not result in the resuspension of drill cuttings, contaminated or otherwise, or potential smothering of adjacent seabed habitats, and there are therefore no foreseeable effects.

A number of historic wrecks are known to be present in the vicinity of the Kinsale area, the closest of which is the U-boat UC42 lying 200m from the export pipeline, 5.5km south east of Roches Point. Other prehistoric or archaeological remains are not known to occur in the Kinsale Area (following extensive surveys). The decommissioning works will take place largely within the original footprint of disturbance of the wider Kinsale area field developments, and therefore significant effects on cultural heritage are not considered to be possible.

7.4.3 Interactions between environmental factors

Potential interactions from physical disturbance effects were identified between receptors within the biodiversity environmental factor in **Section 6** – see **Tables 6.5a** and **6.5b**, specifically, the potential for effects on supporting habitats of species. In light of the information provided above, any impact is considered

to be negligible and temporary, and is not considered to result in significant effects on supporting habitats of species.

7.4.4 Environmental management, mitigation and residual effects

The decommissioning activities will result in some seabed disturbance (0.46-0.76km^2), the effects of which are considered to be minor and temporary. Mitigation is proposed to further reduce the significance of these effects and includes:

- the minimisation of rig and vessel movements which require anchoring where possible
- the use of dynamic positioning (DP) on most vessels where practicable to reduce anchor deployment, and the selection of decommissioning options which minimise interaction with the seabed (subject to wider environmental, safety, technical and economic considerations) – note that sensitive features such as wrecks or Annex I habitats have not been detected in previous surveys
- For each option/activity involving rock placement, efforts will be made to minimise the volume of rock deployed, subject to achieving the required technical function

In view of the above mitigation measures, the residual effect of physical disturbance is considered to be **negligible and short-term**. See environmental management commitments 1, 3 and 4 and mitigation measure 7 in **Section 8.2.**

7.4.5 Summary and conclusion

The area of physical disturbance generated by activities associated with the KADP is small (0.46-0.76km^2) in the context of the wider lease and Celtic Sea area (0.027% of the leased area), and the majority this disturbance will take place within the original footprint of development.

In view of the potential effects described and assessed in the context of the proposed mitigation and recovery potential of the seabed, significant effects from physical disturbance are not considered to be likely for activities associated with KADP consent applications 1 or 2, and are predicted to be negligible and short-term.

7.5 Underwater noise

The key sources of noise and vibration associated with the decommissioning operations split by project consent application are shown below, with reference to relevant environmental factors detailed in the EIA Directive (see **Section 6.1**).

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells	Underwater noise associated with cutting and removal of casings Underwater noise from vessels, including DP	*Biodiversity*
Subsea wells		
Topsides removal	Underwater noise from vessels, including DP	
Subsea structures	Underwater noise from vessels, including DP	
Consent Application 2		
Jackets	Underwater noise from abrasive, high pressure water jet and other cutting (internal and external cuts) Underwater noise from vessels including DP	*Biodiversity*
Pipelines and umbilicals	Underwater noise from vessels including DP and rock placement	

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Post-decommissioning survey	Underwater noise from survey equipment	

The potential for effects from underwater noise were identified in **Section 6** for the broad environmental factor; biodiversity (including conservation sites and species) (**Tables 6.3a and 6.3b**), and more specifically, the potential for effects was identified for fish, diving birds, marine mammals, and relevant conservation sites and species. A description and assessment of these potential effects is provided below.

7.5.1 Description of potential effects of underwater noise

The following section provides a consideration of the characteristics of underwater noise that could be generated from the decommissioning activities, followed by an assessment of these against sensitive receptors in **Section 7.5.2**. A high level summary of the main noise source types is given in **Table 7.4**.

Table 7.4: Summary of indicative noise sources associated with the KADP

Noise source (relevant activities)	Approximate indicative broadband source level (dB re 1µPa@1m)	Indicative dominant frequency	Source	Relevant Consent Application	
				1	2
Vessels of 50-100m length (PSV, AHV, CSV, DSV; rock placement vessel)	165-180[a,b]	< 1,000Hz	OSPAR (2009)	✓	✓
Vessels of 100-300m length (HLV)	175-195[a,b]	< 200Hz	OSPAR 2009, McKenna *et al*. (2012) ; Veirs *et al*. (2016)	✓	✓
Diamond wire cutting tool (jacket structural members)	na; at 100m from source: ≤ 130dB re 1 µPa^2 per 1/3 octave band for all recorded frequencies from 5,000-40,000Hz[c]	> 10,000Hz	Pangerc *et al*. (2016)	✓	✓
Water jet lance tool (broadly indicative of abrasive water jet cutting e.g. jacket structural member cutting)	160.1-170.5	> 200Hz	Molvaer & Gjestland 1981	✓	✓
Side scan sonar (post-decommissioning survey)	223	114 or 440kHz	Based on Kongsberg dual frequency side scan sonar[6]	-	✓
Multibeam echosounder (post-decommissioning survey)	210	200-400kHz (300kHz normal operation)	Based on Kongsberg Maritime EM2040	-	✓

Notes: [a] Within the ranges provided, broadband source levels are generally higher for larger vessels of these categories. [b] Slight increases in broadband source levels anticipated during use of DP thrusters. [c] Generally indistinguishable above background noise at low frequencies; ca. 4 and up to 15dB re 1 µPa^2 per 1/3 octave band above background between 10,000-40,000Hz.

[6] Based on representative Kongsberg dual frequency side scan sonar: https://www.km.kongsberg.com/ks/web/nokbg0240.nsf/AllWeb/2D0C8EA035ABC7C6C12574C500512571?OpenDocument

No explosive cutting is proposed to be undertaken as part of any of the KADP decommissioning options.

7.5.1.1 Vessel movements/operations

Underwater sound radiates from a vessel as the combined effect of multiple sources and paths; the main sources are propeller/thruster cavitation and machinery noise, with additional sound generated as the hull moves through the water (hydrodynamic noise) or by sea-connected systems (e.g. pumps) (Spence *et al.* 2007, Abrahamsen 2012).

Propeller cavitation is a process involving bubble formation and implosion resulting from pressure fluctuations (above and below the saturated vapour pressure of water) generated by the rotating propeller blades when a given speed (cavitation inception speed) is reached or exceeded; noise is generated by the collapse of bubbles. Cavitational noise commonly arises at speeds between 8 and 12 knots and grows in amplitude with increasing speed; its frequency spectrum is broad with dominant frequencies above a few hundred Hz. However, cavitational noise mechanisms are varied and complex; in addition to vessels in transit, cavitational noise is important when vessels are operating under high load conditions (high thrust) and when dynamic positioning (DP) systems are in use (Spence *et al*. 2007, Abrahamsen 2012). The use of thrusters for DP has been reported to result in increased sound generation (>10dB) when compared to the same vessel in transit (Rutenko & Ushchipovskii 2015).

Shipboard machinery creates both vibrations and airborne noise which in turn can generate underwater sound radiation; most pronounced is the sound generated from propulsion machinery such as diesel engines or turbines and diesel generators. Machinery induced noise is generally tonal in nature and can span across a wide range of frequencies, from very low (below 10Hz) to several thousand Hz. Higher frequency tones are typically seen only at slow speeds i.e. in the absence of propeller cavitation but low frequency tones (<500Hz) tend to be predominant at all speeds (Spence *et al*. 2007, Abrahamsen 2012).

While the sources and paths of sound from vessels are well understood, predicting sound exposure on the basis of vessel information is complex; it depends on the design of the vessel, how it operates, its age (or time since regular maintenance), and also the characteristics of the environment in which it operates (OSPAR 2009).

Noise from vessels is predominantly low frequency and the global shipping fleet is recognised as the main contributor to ambient noise in the open ocean. The indicator being developed for 'ambient noise' as part of the implementation of the Marine Strategy Framework Directive focuses on two low frequency third-octave bands, centred at 63 and 125Hz; these bands are where the contribution of noise from shipping (relative to other sources, including natural – see **Section 4.3**) is likely to be greatest (Dekeling *et al*. 2014).

Several studies have described and reviewed underwater sounds from a variety of commercial ships in transit (e.g. OSPAR 2009, Bassett *et al*. 2012, McKenna *et al*. 2012, Veirs *et al*. 2016). In general, support and supply vessels (50-100m) are expected to have broadband source levels in the range 165-180dB re 1µPa@1m, with the majority of energy below 1kHz (OSPAR 2009). Larger vessels of 100-300m length, including tankers, bulk carriers and container ships, produce higher source levels generally in the range of c. 175-190 dB re1 µPa^2 (OSPAR 2009, McKenna *et al*. 2012). While most energy from these larger vessels is below 200Hz, median received levels above those of ambient levels (+ 5-13 dB) have also been reported at higher frequencies of 10,000-40,000Hz up to a distance of 3km from the source (Veirs *et al*. 2016).

7.5.1.2 Other sources of underwater noise

There are a range of underwater noise-generating activities associated with decommissioning activities, including the use of cutting tools and rock placement. However, evidence suggests that noise from associated vessels is commonly recorded as the dominant source during these activities. For example, measurements made by Nedwell & Edwards (2004) of a rock fall pipe vessel indicated that there was no discernible difference between normal vessel operating conditions and those during rock placement, suggesting that noise levels from this activity were dominated by vessel propellers and thrusters rather than the rock placement. Doppler Velocity Logs (DVL) or Ultra Short Baseline (USBL) sonar systems for use in positioning rock placement ROVs, which produce high frequency noise comparable to that of a ships' single-beam echo-sounder, are not expected to be discernible from the broadband noise of associated vessels in the area. DVL systems generally emit noise at frequencies which are beyond the hearing range of relevant marine mammals (300-1,200kHz). While USBL systems operate at frequencies (20-40kHz[7]) which are

[7] Based on indicative manufacturers' specifications (e.g. Tritech MicroNav, SonarDyne ROVNav 6).

audible to mid- and high-frequency cetaceans (see **Table 7.5**), they are designed for close-range transmission between features close to the seabed; source sound levels (e.g. indicative 187-196dB re 1µPa at 1m[5]) are less than those of Multi Beam Echo Sounders (MBES), significantly less than seismic survey, and will be rapidly attenuated to low levels within a few tens of metres of the source.

Similarly, noise from the cutting of the platform conductors, jacket members is not anticipated to significantly exceed that of vessel operations. Measurements of an ROV-operated diamond wire cutting tool on a platform conductor at 80m water depth found noise levels to be not easily discernible above background levels between 100-800m from the source, with associated increases of around 4dB and up to 15dB re 1 µPa2 per 1/3 octave band for some frequencies, mostly above 10kHz (Pangerc *et al*. 2016). The number of cuts required to remove the jackets will vary depending on the selected removal option, and in all cases these are not anticipated to generate noise levels exceeding that of the vessels involved in the jacket removal work. There is the potential for more than one cut to take place at the same time, though this is not considered likely to cumulatively increase the sound source levels associated with cutting significantly; for example, sound levels are expressed in dB i.e. using base-10 logarithms as a ratio relative to a reference value (the reference value for underwater sound is 1 µPa), and the addition of two identical sources results in an increase of 3dB, or just 10dB if ten simultaneous sources are considered.

Direct measurements of noise levels generated by non-impulsive underwater tools are limited, but where available they have been reported to generate sound of an amplitude that does not exceed those from average vessels. For example, Anthony *et al.* (2009), as part of a review of diver noise exposure, presents estimates of source levels of 148-180 dB re 1µPa@1m for several hand held tools (excluding impulsive stud/bolt guns). These include estimates of 160.1 and 170.5 dB re 1µPa@1m for water jet lances (most energy > 200 Hz; Molvaer & Gjestland 1981), which are likely to be broadly representative of noise emissions from abrasive water jet cutting tools (Molvaer & Gjestland 1981).

7.5.1.3 Post-decommissioning survey

A debris clearance and pipeline survey will be undertaken to confirm the completion of the decommissioning operations (see **Section 3.5.5**). As a minimum the survey area covered for debris clearance will include a 500m radius around any installation and a 100m corridor (50m on either side) along the length of any pipelines and umbilicals, the survey will be undertaken in approximately 5 days. Identification of debris would normally be conducted by side scan sonar and/or MBES with an ROV deployed to investigate and recover any potential hazards. Larger items of debris would be recovered by crane from a construction support vessel. A seabed clearance certificate will be issued by the survey contractor to confirm completion of the scope. Standard overtrawling surveys will also be undertaken where wellheads, spoolpieces etc. are removed to confirm the area is clear of debris and snagging hazards.

The offshore survey of the export pipeline will end at some 3km offshore of the landfall at Powerhead. Based on the landfall location, the area surveyed will be outside 1,500m from the inlet to the Cork harbour area (i.e. of any bay, inlet or estuary) as referred to in NPWS (2014). A separate inshore survey involving a smaller vessel will also be undertaken; both surveys would require a consent application(s) detailing the proposed survey methods and mitigation measures.

7.5.1.4 Summary of anticipated underwater noise sources from the KADP

Likely vessels to be used during decommissioning and their estimated duration of operations have been described in **Section 3.5**. The number, nature and days of operation of vessels will vary according to the decommissioning approaches selected and the vessels available. Whilst the operational schedule for discrete parts of the decommissioning programme have been estimated (see **Sections 3.5.1-3.5.5**), the total time taken to complete the offshore aspects of the KADP will be shorter due to parallel working and the potential for vessel synergies, though operations will also not be continuous. It is anticipated that offshore work will take approximately 12-18 months, though the total decommissioning programme covering activities associated with both project applications may extend over a period of up to 10 years.

The bulk of the activity will be carried out by medium-sized (80-100m length) support vessels[8], in addition to a rock-placement vessel(s); these will generate source levels of 165-180 dB re 1µPa@1m, with slightly increased levels expected during operations requiring DP. In the absence of vessel-specific or directly comparable data, it is assumed that as a precautionary approach the average broadband source levels of the

[8] Including PSV, AHV, CSV, and DSV.

HLV and drilling rig in transit would be taken as those of the loudest recorded container ship, in the region of 185-195 dB re 1µPa@1m (McKenna *et al*. 2012, Veirs *et al*. 2016).

Among each of the key phases of noise-emitting activity (subsea well decommissioning; platform topsides removal; jacket removal; pipeline decommissioning), there may be periods of up to one month where multiple (i.e. 3-6) vessels will be operational in the Kinsale Area, with the exception of the option to rock cover all exposed pipeline sections (see **Section 3.5.4.1**). Active rock placement could take up to 98 days, or 252 days (with 25% contingency) when accounting for remobilisation for additional rock and transit to the Kinsale area. Individual support vessels (i.e. CSV, PSV) and guard vessels may be present for longer periods of two-three months. Single lift options for decommissioning represent the lowest number of vessel days on-site and in transit.

Cutting (e.g. of well casings or jacket legs) and rock placement activities will periodically generate underwater noise of short duration, with source levels of up to 170 dB re 1µPa@1m which are unlikely to be readily discernible over the noise generated by associated vessels in the area.

Side scan sonar and MBES equipment are used routinely in surface geophysical surveys, and are proposed to be used in the post-decommissioning survey. There are a number of different systems on the market resulting in a variety of outputs in terms of power, frequency and directionality, but for those most commonly deployed on site surveys the expectation is that generated sound levels drop off very quickly with distance due to a combination of high frequency and high directionality (DECC 2016). Characteristics of sound generation are commonly modelled from estimated source levels based on manufacturers' specifications (Zykov 2013) but efforts are ongoing to obtain direct measurements of operating equipment in testing facilities and in the field (Crocker & Fratantonio 2016). The specific survey equipment to be used in the post-decommissioning survey are yet to be selected and so for the purposes of assessment it has been assumed that the sidescan sonar equipment will operate at dual frequency of 114 or 410kHz with a source sound level of ~223dB re 1µPa@1m, and that the MBES equipment will operate at a frequency of 200-400kHz (300kHz normal operation) with a source sound level of ~210db re1µPa@1m (see **Table 7.4**).

7.5.2 Effects assessment of noise sources on relevant receptors

Potential effects of anthropogenic underwater sound on receptor organisms (within the biodiversity environmental factor) range widely, from masking of biological communication and small behavioural reactions, to chronic disturbance, auditory injury and mortality. In addition to direct effects, indirect effects may also occur (e.g. via effects on prey species). Marine mammals and fish are considered to be the most sensitive receptors to underwater noise.

7.5.2.1 Marine mammals

Marine mammals, for which sound is fundamental across a wide range of critical natural functions, show high sensitivity to underwater sound. In terms of impact, anthropogenic sound sources have been categorised based on acoustic and operational features (Southall *et al.* 2007); the main distinction is between pulsed and non-pulsed sounds due to differences in the auditory fatigue and acoustic trauma they induce, with the brief, rapid-rise of impulsive sounds being potentially more damaging. Generally, the severity of effects tends to increase with increasing exposure to noise with both sound intensity and duration of exposure being important. A distinction can be drawn between effects associated with physical (including auditory) injury and effects associated with behavioural disturbance. With respect to injury, risk from an activity can be assessed using threshold criteria based on sound levels (e.g. Southall *et al.* 2007, Lucke *et al.* 2009, NMFS 2016). With respect to disturbance however, it has proved much more difficult to establish broadly applicable threshold criteria based on exposure alone (NPWS 2014).

In addition, auditory capabilities are frequency dependent and vary between species (Southall *et al.* 2007). Several species of marine mammals may be present in the Kinsale Area (see **Section 4.4.7**). **Table 7.5** provides details of the relevant species listed by functional hearing group, the relevant auditory bandwidth as defined by Southall *et al.* (2007) and NMFS (2016), and the broadband injury threshold sound pressure levels proposed by Southall *et al*. (2007) and Lucke *et al*. (2009).

Table 7.5: Marine mammal species relevant to the Kinsale Area and their auditory capabilities

Species which may be present in the Kinsale Area (by functional hearing group)	Hearing range	Proposed injury threshold criteria to non-pulsed sounds (SPL)
Low-frequency cetaceans Fin whale *Balaenoptera physalus* Minke whale *Balaenoptera acutorostrata* Humpback whale *Megaptera novaeangliae* Sei whale *Balaenoptera borealis*	7Hz to 22kHz [1] 7Hz to 35kHz [2]	230 dB re 1µPa [1]
Mid-frequency cetaceans Bottlenose dolphin *Tursiops truncatus* Common dolphin *Delphinus delphis* White-beaked dolphin *Lagenorhynchus albirostris* Atlantic white sided dolphin *Lagenorhynchus acutus* Risso's dolphin *Grampus griseus* Striped dolphin *Stenella coeruleoalba* Long-finned pilot whales *Globicephala melas* Northern bottlenose whale *Hyperoodon ampullatus* Killer whale *Orcinus orca*	150Hz to 160kHz [a,b]	230 dB re 1µPa [a]
High-frequency cetaceans Harbour porpoise *Phocoena*	200Hz to 180kHz [a] 275Hz to 160kHz [b]	200 dB re 1µPa [c]
Pinnipeds in water Harbour seal *Phoca vitulina* Grey seal *Halichoerus grypus*	75Hz to 75kHz [a] 50Hz to 86kHz [b]	218 dB re 1µPa [a]

Notes: Injury is defined as the level at which a single exposure is likely to cause onset of permanent hearing loss[1]. SPL = Sound Pressure Level. Sources: [a] Southall et al. (2007); [b] NMFS (2016); [c] Lucke et al. (2009).

As described above, sound from vessels has a wide frequency spectrum, but the dominant and most widely propagated frequency tends to be low (<200Hz). Therefore, while all marine mammal species which may occur in the Kinsale Area are expected in principle to be able to detect these sounds, it is low-frequency cetaceans and pinnipeds whose hearing ranges show the greatest overlap with noise generated by the KADP. With respect to injury thresholds and disturbance considerations, continuous underwater sound generated from vessels and cutting tools is understood to be relatively minor in comparison to impulsive sounds derived from high amplitude sources such as airguns during seismic surveys, impact piling or explosives (DECC 2016). Moreover, the estimated source levels of the decommissioning activities are below the proposed thresholds for injury to all functional hearing groups of marine mammals, limiting any effects to those of behavioural disturbance.

In terms of behavioural disturbance, it cannot be excluded that sound from vessels will in the short-term influence the behaviour of individual marine mammals within the vicinity of the operations. Given the very low occurrence of harbour or grey seals in the Kinsale area and ≥74km distance to the nearest designated conservation site for seals (Roaringwater Bay and Islands SAC: grey seal), the potential for disturbance to these species from underwater noise in the Kinsale Area is considered highly unlikely. Of those low-frequency cetaceans listed in **Table 7.5**, minke whale (summer) and fin whales (autumn/winter) are those most likely to be present in the Kinsale Area. The occurrence of these highly mobile species in this open, offshore habitat is likely to be of only limited duration as they traverse the wider Celtic Sea in search of foraging opportunities; as such, any disturbance associated with the KADP is considered highly unlikely to cause prolonged displacement from key habitat.

The hearing range of marine mammals has the potential to overlap with the high frequency sound generated by the sidescan sonar and MBES systems (particularly the lower frequency of 114kHz). Because of the high frequency, attenuation of sound intensity occurs efficiently in the water column. Thus based on the

characteristics of the sound source, the hearing capabilities of marine mammals, and the overall duration and location of the survey, any risk of injury or disturbance are assessed as highly unlikely.

Overall, the likelihood that behavioural disturbance effects could become significant at the population level is considered to be extremely low due to a combination of source level characteristics, duration of activity, and the current understanding of marine mammals movement and behaviour in the relevant offshore area.

7.5.2.2 Marine reptiles

Available information on potential effects of underwater sound on marine turtles is very limited (Nelms *et al*. 2016). The hearing range of cheloniid species has been estimated as between 50-2,000Hz, with highest sensitivity below 400Hz (Popper *et al*. 2014). For leatherback turtles, measurements made on hatchlings suggested a similar low frequency sensitivity, with sound detection ranging between 50 and 1,200Hz when in water and between 50 and 1,600Hz in air (Dow Piniak *et al*. 2012). A variety of potential functions of hearing have been proposed for marine turtles, although the issue is poorly understood; they do not appear to vocalize or use sound for communication, but may use sound for navigation, locating prey, avoiding predators, and general environmental awareness (see Dow Piniak *et al*. 2012, Nelms *et al*. 2016 and references therein). While some authors have raised concerns over the potential for physical injury (including hearing damage) to marine turtles from seismic surveys (Nelms *et al*. 2016) and disturbance from increasing anthropogenic noise generally (Samuel *et al*. 2005), such potential impacts remain to be investigated, as do any subsequent ecological effects (Nelms *et al*. 2016).

Underwater noise generated by vessels during the decommissioning activities is likely to be detectable by leatherback turtles, although their low density and only seasonal presence in the area dictates that very few individuals are likely to be exposed to noise levels beyond that of the background for the region. The sound generated by the post-decommissioning survey is unlikely to be detectable by marine turtles; resultant injury and disturbance is therefore highly unlikely. Considering this low likelihood of exposure, the perceived limited sensitivity of the receptor, and the moderate intensity non-impulsive nature of the noise source, significant impacts on marine turtles are considered highly unlikely.

7.5.2.3 Birds

Direct effects from impulsive noise on seabirds could occur through physical damage, or through disturbance of normal behaviour. Diving seabirds (e.g. auks) may be most at risk of acute trauma but while this is theoretically possible, evidence is limited. Hearing sensitivity for species measured so far peaks between 1 and 3kHz, with a steep roll-off after 4kHz (Crowell *et al.* 2015).

Mortality of seabirds (see **Section 4.4.6** for coverage of those considered) has not been observed during extensive seismic operations in the North Sea and elsewhere, and the post-decommissioning survey proposed for the KADP will have noise sources significantly less than these.

While very high amplitude low frequency underwater noise may result in acute trauma to diving seabirds (i.e. with tens of metres of underwater explosions; Danil & St Leger 2011), their region of greatest hearing sensitivity suggests a low potential for disturbance due to vessel noise. As such, and given the short-term duration of vessel presence, including rock placement activities, in the context of many decades of shipping and fishing activity in the region, significant disturbance to diving seabirds is assessed as highly unlikely.

7.5.2.4 Fish

Many species of fish are highly sensitive to sound and vibration and broadly applicable sound exposure criteria have recently been published (Popper *et al.* 2014). While it is recognised that vessel and other continuous noise may influence several aspects of fish behaviour including inducing avoidance and altering swimming speed, direction and schooling behaviour (e.g. De Robertis & Handegard 2013), there is no evidence of mortality or potential mortal injury to fish from ship noise (Popper *et al.* 2014). Given the source level characteristics and the context of similar contributions to the ambient anthropogenic noise spectrum of the area over several decades, no injury or significant behavioural disturbance to fish populations is anticipated.

Studies of fish mortality or behavioural response to noise have tended to focus on geological seismic survey, and while the proposed post-decommissioning survey will generate significantly less noise than these (the methods deployed will involve seabed mapping using side scan sonar and/or MBES), these studies have relevance to the consideration of potential effects on fish and are therefore described here. Studies investigating fish mortality and organ damage from noise generated during seismic surveys are very limited and results are highly variable, from no effect to long-term auditory damage (reviewed in Popper *et al*. 2014).

On the other hand, behavioural responses and potential effects on fishing success ("catchability") have been reported following seismic surveys (Pearson *et al.* 1992, Skalski *et al*. 1992, Engås *et al*. 1996, Wardle *et al*. 2001). Potential effects on migratory diadromous fish is an area of significant interest for which empirical evidence is still limited, especially as salmonids and eels are sensitive to particle motion (not sound pressure) (Gill & Bartlett 2010). Atlantic salmon *Salmo salar* have been shown through physiological studies to respond to low frequency sounds (below 380Hz), with best hearing at 160Hz (threshold 95 dB re 1 µPa). Hence, their ability to respond to sound pressure is regarded as relatively poor with a narrow frequency span, a limited ability to discriminate between sounds, and a low overall sensitivity (Hawkins & Johnstone 1978, cited by Gill & Bartlett 2010).

Given the source level characteristics of rock placement, and the context of similar contributions (shipping and fishing) to the ambient anthropogenic noise spectrum of the area over several decades, no injury or significant behavioural disturbance to fish populations is anticipated.

7.5.3 Interactions between environmental factors

Potential interactions from underwater noise effects were identified between receptors within the biodiversity environmental factor in **Section 6** – see **Tables 6.3a** and **6.3b**, specifically, the potential for effects on prey species of other animals if those prey are subject to injury or disturbance which reduce their availability (for example effects on fish which may have a resultant effect on seabirds or marine mammals, which may include species which are subject to protection; see **Section 7.9**). In view of the nature and scale of potential noise sources associated with the KADP and related effects on fish noted above, it is not considered likely that there will be significant indirect effects on prey species and the potential for interactions is considered to be negligible.

7.5.4 Environmental management, mitigation and residual effects

Wherever possible, through careful activity phasing, the KADP will seek vessel synergies to minimise vessel days and associated noise emissions, and the post-decommissioning survey will be carried out in accordance with established guidelines (including NPWS 2014) as appropriate.

Specific additional mitigation is not required, as the anticipated source level characteristics from vessels are low, the post-decommissioning survey has a minor source of effect and is temporary (5 days), and the use of explosive cutting was eliminated early in project design, such that residual negative effects are considered to be **minor and temporary**.

7.5.5 Summary and conclusion

The primary contributor to underwater noise from KADP activities relevant to both consent applications will be vessel activity, as subsea activities such as cutting and rock placement are not discernible above their associated vessel noise source. The increased vessel activity associated with the KADP will add to the overall ambient noise in the Kinsale Area; however, source level characteristics are well-below proposed injury criteria for marine mammals, and the continuous noise from vessels is not reported to result in injury to fish or marine turtles. Similarly, noise associated with the post-decommissioning survey is regarded to pose a low risk of significant effect on marine mammals, birds and fish.

The noise sources will be temporary and minimised by a phased approach to decommissioning such that vessel time in the field is minimised. While sound from vessels may result in some temporary influence on the behaviour of individual marine mammals within the vicinity of the operations, significant negative effects at the population level are not anticipated. No specific additional mitigation was considered necessary beyond application of established survey guidance.

7.6 Discharges to Sea

A range of discharges from operational and legacy sources were identified as requiring further consideration in **Section 6.** These are shown below, split by project consent application with reference to relevant environmental factors detailed in the EIA Directive (see **Section 6.1**). Each of these discharge sources is discussed below in **Sections 7.6.1-7.6.3**.

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells	Discharges associated with well decommissioning: cementing and other chemicals.	*Biodiversity; Land, soil, water, air and climate.*
Subsea wells		
Topsides removal	n/a – none considered significant, see Appendix D.	n/a
Offshore facilities preparation	Displacement of contents of pipelines and umbilicals (hydraulic fluid from umbilical chemical lines)	*Biodiversity; Land, soil, water, air and climate.*
Subsea structures	n/a – none considered significant, see Appendix D	n/a
Consent Application 2		
Pipelines and umbilicals	Discharges associated with displacement of contents of export pipeline (including inhibited seawater) and legacy discharges	*Biodiversity; Land, soil, water, air and climate.*

The potential for effects from discharges to sea were identified in **Section 6** for the broad environmental factors; biodiversity (including conservation sites and species), land, soil, water, and air and climate (**Tables 6.3a** and **6.3b**). More specifically, the potential for significant effects was identified for water quality (with related minor effects of relevance to receptors within the biodiversity factor including plankton, fish and shellfish and marine mammals).

A description and assessment of these potential effects is provided below.

7.6.1 Potential effects from discharges to sea

7.6.1.1 Operational discharges

While the operations include the decommissioning of multiple wells and use of a mobile drilling rig, no well related drilling is planned (although some milling of concrete or steel casing may be necessary) and therefore, discharges will be limited to excess made cement (though only likely for contingency) and potentially treated seawater used to ensure a good bonding of the cement plugs in the wells. A filtration package will be used to treat any well returns prior to discharge to sea (note that the produced hydrocarbons from the Kinsale Area are gas, negating any substantial oil content).

Significant effects on water quality and related water column fauna (e.g. plankton, fish and shellfish, marine mammals, see **Section 4.4** for more details) are not considered to be likely, and any discharges associated with well decommissioning will be subject to a Permit to Use or Discharge Added Chemicals (PUDAC).

The 24" (and potentially the 18" Seven Heads) export pipeline will initially be filled with ~15,800m^3 (~21,500m^3 if both export lines) inhibited seawater from Kinsale Alpha to maintain the pipelines, including the onshore section to Inch. The seawater will be treated with a combination of corrosion inhibitor, oxygen scavenger and microbicide[9]. In the event that no reuse option is identified within the overall decommissioning programme timeframe, the seaward pipeline end (i.e. at the KA jacket) would be opened and the inhibited seawater would be gradually discharged to sea. If a reuse option is identified, the inhibited water would also need to be discharged to accommodate that use at a suitable time. The water depths at the discharge point (Kinsale Alpha) are ~90m, and dispersion of this discharge will be rapid. Additionally, surfactants may be used during the displacement of the other pipelines to seawater in order to maximise the removal of any residual hydrocarbons in these pipelines. Though this would be contained as part of the displacement to wells, a small quantity may be locally released on removal of spool pieces during subsea structure removal and jacket removal scope of works. Chemicals of low toxicity and bioaccumulation potential, and without substitution or other warnings, will be preferentially selected for use in the decommissioning operations. Final chemical selection would be made at the time of decommissioning and this would follow the principle of using the least

[9] Note that total chemical usage and discharge for this operation has been estimated using representative chemicals and concentrations (100-500ppm) to be in the order of 13.5m^3 (18.3m^3 if the 24" and 18" export lines are treated).

harmful chemicals for technical function, and their use and discharge would be subject to permitting via a PUDAC. Significant effects on water quality and related water column fauna are not predicted from pipeline related discharges.

For context, annual average operational discharges to sea from the Kinsale Area facilities (2010-2016) have been minor and include 1,313m^3 water of condensation (no connate water is produced with the gas), 21kg of oil associated with produced water, 7,471kg of triethylene glycol (TEG) and methanol and 3,911kg of hydraulic fluid losses. These discharges will cease following decommissioning.

7.6.1.2 Legacy discharges

Legacy discharges represent those which may take place gradually some time after decommissioning, resulting from losses from the open ends of pipelines/umbilicals, or as pipeline/umbilicals degrade. Other than the 24" export pipeline, all pipelines will be displaced to seawater and no discharge of residual hydrocarbons is expected, noting the nature of the produced gas. This seawater, and a small quantity of surfactants used in pipeline cleaning, will eventually be released as the pipelines degrade (see **Section 7.3**).

Prior to decommissioning, all of the chemical lines within the umbilicals will have been displaced with seawater, eliminating discharges to sea from this source during or after decommissioning activities. These lines contain methanol and TEG used for the prevention of hydrate formation. Both of these chemicals are in the Offshore Chemical Notification Scheme (OCNS)[10] group E (those considered to have the least potential environmental hazard), methanol is categorised to Pose Little or No Risk to the environment (PLONOR). It is proposed that the water based hydraulic fluid used in the subsea hydraulic control system will remain in the lines, all or part of which may be lost during decommissioning (removal of umbilical jumpers) and/or over time due to degradation of the umbilical, depending on the chosen options. The total volume of hydraulic fluid in all the Kinsale Area umbilicals is approximately 29.5m^3.

Any of the legacy discharges described above would, under the influence of local currents, rapidly disperse and dilute and are not considered likely to result in significant environmental effects.

7.6.1.3 Marine growth removal

The jackets of the two Kinsale Head platforms are each covered with an estimated 1,450 tonnes of marine growth. The growth comprises of a variety of hard- and soft-bodied organisms which commonly colonise hard structures in the temperate north-east Atlantic, including: various species of algae, bivalves (primarily *Mytilus edulis*), barnacles, hydroids, plumose anemones, and soft corals (e.g. *Alcyonium digitatum*). These species have a minor influence on the surrounding water column and seabed through the release of solid and dissolved metabolic products, of larvae, and detached biota.

The presence of the jackets and subsea structures and their associated marine growth also provide shelter and food for larger animals such as fish and marine mammals. As these structures are required to be removed under OSPAR Decision 98/3, the assessment only considers the effects of the removal of marine growth as structures are removed. BMT Cordah (2013) reviewed the relative performance of options for marine growth removal during the decommissioning of offshore facilities. Two approaches were considered: (1) removal at the onshore disposal yard and (2) removal offshore at the field location.

An advantage of offshore removal is the avoidance of two sources of potential impact associated with onshore marine growth removal: odour and waste disposal (BMT Cordah 2013). An identified disadvantage of offshore removal is longer vessel operations, resulting in extended physical presence, additional atmospheric emissions and increased costs. However, it is noted that BMT Cordah (2013) only considered removal of marine growth from the jacket *in situ* by ROV; removal of marine growth from a jacket already loaded on to an HLV or barge and/or as it is being removed, is anticipated to be more efficient.

Marine growth removal at an onshore disposal yard has the advantage of not adding time to offshore operations. Some marine growth will still be removed offshore in this scenario, for example to gain access to cut jacket members or legs, and a proportion will also fall off on transport to shore through desiccation (BMT Cordah 2013). Onshore removal of marine growth results in odours associated with decaying organisms, which may pose a nuisance to local settlements depending on their proximity to the yard and environmental conditions at the time. Yard operators implement odour management plans and can apply various measures to minimise the issue (e.g. applying odour suppressants; storing in covered skips), which is generally

[10] The OCNS is a management system used in the UK and Netherlands, in accordance with the OSPAR Harmonised Offshore Chemical Notification system.

successfully mitigated. Removed marine growth is typically disposed of at a landfill; composting or land (agricultural) spreading present alternative methods of disposal, but their availability may be limited.

It is assumed that all marine growth is to be removed onshore, as described, with the material being transported along with the jackets to a licensed disposal yard (see **Section 7.7**). Any negative effect predicted are minor and temporary in nature with no significant negative effects predicted.

7.6.2 Interactions between environmental factors

No foreseeable interactions were identified between those environmental factors for which potential environmental effects were identified in **Section 6** – see **Tables 6.5a** and **6.5b**.

7.6.3 Environmental management, mitigation and residual effects

The description and assessment of potential effects from discharges to sea has been undertaken assuming that activities are in accordance with regulatory and policy controls, these include:

- Existing operational controls for the management of routine marine discharges from the decommissioning activities (e.g. adherence to MARPOL standards).
- Chemicals selected for use and discharge for well abandonment will be subject to a PUDAC

All potential discharges associated with decommissioning the Kinsale Area facilities (e.g. from pipelines and well abandonment) are considered to be minor. Discharges from well abandonment will be minimal, subject to treatment/filtration, with chemicals being selected on the basis of the lowest hazard quotient for the required technical function.

Specific additional mitigation is not required as no significant negative effects from discharges to sea resulting from the KADP are predicted, with any residual effect being **minor and temporary**. See environmental management commitments 1, 2, 3, 4 and 7 in **Section 8.2**.

7.6.4 Summary and conclusion

Discharges from well abandonment will be risk assessed and subject to standard permitting controls, and the discharge of inhibited seawater from the 24” and 18” export pipelines is not predicted to result in significant effects. Consequently, no likely significant impacts are anticipated from marine discharges associated with the KADP, and residual effects are considered to be minor and spatially and temporally restricted.

7.7 Waste: Materials Recycling, Reuse and Disposal

Table 3.28 of **Section 3.5.7** summarises the estimated waste generated from the decommissioning of the KADP. The main structures of the fixed platforms in the Kinsale Gas Field are constructed of steel which is highly recyclable, as are the well protection structures and wellheads. During well decommissioning a quantity of steel and cement will be recovered from the removal of the casings to *ca*. 3m below the seabed. Other wastes present at the KA facilities are asbestos, refrigerants, fluorescent tubes (mercury), fire & gas detectors (radioactive waste), fire extinguishants, diesel and lubricating oils. The Inch terminal will be fully demolished with wastes arisings removed for recovery or disposal.

The key sources of potential effect from waste associated with the decommissioning operations split by project consent application are shown below with reference to relevant environmental factors detailed in the EIA Directive (see **Section 6.1**).

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells Subsea wells	Solid & liquid wastes to shore Onshore waste treatment Landfill of residual waste	*Population and human health; Material assets, cultural heritage and the*

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Offshore facilities preparation	Removal of hazardous materials (e.g. asbestos, refrigerants)	*landscape;*
Subsea structures	Mattress removal Removal of pipeline spoolpieces and umbilical jumpers Removal of manifolds and wellhead protection structures Onshore waste treatment	*Population and human health; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape;*
Consent Application 2		
Jackets	Onshore waste treatment	*Population and human health; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape*
Planning Permission Consent		
Onshore (decommissioning of Inch Terminal)	Materials recycling/recovery – effect considered negligible (See **Appendix D** and **Section 7.11**)	n/a

The potential for effects from waste recycling, reuse and disposal were identified in **Section 6** for the broad environmental factors; population and human health, land, soil, water, air and climate and material assets, cultural heritage and the landscape (**Tables 6.3a and 6.3b**). More specifically, the potential for significant effects was identified for the generation and handling of waste.

A description and assessment of these potential effects is provided below.

7.7.1 Potential effects from waste recycling, reuse and disposal

All wastes returned to shore will be handled, recycled and disposed of in accordance with relevant waste legislation and the waste hierarchy such that the reuse and recycling of materials will be considered before disposal (e.g. to landfill). **Section 3.5.2.1** notes that topsides will be cleaned and all wastes including residual inventories will be collected for onshore disposal or use as appropriate.

All regulatory and company procedures for segregation, transport and disposal will be strictly adhered to and only fully permitted and licensed waste facilities will be used for recycling or disposal.

The dismantling yard for the offshore structures is yet to be selected, though it will be an established, licenced yard for the disposal of decommissioned offshore structures where the dismantling, transport and disposal of materials represent an increment to ongoing activities. Disposal of certain wastes may take place outside Ireland in accordance with the relevant legislation and requirements.

The overall significance of the impact of waste as a result of the decommissioning project is considered to be low. It is expected that there will be a minor positive effect from material reuse and recycling, offsetting the use of primary raw materials, including in relation to emissions (see **Section 7.8.2**), and wider environmental effects associated with raw material extraction and transport.

Potential effects on population and human health (e.g. through handling of hazardous materials) are considered to be low, through strict regulatory compliance, and the selection of established, licenced, facilities for which material from the KADP represents an increment to existing dismantling work.

7.7.2 Interactions between environmental factors

No foreseeable interactions were identified between the factors for which potential environmental effects related to waste were identified in **Section 6** – see **Tables 6.3a** and **6.3b**.

7.7.3 Environmental management, mitigation and residual effects

The decommissioning works shall be undertaken in a manner which maximises the potential for reuse and recycling, including source segregating waste where appropriate. Management of all waste will be undertaken in accordance with the relevant waste legislation and only permitted and licensed waste facilities will be used.

7.7.3.1 Outline Resource and Waste Management Plan

An outline Resource and Waste Management Plan has been developed to establish the minimum standards that the contractor must apply during the decommissioning phase. A detailed Resource and Waste Plan will be prepared by the contractor which will be submitted to KEL for approval prior to commencement of the decommissioning works.

The outline Resource and Waste Management Plan states the following:

- The KADP will comply with all relevant waste and resource management policy and legislation that applies (including International, European and Irish policy and legislation);
- All relevant obligations governing storage, transfer, treatment and disposal of all wastes arising from KADP will be complied with and the contractors will implement approved method statements and procedures for transporting and managing waste as part of their detailed Resource and Waste Management Plan;
- Resource and waste management objectives to be applied to the KADP to maximise the potential for reuse and recycling are:
  - Target 90% recycling rate by weight;
  - Minimise disposal of waste to landfill; and
  - Minimise environmental impacts of waste management.
- A fully detailed description of solid waste generation associated with each of the key elements of KADP will be provided in the detailed Resource and Waste Management Plan (estimate waste quantities have been calculated from detailed analysis of the waste arisings/material surpluses as outlined in **Section 3.5.7**);
- The contractor will put in place all relevant waste authorisations (detailing the name, address and authorisation details of proposed recovery and disposal facilities which will be used for all wastes generated from the decommissioning project) in advance of the removal of any waste and will maintain a register of resource and waste management information throughout KADP;
- Waste recovery and disposal will be undertaken at authorised waste facilities and the typical management methods for different waste streams associated with KADP are summarised below.

Waste Stream	Removal method	Waste management method
Platforms	Platform jacket legs will be cut at the top of footings at the seabed before removal. Topsides will be disconnected from jacket and removed. Materials will be transferred from the site on vessels to authorised waste facilities.	Steel will be brought to a dismantling facility and recycled where appropriate at authorised waste facilities. Concrete will be brought onshore for reuse and recycling at authorised waste facilities.
Wellhead Protection Structures	Wellhead Protection Structures will be dismantled and casings to 3m below the seabed removed to allow access to the wells	Steel and concrete will be brought onshore for reuse and recycling at authorised waste facilities.
Subsea protection materials	Concrete mattresses and grout bag materials will be removed only when necessary to allow access to the tie-in facilities underneath.	Steel and concrete will be brought onshore for reuse and recycling at authorised waste facilities.
Non-ferrous metals	Removed from platforms as part of the dismantling and removal of the topsides and jackets	Non-ferrous metals will be brought onshore for reuse and recycling at authorised waste facilities.

Waste Stream	Removal method	Waste management method
Asbestos	Protocols to be followed to remove asbestos and transfer into heavy gauge polythene bags for transfer. Asbestos will be brought onshore for disposal by authorised handlers	Asbestos and other hazardous materials will be handled by a licensed operator and disposed of at a licensed facility.
Routine wastes from the decommissioning vessels	Transferred onshore to port in line with European Communities (Port Reception Facilities for Ship-Generated Waste and Cargo Residues) Regulations 2003 (S.I. No. 117 of 2003) and MARPOL	Disposal will be undertaken in accordance with normal procedures. Waste will be recycled, reused and/or disposed of (depending on type) in appropriately licensed facilities.
Hazardous waste	Where practicable, hazardous waste will be removed from the platforms prior to dismantling and be transferred to appropriate waste facilities for treatment and disposal.	Chemicals, lubricants, hydrocarbon contaminated materials, diesel – disposed of to an appropriately licensed facility, if it cannot be reused or recycled.

The overall effect from waste generation relevant to project consent applications 1 and 2 is considered to be **minor and temporary**. See environmental management commitments 1, 3 and 8 in **Section 8.2**.

7.7.4 Summary and Conclusions

The waste activity will represent a minor increment to waste handling and disposal at existing licenced facilities, and to the transport of such material to these sites. In view of the proposed mitigation, the effects from waste generation is considered to be minor and temporary.

7.8 Energy Use and Atmospheric Emissions

Sources of atmospheric emissions from the Kinsale Area Decommissioning Project split by project consent application are shown below with reference to relevant environmental factors detailed in the EIA Directive (see **Section 6.1**).

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells	Atmospheric emissions associated with plant power generation, fugitive emissions from fuel & chemical storage, and venting	*Land, soil, water, air and climate; Material assets, cultural heritage and the landscape*
Subsea wells	Atmospheric emissions associated with rig power generation, fugitive emissions from fuel & chemical storage, and venting	
Offshore facilities preparation	Vessel and ancillary equipment power generation Material recycling	
Topsides removal		
Subsea structures	Vessel and ancillary equipment power generation Material recycling (manifolds and pipeline spoolpieces and umbilical jumpers)	
Consent Application 2		
Jackets	Vessel and ancillary equipment power generation Material recycling	*Land, soil, water, air and climate; Material assets, cultural heritage and the landscape*
Pipelines and umbilicals	Vessel and ancillary equipment power generation Lost benefit of recyclable material left *in situ*	
Planning Permission Consent		
Onshore (decommissioning of Inch Terminal)	Vehicle emissions and dust - effect considered negligible (See **Appendix D** and **Section 7.11**) Materials recycling/recovery - effect considered negligible (See **Appendix D** and **Section 7.11**)	n/a

The potential for effects from energy use and atmospheric emissions were identified in **Section 6** for the broad environmental factors; land, soil, water, air and climate, material assets, cultural heritage and the landscape (**Table 6.3a and 6.3b**). More specifically, the potential for significant effects was identified for air quality and climate from emissions from power generation, and in relation to waste generated and its fate (e.g. re-use, recycling, leaving materials *in situ*).

A description and assessment of the potential effects is provided below.

7.8.1 Potential effects from energy use and atmospheric emissions

Anthropogenically enhanced levels of greenhouse gases (GHGs, principally CO_2) have been linked to global climate change (IPCC 2013). Predicted effects include *inter alia* an increase in global temperate (Kirtman *et al.* 2013, Collins *et al.* 2013), rising sea-levels (Lowe *et al.* 2009, Church *et al.* 2013, Horsburgh & Lowe 2013), changes in ocean circulation (Collins *et al.* 2013) and potentially more frequent extreme weather events (Woolf & Wolf 2013), and other effects including ocean acidification generated by enhanced atmospheric acid gas loading, deposition and exchange (see Bates *et al.* 2012). These effects, most recently summarised in the Intergovernmental Panel on Climate Change (IPCC) 5th assessment report (IPCC 2013, also see Dolan 2015), are the rationale on which global carbon dioxide reduction measures such as the Paris Accord and the EU (see EC 2011) target of a reduction of 80% CO_2 by 2050 on 1990 levels which forms the basis of Ireland's National Policy Position. The National Mitigation Plan (DCCAE 2017), a requirement of the *Climate Action and Low Carbon Development Act 2015*, was published in July 2017 and outlines where Ireland is in transitioning towards decarbonisation with a view to being regularly updated to provide sectoral (e.g. electricity generation, transport) mitigation options.

In addition to effects associated with atmospheric greenhouse gases, emissions also have the potential to have negative effects on air quality. Poor air quality can result in effects on human health, the wider environment and infrastructure. Reduction in local air quality through inputs of contaminants such as oxides of nitrogen (NO_X), volatile organic compounds (VOCs) and particulates (e.g. PM_{10}, $PM_{2.5}$), may contribute to the formation of local tropospheric ozone and photochemical smog, which in turn can result in human health effects (see WHO 2013, EPA 2017).

Monitoring of these and a range of other pollutants (e.g. SO_2, CO, benzene, heavy metals and PAHs) is undertaken in a number of zones across Ireland in order to understand air quality in relation to those limits set out in the Ambient Air Quality and Cleaner Air for Europe Directive (2005/50/EC). These pollutants were not observed to exceed EU limit values in the most relevant zone to the KADP (Zone B – Cork) in 2016 (EPA 2017).

7.8.1.1 Emissions associated with decommissioning operations

The principal GHG of concern is CO_2 as it constitutes both the largest component of global combustion emissions (generally ~80% of total GHG emissions), and has a long atmospheric residence time such that emissions made today continue to contribute to radiative forcing for some time[11]. Emissions of relevant gas species and their associated Global Warming Potential (GWP) have been estimated for activities associated with the decommissioning of the Kinsale facilities (covered in **Section 3.5**). This has involved the use of standard Environmental and Emissions Monitoring System (EEMS) conversion factors (DECC 2008) to estimate the relative quantity of each gas species from combustion for offshore works, and the most recent GWP metrics (Myhre *et al.* 2013, **Table 7.6**). The result is a value in tonnes of CO_2 equivalent (CO_2 eq.) based on the radiative forcing effect of each GHG species relative to CO_2 and the atmospheric residence time of each gas. The GWP factor therefore changes depending on the "time horizon" considered (see IPCC 2001, 2007, Myhre *et al.* 2013, and Shine 2009 for a synthesis and critical review). GWP factors for CO have previously been calculated as 1.9 at 100 years, and that for NO_x is considered highly uncertain (Forster *et al.* 2007), and these are therefore not generally calculated.

For the purposes of this assessment, a 100 year time-horizon has been used, in line with its adoption by the United Nations Framework Convention on Climate Change and use in the Kyoto protocol (Myhre *et al.* 2013), and nationally for the calculation of carbon dioxide equivalent emissions (Shine 2009). In view of the atmospheric residence time of the principal greenhouse gases and their overall contribution to global greenhouse gas loading, the emissions relevant to both consent applications are considered together.

Table 7.6: Emissions factors

Gas	CO_2	N_2O	CH_4	CO	NOx	SO_2	NMVOCs
Diesel (turbine)	3.22	0.00022	0.0000328	0.00092	0.0135	0.0040	0.000295
Diesel (engine)	3.22	0.00022	0.00018	0.0157	0.0594	0.0040	0.002
Aviation fuel (helicopter)	3.15	0.00012	0.00035	0.00953	0.012	0.0009	0.00306
GWP at 100 years	1	265	28	-	-	-	-

Source: IPCC (1996), DECC (2008), Myhre et al. (2013), AEA-Ricardo (2015)

It should be noted that the emissions calculations are based on a range of assumptions relating to vessel types and timings which are considered to be conservative and include a 25% contingency (see **Section 3.5**). Actual vessel use at the time of decommissioning will be informed by the final decommissioning options and detailed engineering design, though will not be greater than that calculated below.

[11] Figures vary widely from between 5-200 years (Houghton *et al.* 2001) to ~1,000 years (Archer 2005).

Operational emissions

Depending on the selection options for well decommissioning, platform removal and pipeline and umbilical[12] decommissioning, the total emissions from the KADP are estimated to be between 67,600tCO_2eq and 95,600tCO_2eq (see **Table 7.7**).

[12] As indicated in **Section 3.4.6**, in view of the conclusions of the Comparative Assessment, and that further evaluation of whether additional rock cover may be applied to certain sections of the pipelines to reduce 3rd party risk further (mainly in relation to those sections exposed >50%), it was considered that a worst case scenario of applying rock to all exposed sections should be considered. The two scenarios assessed here are therefore the preferred options as indicated in the Comparative Assessment and this worst case option.

Table 7.7: Summary of estimated emissions from decommissioning operations (tonnes)

	Decommissioning Options											Total (CO_2eq.) Application 1 & 2	
	Project Application 1						Project Application 2						
	Wells[a]		Subsea	Topsides			Jackets[b]			Pipelines[c]			
Gas	Rig	LWIV & Rig	Subsea structure removal	Reverse installation	Specialist HLV	Single lift (HLV)	Multiple lift	Specialist HLV	Single lift (HLV)	Rock cover ends and freespans	Extended rock placement	High	Low
CO_2	19,700	14,500	8,500	23,500	22,500	19,100	33,100	20,600	21,300	3,400	9,000	93,900	66,200
N_2O	1	<1	<1	2	2	1	2	1	1	<1	<1	1,600	1,300
CH_4	1	<1	<1	1	1	1	2	1	1	<1	<1	100	100
SO_2	24	18	11	30	30	20	40	30	30	4	10	-	-
CO	100	70	41	110	110	90	200	100	100	20	40	-	-
NO_X	400	300	160	400	400	400	600	400	400	100	200	-	-
VOC	12	9	5	10	14	12	20	13	13	2	5	-	-
											Total	**95,600**	**67,600**

Note:

[a] figures include those for rigless platform well abandonment.

*[b] The use of flotation to remove jackets (see **Section 3.5.2.3**) is estimated to produce emissions of ca. 9,600tCO_2eq., compared to alternatives in the range 21,000tCO_2eq (specialist HLV single lift) and 33,000tCO_2eq. (multiple lift).*

[c] emissions associated with generating new material for rock cover varies between 98tCO_2 and 1,146tCO_2. A post-decommissioning survey is required under all scenarios, and emissions associated with the vessel are incorporated into the totals above.

Figures rounded following; >100, rounded to nearest 100; 10-100, rounded to nearest 10; <10, rounded to nearest whole number or indicated as <1.

From 2020, new IMO limits on SOx and particulate matter emissions (0.5% by mass) outside of Emission Control Areas (note the Celtic Sea is not within an ECA) will come into force. Note that ships at berth are already subject to controls on the use of fuels which should not exceed 0.10% SO_2 by mass.

Local effects on air quality from fuel combustion are mitigated through the remote location of most of the activities associated with the KADP (at least 40km from nearest land, unless the option to rock cover all exposed sections of the export pipeline is selected), away from any areas with air quality management plans (the closest being Dublin for NO_2). Given the development location and predominant air flow, the resulting atmospheric emissions will have, at most, negligible, temporary and local effects which are considered to be minor.

The removal of the Kinsale Area facilities and their operational emissions is undertaken in the context of Ireland's national objective to transition to a low carbon economy as set out in the *Climate Action and Low Carbon Development Act 2015*. The related National Policy Position has a long-term vision based on:

- an aggregate reduction in CO2 emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors
- in parallel, an approach to carbon neutrality in the agriculture and land-use sector, including forestry, which does not compromise capacity for sustainable food production.

To place the CO_2eq. emissions from activities associated with the KADP in context, in 2015 the EU28 emitted a total of 4,452 million tonnes CO_2eq. greenhouse gases, excluding net CO_2 sequestrations through land use, land use change and forestry (LULUCF) (EEA 2017). In 2015, emissions of the basket of six greenhouse gases covered by the Kyoto Protocol from Ireland were estimated to be 59.88 million tonnes CO_2eq (provisionally 61.19 million tonnes CO_2eq in 2016). Emissions have generally fallen in Ireland since the economic downturn of 2008, however 2015 emissions were 3.7% higher than in 2014 (57.76 million tonnes), with the largest increases between 2014 and 2015 coming from the waste and industrial sectors, up 10.9 and 10.2% respectively (EPA 2017a), and are provisionally estimated to be another 3.5% higher in 2016, returning emissions to 2009 levels (EPA 2018, also see EPA 2017c).

The above emissions estimates resulting from KADP activities (Consent applications 1 and 2) would constitute between approximately 0.12 and 0.16% of 2015 Irish national emissions. Locally, annual average (2010-2016) operational emissions of CO_2 from the Kinsale Area were 35,700t, which will be eliminated on CoP. Therefore, though the KADP emissions may be considered as additive to these in the context of wider atmospheric GHG loading derived from Kinsale Energy emissions, the outcome of the operations is that there will be no further emissions from the Kinsale Area. Overall, it is considered that emissions associated with the KADP will have a minor negative effect resulting from small incremental GHG loading.

7.8.1.2 Emissions associated with material recycling

To provide a more complete indication of the emissions associated with the decommissioning of the Kinsale Area facilities, emissions from the recycling of their primary components to be removed have been estimated (note that re-use options have not been identified for the KADP facilities – see **Section 3.3**). These are primarily from steel and concrete associated with the platform topsides, jackets, terminal building (considered minor, see **Appendix D** and **Section 7.11**) and any recovered pipeline and umbilical materials (largely negligible given proposed methods of decommissioning) as well as concrete from recovered mattresses, with some other minor metal and plastic components.

Most materials to be recovered from the Kinsale Area are highly recyclable (e.g. steel, making up ~70% of the recovered materials, see **Table 3.27**) and therefore have a strong potential end-of-life benefit (i.e. through the displacement of virgin material in the wider steel supply chain (Hammond & Jones 2011, Weinzettel *et al.* 2009, Yellishetty *et al.* 2012)), which also has wider implications than just emissions. Conversely the leaving of components *in situ* results in a loss of future use of that material.

The emissions calculated below represent those that would be associated with the production of secondary materials (i.e. with a recycled content which will also include an element of primary raw materials, e.g. typical steel in the EU comprises an average of 59% recycled content). Additionally, the lost benefit from not recycling the pipelines and umbilicals left *in situ* is estimated based on the emissions using the carbon intensity of 100% virgin materials (i.e. due to the necessity to replace the materials which could have been recycled with new materials). Further detail with regard to the emissions from minor impacts, such as the Inch terminal decommissioning, is provided in **Appendix D**, and are also considered as a potential source of cumulative effect (see **Section 7.11**).

Total emissions relating to the production of recycled materials have been calculated based on the typical embodied carbon of materials to be returned for recycling (tCO_2eq./t), with factors largely based on those from Hammond & Jones (2011) and IoP (2000) (see **Table 7.8**). Emissions estimated to be generated from the recycling of materials associated with the KADP are 28,400tCO_2eq.

When considered in relation to the equivalent emissions using materials from primary sources (*ca.* 57,900tCO_2eq.), it can be estimated that there is a net emissions benefit of *ca*. 29,800tCO_2eq. from recycling the material that is returned to shore. Recycling of these materials may be taken to be either a benefit to the overall lifecycle emissions associated with the Kinsale area infrastructure, or may be considered as offsetting those emissions otherwise embodied in the extraction and transport of primary materials for use in new products. Additionally, wider environmental interactions associated with the extraction of virgin materials are also avoided.

Table 7.8: Emissions relating to the recycling of materials associated with the KADP (tonnes)

Activity	Material recovered (t)					Emissions (tCO_2eq.)
	Steel	Aluminium	Copper	PP	Concrete	
Topsides recycling	8,100	-	-	-	-	11,900
Jacket recycling	9,000	200	-	-	-	13,500
Pipeline & umbilical ends recycling	200	0.12	-	-	4,500	300
Subsea manifolds and WHPS	300	-	-	-	1,400	500
Recovered well casing and tubular sections	1,500	-	-	-	-	2,200
					Total	28,400
					Emissions estimated from production of equivalent material from primary sources	57,900
					Emissions avoided from material recovery	-29,800

Notes: values rounded to nearest 100t.

Emissions have been estimated for the production of replacement materials for those which are proposed to be left *in situ*. These are summarised in **Table 7.9** and are estimated to be *ca.* 93,200tCO_2eq. For the purposes of comparison, on the basis of emissions alone (i.e. not considering wider potential effects from seabed disturbance and additional risk relating to full pipeline and umbilical removal, as detailed in the Comparative Assessment), in view of those emissions estimates for the proposed decommissioning options (**Table 7.7 and 7.8**), and assuming that the entire emissions recycling benefit is attributed to the KADP, it is not regarded that there is a net emissions benefit to the recovery of the additional pipeline material (summarised in **Table 7.9**).

Table 7.9: Estimated total decommissioning emissions from operations and material recovery/replacement

Emissions component	Values incorporating pipeline/umbilical leave *in situ* options		Values incorporating pipeline/umbilical recovery	
	Low	High	Low	High
Emissions from decommissioning operations	67,600	95,600	193,100	215,300
Emissions from recycling recovered materials	28,400	28,400	73,400	73,400
Emissions from the production of new material to offset that left *in situ*	93,200	93,200	-	-
Emissions offset from avoided production of new materials	-30,600	-30,600	-77,400	-77,400
Net emissions	**158,600**	**186,600**	**189,100**	**211,300**

Notes: Values rounded to nearest 100t.

7.8.2 Interactions between environmental factors

While emissions associated with the KADP represent an increment to global GHG loading and therefore will contribute to the associated effects of climate change which are projected to affect all environmental factors to varying degrees (e.g. see IPCC 2013, Marine Institute 2009), the emissions are minor in a regional context and of short duration. In addition, further emissions from the Kinsale Area will be eliminated on completion of the decommissioning work. Emissions are therefore not considered to generate significant effects on a broader range of environmental factors than those identified above.

7.8.3 Environmental management, mitigation and residual effects

It is considered that there is limited scope for additional mitigation measures to reduce the residual effect on atmospheric GHG loading, or any local effects on air quality. There is the potential to minimise time in the field and associated vessel days and related emissions by making use of vessel synergies and careful activity phasing which would form part of standard programme management, and there is the potential to make further emissions reductions during contractor selection (e.g. those using modern efficient vessels); however neither of these are considered to significantly alter the predicted effect. Emissions from material flows will be minimised by using a waste hierarchy approach consistent with the Waste Framework Directive 2008/98/EC; establishing where there is scope for equipment and material re-use and recycling, with disposal only taking place where no feasible alternative is available.

Effects on any environmental factor from energy use and atmospheric emissions associated with the KADP are considered to be **negligible and temporary**. See environmental management commitments 1, 3, 4 and 9 in **Section 8.2**.

7.8.4 Summary and conclusion

Activities associated with the KADP covered by consent applications 1 and 2 will lead to emissions of gases which contribute both to localised and short-term increases in atmospheric pollutants, and to global atmospheric GHG concentrations. In the context of wider Irish emissions these effects are considered to be negligible, and there will be a minor positive benefit from the return of recyclable materials to shore which will have a future use and offset the extraction and transport of primary raw materials. On completion of the KADP, all current emissions from the Kinsale Area will be eliminated. Effects are considered to be negligible and temporary.

7.9 Conservation Sites and Species

There are a number of Natura 2000 sites located along the coast of south west Ireland, the closest site (Cork Harbour SPA) being within 6km of the export pipeline (see **Section 4.4.8**). With the exception of the export pipeline, the Kinsale Area facilities to be decommissioned are at least 25km from the closest site (Old Kinsale Head SPA), though the qualifying interests of certain sites e.g. seals, harbour porpoise (both on Annex II of the Habitats Directive) and seabirds may be present across the Kinsale Area at some distance from site boundaries. Relevant sites include Roaringwater Bay and Islands SAC (74km) for harbour porpoise and grey seal, Saltee Islands SAC (109km) for grey seal, and Old Head of Kinsale SPA (25km) and Saltee Islands SPA (116km) for seabirds including gannet, fulmar, kittiwake, gulls and auks (see **Section 4.4.8** for more details).

Additionally, protected species such as those listed on Annex II and IV of the Habitats Directive may also be present across the Kinsale Area. Annex IV includes all cetaceans (e.g. harbour porpoise, common dolphin, bottlenose dolphin, minke whale, fin whale and humpback whale) and the leatherback turtle.

Sources of effect on conservation sites and species from the Kinsale Area Decommissioning Project split by project consent application are shown below. Biodiversity (with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC) was the only environmental factor, as detailed in the EIA Directive (see **Section 6.1**), considered to be relevant to this topic.

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells	Mechanical cutting of and removal of surface casings Accidental spills of fuel/lubricants	*Biodiversity*
Subsea wells		
Topsides removal	Presence in field of vessels Transit of vessels and transport to shore Underwater noise from vessels including DP Accidental spills of fuel/lubricants	
Subsea structures	Presence in field of vessels Transit of vessels and transport to shore Underwater noise from vessels including DP Accidental spills of fuel/lubricants	
Consent Application 2		
Jackets	Abrasive, high pressure water jet and other cutting (internal and external cuts)	*Biodiversity*
Pipelines and umbilicals	Presence in field of vessels Transit of vessels and transport to shore Underwater noise from vessels including DP and rock placement Accidental spills of fuel/lubricants	
Post-decommissioning survey	Underwater noise from survey equipment	

7.9.1 Assessment of potential effects

Noise from vessel activity associated with the decommissioning activities has the potential to contribute to existing noise levels in the area. It is indicated in **Section 7.5** that while it cannot be excluded that sound from vessels will in the short-term influence the behaviour of individual marine mammals within the vicinity of the operations, the risk that any effect could become significant at the population level is deemed to be extremely low due to a combination of sound characteristics, duration of activity, current understanding of marine mammals movement and behaviour in the relevant offshore area, and distance to the closest marine protected areas (Roaringwater Bay and Islands SAC) with relevant qualifying features (harbour porpoise, see **Section 4.4.8**). Additionally, noise from cutting (e.g. of the platform conductors, jacket members and risers) and rock placement is not anticipated to significantly exceed that of vessel operations. In view of the characteristics of the sound sources associated with the proposed post-decommissioning survey, the hearing capabilities of marine mammals, and the overall duration and location of the survey, any risk of injury or disturbance are assessed as highly unlikely with no predicted significant effects.

The physical presence, light and noise generated by rigs and vessels associated with decommissioning activities may potentially cause displacement and/or other behavioural responses in birds (see **Section 7.2.2**). The foraging ranges of a number of seabirds associated with nearby colonies (some of which are also SPAs) could bring them to within the Kinsale Area. However, most of these species have been judged to have a low to moderate sensitivity to disturbance by shipping traffic (Garthe & Hüppop 2004). Only the cormorant, a coastal species and a feature of the Cork Harbour SPA and Sovereign Islands SPA, was judged to be highly sensitive to disturbance by shipping (Garthe & Hüppop 2004). However, the KADP will result in a small increase in vessel traffic within the wider Kinsale Area and is anticipated to cause no more than temporary and localised disturbance, which is not predicted to result in significant effects.

Accidental events, particularly spills, have the potential to result in significant impacts on conservation sites and species, however the nature of potential spills from the decommissioning operations and their low likelihood are such that significant effects are not predicted. Further information is provided in **Section 7.10**.

All recent benthic sampling and photographic surveys in the Kinsale Area (including the 2017 seabed survey) 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.

7.9.2 Environmental management, mitigation and residual effects

No further residual effects following mitigation beyond that already indicated in **Sections 7.2-7.8** has been identified for conservation sites and species.

7.9.3 Summary and conclusion

The potential for significant effects to arise for qualifying features of sites of relevance to the Kinsale Area are considered to be minor (for example due to the lack of any significant impulsive noise sources). The KADP has also been considered in relation to the relevant Natura 2000 sites described in **Section 4.4.8** as part of a separate screening for Appropriate Assessment (AA), which considered the likelihood of potential significant effects on European sites from the proposed activities.

7.10 Accidental Events

Risk assessment of accidental events, including the risk of major accidents (i.e. as required under Article 3(2) of Directive 2011/92/EU, as amended), involves the identification of credible accident scenarios, evaluation of the probability of incidents and assessment of their ecological and socio-economic consequences. Given the nature of the activities which could take place as a result of decommissioning, the following potential sources of accidental events have been identified for each project consent application:

Facility	Activity/Source of Potential Effect	Relevant Environmental Factor
Consent Application 1		
Platform wells	Dropped objects Accidental releases to atmosphere (including refrigerants and natural gas from well blowout) Accidental spills of fuel/lubricants Chemical spills	*Population and human health; Biodiversity; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape*
Subsea wells		
Topsides removal	Dropped objects Vessel collision Accidental spills of fuel/lubricants	
Subsea structures	Dropped objects Vessel collision Accidental spills of fuel/lubricants	
Consent Application 2		
Jackets	Dropped objects Vessel collision Accidental spills of fuel/lubricants	*Population and human health; Biodiversity; Land, soil, water, air and climate; Material assets, cultural heritage and the landscape*
Pipelines and umbilicals		

The potential for effects from accidental events were identified in **Section 6** for the broad environmental factors; population and human health; biodiversity (including conservation sites and species), land, soil, water, air and climate and material assets, cultural heritage and the landscape (**Tables 6.3a and 6.3b**). More specifically, the potential for significant effects was identified for water quality (with related potential significant effects of relevance to all marine biodiversity receptors (see **Section 4.4**), fisheries and other users of the sea.

A description and assessment of these potential effects is provided below.

7.10.1 Assessment of potential effects

7.10.1.1 Well decommissioning and topsides preparatory work

The platform topsides and pipelines will be cleaned prior to decommissioning work commencing (see **Section 3.5.2.1**), and due to the nature of the produced hydrocarbons (dry gas), there is not considered to be any risk from residual hydrocarbons which could lead to pollution. In advance of well abandonment, each well bore will be displaced to seawater. Extremely low reservoir pressures (~50-100psia at decommissioning) and well control procedures make the risk of a well blowout remote.

During the preparation and removal of topsides every care will be taken to minimise accidental releases to atmosphere of, for example, fluorinated greenhouse gases used as refrigerants. The decommissioning of relevant equipment and recovery of fluorinated gases will be carried out by appropriately certified persons (as specified by European Union (Fluorinated Greenhouse Gas) Regulations 2016 (Statutory Instrument. No. 658 of 2016). Systems containing refrigerants will be depressurised and recovered into dedicated cylinders for each refrigerant type, with the total quantity of such gases being ~90kg per platform. Refrigerants will be disposed of in accordance with relevant waste legislation and only permitted and licensed waste facilities will be used.

7.10.1.2 Vessel collision and accidental spills of fuel/lubricants

Relevant information detailing the risk of interaction with other users and mitigation measures (e.g. lighting, marking and Notices to Mariners, also see **Section 7.10.2**) has already been detailed in **Section 7.2**. In view of these measures, the risk of vessel collision is considered to be low.

The loss of the diesel fuel inventory from the semi-submersible rig or HLV (estimated to be *ca*. 1,000-1,500m^3, see HLV data sheet[13] for example) represents the main source of an accidental spill of oil associated with the decommissioning operations.

Diesel is a low viscosity distillate fuel with a significant proportion of light-ends, which means that evaporation is an important process contributing to the reduction in mass balance. Spilled diesel will spread rapidly on the sea surface and evaporate and dissolve within a few days. Evaporation can be enhanced by higher wind speeds, warmer water and air temperatures, and is likely to be rapid given the mild climate and relatively windy nature of the Kinsale Area (wind speeds > 8m/s are experienced on 70-80% of occasions in winter and 30–35% in summer (see **Section 4.2**)).

Of relevance to the KADP, stochastic oil spill modelling based on loss of diesel inventory from a drilling rig was recently completed for the Midleton Exploration Well 49/11-3, approximately 20km north-east of the Kinsale Head area (RPS 2015). The modelling indicated that in a worst case event of loss of the entire rig fuel inventory (800 tonnes/*ca*. 900m^3), there was <10% chance of any residue reaching coastal waters or crossing the Ireland/UK median line.

The model indicated that due to the relatively strong winds in the area and the chemical properties of the diesel (e.g. low viscosity, no emulsion formation), any fuel spilt either evaporated or was entrained in the water column within 24 hours, leaving very little on the surface and below levels to be of risk to wildlife or habitats, or detectable by visual inspection. From the modelling it was concluded that in the highly unlikely event of the loss of the entire rig fuel inventory, there was zero percent probability of beaching. It is expected that the worst case scenario of a large diesel spill from a rig or HLV during decommissioning operations would result in a similar outcome to that modelled for the Midleton Prospect given the similar environmental conditions and fuel properties, though noting that when operating, the HLV would be at a greater distance from the coast (*ca*. 45km compared to 36km for the Midleton Prospect).

Seabirds and marine mammals are generally considered the most vulnerable components of the ecosystem to oil spills in offshore and coastal environments, because of their close association with the sea surface. Benthic habitats and species may also be sensitive to deposition/sedimentation of oil although given the nature of the potential diesel spill and the water depths over the Kinsale Area, significant effects on the benthos are unlikely.

The effect of oil pollution on seabirds depends (amongst other factors) on the numbers of seabirds at sea around the site of the incident (Webb *et al.* 2016) and this is particularly true given the likely localised and transient nature of a diesel spill. **Section 4.4.6** indicates that a number of seabird species may be present in

[13] https://www.hansaheavylift.com//fileadmin/pdf/vessels/Vessel%20Data%20Sheet_P2%20800.pdf

the Kinsale Area. Of these, guillemot, razorbill, black guillemot, puffin and shag are the most sensitive to oil pollution as judged by their seabird oil sensitivity index (SOSI) (Webb *et al*. 2016). However, the majority of these species have a primarily coastal distribution. Those species that may be present in offshore areas relevant to where most of the decommissioning activities will take place have a moderate SOSI (e.g. fulmar, gannet, lesser black-backed gull and kittiwake).

Generally, marine mammals (which rely on blubber for insulation) are less vulnerable than seabirds to fouling by oil, but they are at risk from hydrocarbons and other chemicals that may evaporate from the surface of an oil slick at sea within the first few days. For a diesel spill this evaporation happens largely within the first 24 hours. In contrast to seabirds there is relatively little evidence of direct mortality associated with oil spills (Geraci & St. Aubin 1990, Hammond *et al.* 2003), although the aggregated distribution of some species (especially dolphins) may expose large numbers of individuals to localised oiling.

Hydrocarbon spills have the potential to affect fish and shellfish populations by tainting (defined as the ability of a substance to impart a foreign flavour or odour to the flesh of fish and shellfish following prolonged and regular discharges of tainting substances) caused by ingestion of hydrocarbon residues in the water column and on the sea bed, though the risk of such taint is low in deeper (>10m), open waters (Law *et al.* 2011). Possible effects on human consumers of seafood are also an issue of concern in relation to accidental spills and industrial discharges, and actual or perceived contamination may therefore result in economic effects on fishing and associated industries.

Given the information presented above, the environmental consequences of a large diesel spill are likely to be of a moderate nature. The complete loss of rig or HLV fuel inventory is only likely to occur following a severe accident such as a major collision, explosion or capsize. Accident statistics for mobile drilling units on the UKCS estimated annual average frequencies for these events of between $1.4x10^{-2}$ and $9.0x10^{-4}$ per unit year for the period 1990-2007 (Oil and Gas UK 2009). The remote likelihood of such an accident occurring in the Kinsale Area indicates that the overall significance of any effect is likely to be low.

7.10.1.3 Chemical spills

Chemical use as part of the decommissioning activities will be limited to the flushing and cleaning of topsides, pipeline displacement to inhibited seawater in the 24” and 18” export pipelines, and cementing activities as part of well decommissioning. Spills from drilling rigs and vessels, are largely preventable through provision of appropriate equipment, maintenance, procedures and training. The accidental discharge of these chemicals from the rig or vessels is unlikely to represent a significant effect given that chemicals with the best environmental profile, for example PLONOR (Pose Little or No Risk) chemicals, and those without substitution warnings and other labels will be preferentially selected as far as practicably possible.

7.10.2 Interactions between environmental factors

While there is the potential for interactions between effects on commercially exploited fish species (biodiversity) and socio-economic effects on fisheries (material assets and population and human health), the potential for such effects are considered to be remote in view of the likelihood of a significant hydrocarbon spill.

7.10.3 Environmental management, mitigation and residual effects

The description and assessment of potential effects from accidental events has been undertaken assuming that activities are in accordance with regulatory and policy controls, these include:

- Other users of the Kinsale Area, which include fisheries, shipping and other sea users such as recreational sailing and those involved in maritime activities such as survey, will be alerted to the decommissioning activities via publication of Notices to Mariners detailing rig and vessel positions, activities and timing and by full navigation lighting on the rig and vessels.
- A standby vessel will minimise the potential for interaction between the rig and other users, and much of the decommissioning activity will be within existing exclusion zones thereby further reducing the potential for interaction.
- All vessels and the rig to be used during decommissioning will be subject to audit and expected to adhere to Kinsale Energy HES policy. They will have in place the relevant, current Shipboard Oil Pollution Emergency Plan (SOPEP) in accordance with MARPOL

and/or an oil spill contingency plan, which would be implemented in the event of an accidental event.

Kinsale Energy risk management measures and legislative compliance minimise the risk that an accidental event could occur (noting the already very low frequencies of such incidents relating to oil and gas activities), and therefore minimise the likelihood of any resultant significant effect. This includes measures which will be in place to avoid, as far as possible, spills from bunkering and supply operations, and general rig operations, including processes and procedures (e.g. bunkering procedures with reference to sea-state and daylight hours where practicable; procedure to be agreed with the Department of Transport, Tourism and Sport (DTTAS)), colour coding of hoses, storage of hoses in a safe area away from risk of physical damage, inspection of hose couplings, critical valves to be locked and controlled by permit, and general good housekeeping.

During the removal of topsides, jackets, wellheads, spool pieces and other associated infrastructure, every care will be taken to minimise dropped objects and the generation of debris. Any dropped objects will be recovered during decommissioning operations and an independent seabed debris clearance survey conducted once decommissioning operations have been completed to verify that debris clearance has been completed.

The likelihood of significant effects is considered to be low due to the nature of produced hydrocarbons (dry gas) and regulatory and policy controls associated with the decommissioning activities. See environmental management commitments 1, 3, 4, 5, 10 and 11 in **Section 8.2**.

7.10.4 Summary and conclusion

Mandatory control mechanisms and additional mitigation measures will be in place for activities associated with consent applications 1 and 2, which when considered in the context of the predicted behaviour of a potential diesel spill and the distance of the offshore field of operations to sensitive receptors, lead to the conclusion that there is a low risk of significant effects to any environmental factors from accidental events associated with the KADP (**Tables 6.3a and 6.3b**).

7.11 Cumulative Impacts

EIAR guidelines (EPA 2017b) define cumulative impacts as the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects. Two main sources of cumulative effects are defined by IEMA (2011) as:

- Intra-project effects, those that occur between different environmental topics within the same proposal
- Inter-project effects, those that occur as a result of the likely effects of a proposal interacting with the impacts of other developments

Potential sources of these two types of cumulative effect are considered below, reflecting the available information on the nature and scale of other (i.e. not KADP related) activities, several of which are not yet consented and the activitiy timing and potential conditions of consent of these are not conjectured.

7.11.1 Intra-project cumulative effects

Significant effects have not been identified for any of the issues considered in **Sections 7.2-7.10** above or **Appendix D**. There is limited scope for intra-project interactions between the decommissioning of the offshore facilities and the Inch Terminal onshore (other than the additive contribution of greenhouse gas emissions), as no intertidal or nearshore work involving vessels together with machinery involved in coastal works for the respective aspects of the project are anticipated.

A summary consideration of intra-project cumulative effects is given in **Table 7.10** which includes both those sources of potentially significant effect assessed in **Sections 7.2-7.9** above, and those considered to be minor which are described in **Appendix D**. The shading in **Table 7.10** indicates those intra-project sources of effect that have the potential to interact with a receptor. The potential for cumulative effects described in Table 7.10 covers those activities proposed to be undertaken as part of the KADP. Accidental events (see Section 7.10)

while possible, and with the potential to act cumulatively with almost all other sources of effect (other than waste and energy use) and almost all receptors associated with each environmental factor (excluding shipping, waste treatment and landfill resource, cultural heritage and landscape/seascape), are considered to be unlikely.

Effects associated with the two project consent applications are not distinguished in this section as all aspects of the project are considered together in terms of their potential cumulative effect. The potential for intra-project cumulative effects was considered to be small, and no likely significant effects were identified.

Table 7.10: Overview of intra-project cumulative effects

Environmental Factor		Broad sources of effect identified (see Section 6)						Description of potential intra-project effects
		Physical presence	Physical disturbance	Noise & vibration	Discharges to sea	Waste: materials recycling, reuse & disposal	Energy use & atmospheric emissions	
Population & Human Health		■		■		■	■	Waste processing at appropriate licensed facilities will minimise the potential for intra-project cumulative effects on local communities associated with the presence of material, and the noise and emissions (including odour) of its processing. Due to the relative location of the Inch Terminal to any dismantling yard, and the distance offshore of the major decommissioning works (at least 40km), the minor and temporary predicted effects on airborne noise, air and water quality from decommissioning operations (e.g. associated with vessel emissions and well abandonment related discharges), are not predicted to act cumulatively such that significant effects would be generated.
Biodiversity	Benthic fauna	■	■		■			A number of activities (rig or HLV mooring, removal of subsea structures and protection materials and rock cover remediation), add to disturbance and subsequent changes to seabed character. The cumulative nature of these interactions is spatially restricted and recovery is expected to be rapid. Marine discharges associated with decommissioning are not considered to be significant sources of cumulative effect when taken in combination with physical disturbance.
	Plankton				■			No intra-project cumulative effects identified.
	Fish & shellfish	■	■	■	■			Impacts identified as potential sources of effect on fish and shellfish (physical presence of vessels, seabed disturbance, noise, discharges) are spatially and temporally limited, with a potentially small spatial overlap at the KA and KB platforms (noise from cutting of platform legs and discharges to sea). Cumulative effects are not considered to be likely.
	Marine reptiles	■						No intra-project cumulative effects identified.

Environmental Factor		Broad sources of effect identified (see Section 6)						Description of potential intra-project effects
		Physical presence	Physical disturbance	Noise & vibration	Discharges to sea	Waste: materials recycling, reuse & disposal	Energy use & atmospheric emissions	
	Marine mammals	■		■				Noise was identified to be the only likely source of potentially significant effect for marine mammals. It is not considered likely that the cumulative noise generated by the multiple vessels and related activities (cutting, rock placement, post-decommissioning survey) involved in the decommissioning project will result in significant effects.
	Waterbirds & seabirds	■		■				Main noise sources (decommissioning vessels, cutting activities, post-decommissioning survey) and the bulk of activities will take place far from colonies, with the exception of vessel transits to shore and any nearshore survey, which will be planned to minimise disturbance. Cumulative effects not considered to be likely.
	Onshore habitats/species	■	■	■				Limited spatial and temporal nature of onshore works and lack of any potential overlap with the offshore aspects of the KADP are such that intra-project cumulative effects are not considered to be likely.
	Conservation sites/species	■		■				No intra-project cumulative effects identified.
Land, soil, water, air & climate	Seabed		■					A number of activities (rig or HLV mooring, removal of subsea structures and protection materials and rock cover remediation), add to disturbance and subsequent changes to seabed character. The cumulative nature of these interactions is spatially restricted and recovery is expected to be rapid.
	Water quality	■	■		■			All marine discharges are unlikely to have a significant spatial or temporal overlap with any sediment turbidity from seabed works, or be a source of cumulative effects.
	Air & Climate					■	■	The low likelihood of emissions from a well blowout, the preferential recycling of materials which may displace the use of primary materials, and the temporary nature of vessel, road traffic and demolition related emissions associated with the Inch Terminal (~110 tCO_2eq., some 0.05% on estimated offshore KADP emissions, see **Appendix D**) are such that cumulative effects are not considered likely.
Material assets, cultural heritage and	Fisheries	■						The presence of decommissioning vessels (including outside of existing exclusion zones and in transit) is spatially and temporally restricted (e.g. the programme of works is expected to take 12-18 months, however this will not involve continuous working across this period). No intra-cumulative effects identified.
	Other users & resources[14]	■						
	Shipping	■						
	Waste treatment & landfill resource onshore					■	■	No intra-project cumulative effects identified.
	Cultural heritage		■					No intra-project cumulative effects identified.

[14] Includes military activity, cables, marine disposal, recreation and tourism.

Environmental Factor		Broad sources of effect identified (see Section 6)						Description of potential intra-project effects
		Physical presence	Physical disturbance	Noise & vibration	Discharges to sea	Waste: materials recycling, reuse & disposal	Energy use & atmospheric emissions	
	Landscape/seascape							No spatial overlap and limited temporal overlap with onshore and offshore activities, which are not intervisible. No intra- project cumulative effects identified.

Sections 7.2-7.10 have considered the potentially significant effects of the KADP as a whole within the broad sources of effect identified in Table 7.10 above, such that cumulative effects within these categories (and relevant interactions between environmental factors) have already been considered for the major issues. When considered in combination with those minor issues described in **Appendix D**, no additional cumulative effects are considered to be likely.

7.11.2 Inter-project cumulative effects

Article IV(5e) of the EIA Directive requires that, "*the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources", are described.* Few existing or approved projects take place in the Kinsale Area, and no relevant projects were identified which were considered to be a source for potential cumulative effects in relation to Inch Terminal decommissioning. Those for which there is a possible interaction with the KADP include:

- Existing oil and gas lease areas and potential offshore oil & gas related exploration activity (see Section 4.5.1)
- The Hibernia Atlantic "D" and Hibernia Express subsea cables (see Section 4.5.5)[15]
- Marine dredge disposal authorisations relating to the Port of Cork and Department of Defence (see Section 4.5.7)
- Commercial shipping (see Section 4.5.2)
- Fisheries (see Section 4.5.3)

In addition to those existing/approved projects/activities, two proposed projects were identified which are yet to be formally approved:

- Ireland France subsea cable (see Section 4.5.5)
- Eirgrid Celtic interconnector (see Section 4.5.5)

These projects/activities are considered below against the broad sources of potential effect identified for the KADP in **Section 6.2**.

[15] Note that potential cumulative effects with the Hibernia cables (e.g. from survey noise, physical presence of vessels, seabed disturbance) would have already taken place on their installation. The KADP will not involve any further interaction with these cables and cumulative effects are not considered to be likely and so are not discussed further.

7.11.2.1 Physical presence

The presence of the rig, HLV and decommissioning vessels associated with the KADP will be of a temporary nature, and signify a small and transient incremental increase in the level of shipping in the Celtic Sea. Additionally, the jackets would continue to be present in the short-term should they be placed in "lighthouse mode", however this does not represent any increment to levels of physical presence with any other project (see Section 7.2). No other controls on access (e.g. strategic exclusions such as from International Maritime Organisation (IMO) routeing) are present in the area.

There are a number of current authorisations for oil and gas exploration in the Celtic Sea (**Figure 4.11**) which abut the Kinsale lease areas, or overlap these in the case of EL 1/11. While activity including the drilling of a well or seismic survey could take place within the terms of these licences, no activity is presently planned[16], and any activity would be likely to take place some distance from those involving the KADP. Any exploratory drilling would be subject to controls including the placement of a temporary exclusion zone, guard vessel and publication of activities through Notices to Mariners, and be subject to its own assessment. Such activity is also temporary in nature (perhaps lasting a few months). Significant cumulative effects with offshore exploration activities are therefore not considered to be likely. The Barryroe oil discovery is located within the EL 1/11 exploration licence area, with an associated appraisal well (48/24-10z) located ~3km from the nearest Kinsale Area facilities (Seven Heads manifold). The discovery has the potential to be developed in the future, but further appraisal is to take place and no firm development proposals have been made. Therefore the nature and scale of any development and its potential interaction with the KADP is uncertain.

Interactions with commercial fishing and shipping (which would include those involved in dredge disposal, and survey or installation activities associated with the proposed subsea cables) have already been considered in Section 7.2. In view of the minor and temporary increment to vessel presence that the KADP would represent, the significant potential for temporal separation of activities (e.g. there is uncertainty in timescales for any exploration activity, and installation activity associated with the potential Celtic interconnector is proposed for between 2021 and 2025), significant cumulative effects are not considered to be likely.

The KADP is not considered likely to lead to significant inter-project cumulative effects by the physical presence of the drilling rig (consent application 1) or vessel (consent applications 1 and 2), when taken together with the above projects.

7.11.2.2 Physical disturbance

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 (see **Section 4.5**). Wells have already been drilled in the exploration licence areas using semi-submersible rigs between 2005 and 2011 (i.e. involving anchoring and the drilling of surface holes with local seabed disturbance), and further exploration in these areas is possible as noted in 7.11.2.1. As project plans for additional exploration or any development are not known, and in view of the physical and temporal scale of any potential incremental disturbance, and the capacity for seabed recovery (see **Section 7.4**), no cumulative effects are considered to be likely.

Seabed disturbance at the Roche's Point dredge disposal site from the Ringaskiddy redevelopment and the Haulbowline Naval Base is unlikely to act in a cumulative manner given the spatial (at least 5km from the export pipeline, and potentially further from any KADP activity which could generate physical disturbance depending on the selection pipeline decommissioning option) and temporal separation of proposed activities (note that current disposal activities are permitted up to 2021 which is prior to planned subsea decommissioning operations). It should also be noted that the dredge disposal from these projects represents an increment to historical and ongoing disposal at the Roche's Point site, and any disturbance from the KADP, including from rock placement, is minor in this context (for example the Ringaskiddy port authorisation permits the disposal of up to 1.8 million tonnes of dredged material). Cumulative effects from the KADP are not considered to be likely.

Demersal fishing intensity is moderate, and probably represents the principal source of seabed disturbance in the wider Celtic Sea, although the Future trends in the Celtic Seas report (ABPmer & ICF International 2016) suggests that the area impacted by mobile demersal gears may be declining.

[16] https://www.dccae.gov.ie/en-ie/natural-resources/topics/Oil-Gas-Exploration-Production/environment/statuatory-consents/Pages/2017-Statutory-Assessments.aspx

Impacts from physical disturbance associated with the KADP are to take place largely within the existing footprint of the KADP infrastructure and also within exclusion zones presently closed to fisheries, with the exception of any pipeline remediation outside of these areas.

Seabed disturbance associated with the potential Celtic interconnector will be limited and given that installation could happen between 2021 and 2025 there is considerable scope to ensure there is limited overlap with decommissioning activities. One of the indicative routes for the Ireland-France subsea fibre optic cable crosses the 24" export pipeline in the nearshore area[17] and is proposed to be active in 2019, and therefore in advance of the decommissioning project, though this project is yet to be formally approved. Dialogue will be maintained with the developer to understand the nature of any crossing and the interaction of this with the pipeline decommissioning options.

The KADP is not considered likely to lead to significant inter-project cumulative effects by the physical disturbance generated by vessel or rig anchoring, subsea structure removal (consent application 1), and jacket removal and pipeline remediation (consent application 2), when taken together with the above projects.

7.11.2.3 Underwater noise

Noise sources associated with those existing projects/activities listed above are likely to be associated with vessels (e.g. shipping, fishing, oil and gas support and rig noise), or possibly seismic survey (i.e. associated with oil and gas exploration). Similarly, vessel noise and potentially surveys to provide seabed mapping (e.g. using side scan sonar and/or MBES) and seabed preparation for cable laying would be a feature of any work associated with the proposed projects identified, however a lack of firm project proposals or approvals limits their consideration here. **Section 7.5** indicated that while it cannot be excluded that sound from decommissioning will in the short-term influence the behaviour of individual marine mammals within the vicinity of the operations, the risk that any effect could become significant at the population level, when taking into account other relevant projects/activities, is deemed to be extremely low due to a combination of sound characteristics, duration of activity, and current understanding of marine mammal movements and behaviour in the Kinsale Area. The underwater noise associated with the KADP will represent a small and highly temporary increment to an area exposed to moderate levels of shipping (ambient noise in the area is described in **Section 4.3.1**), and following decommissioning, shipping associated with the Kinsale Area facilities (~one supply round trip every 28 days), permanent presence of standby vessel and any noise generated from platform operations (e.g. including helicopter traffic, ~2 flights per day), will cease.

As noted above, while there are a number of exploration licence areas in the vicinity of the Kinsale Area, project plans for additional exploration are not known or are uncertain, and therefore no cumulative effects are predicted at this time.

The KADP is not considered likely to lead to significant inter-project cumulative effects by the underwater noise generated by the rig (consent application 1), vessels (consent applications 1 and 2), cutting (consent applications 1 and 2) or post-decommissioning survey (consent application 2), when taken together with the above projects.

7.11.2.4 Discharges to sea

No significant impacts are anticipated from marine discharges associated with the KADP in-combination with other users such as wider shipping (which also includes that associated with the proposed subsea cable projects), discharges from other potential offshore oil & gas exploration activities (e.g. chemical discharges (which would be subject to a PUDAC), or of cuttings), and marine disposal of dredged material at the Roche's Point dredge disposal site. Decommissioning will also result in the cessation of small permitted discharges associated with the Kinsale platforms (see **Section 7.6**) and related support operations.

The nature of the decommissioning activities are such that marine discharges will be minor (e.g. from well decommissioning, subject to a PUDAC; consent application 1) and largely those associated with normal shipping operations (consent applications 1 and 2) for which there are adequate existing regulatory standards and controls. The KADP activities are temporary, have no long-term implications, and are not considered to be a source of potentially significant cumulative effect.

[17] http://www.housing.gov.ie/planning/foreshore/applications/ireland-france-subsea-cable-ltd

7.11.2.5 Waste: materials recycling, reuse and disposal

Unlike the North Sea, the Kinsale Area represents the only major offshore energy installation in the Celtic Sea, and therefore the only related decommissioning project of this kind. The overall significance of the impact of waste as a result of the decommissioning project is considered to be low, including a minor positive increment from material reuse, offsetting use of primary raw material. No cumulative waste-related effects can be identified with regards to those projects listed in **Section 7.11.2**.

The decommissioning works shall be undertaken in a manner which maximises the potential for reuse and recycling, including source segregating waste where appropriate. Management of all waste will be undertaken in accordance with the relevant waste legislation and only permitted and licensed waste facilities will be used.

7.11.2.6 Energy use and atmospheric emissions

The emission of greenhouse and other gases associated with the KADP resulting from offshore and onshore activities will be incremental to wider regional and global atmospheric gas loading – in the context of wider annual Irish GHG emissions these are marginal (approximately between 0.12 and 0.16%, which are based on conservative vessel timings and a 25% operational contingency). Given the KADP will eliminate continuing operational emissions from gas production and export (~35,700tCO_2 per year), no significant cumulative effects are predicted with other projects/activities, either ongoing or proposed, which will similarly contribute to emissions from vessel traffic.

7.11.2.7 Accidental events

The type of accidental events described in **Section 7.10** are not planned events and are considered to be highly unlikely. In the context of historical and ongoing leak reporting on the UKCS, including of major accidents (as reported in Dixon (2015)) the incremental risk of additional diesel and chemical spills from other vessels in the region are considered small.

7.11.3 Summary and conclusion

No significant intra-project cumulative effects were identified for any environmental factor, when major and minor potential effects were taken together. A limited number of potential interactions with other projects/activities, either consented or planned, were identified. No significant inter-project cumulative effects were identified due to the limited spatial and temporal nature of the major sources of effect of the KADP, and the limited scope for further interaction (Hibernia subsea cables), the spatial separation of the KADP work and certain projects (dredge material disposal) or potential activities (other oil & gas exploration activities), and the current uncertainty about the timing and routes of potential projects (Ireland France subsea cable and the Eirgrid Celtic interconnector).

7.12 Transboundary Impacts

Ireland has ratified the Convention on Environmental Impact Assessment in a Transboundary Context (the Espoo Convention) and thus an assessment is needed of the potential for the proposed KADP to result in significant transboundary effects[18] – the shortest distance to the nearest Median line is 75km (Ireland/UK). The likely nature and footprint of effects described above for seabed disturbance, physical presence, noise, discharges to sea and atmospheric emissions (alone and cumulatively), are regarded to be localised in extent, minor in a regional context, and are not regarded to pose a risk of transboundary effects to UK waters. It is regarded that there is a low potential for diesel to reach UK waters in the event of a worst case loss of fuel inventory from the rig or HLV due to its chemical properties leading to rapid evaporation, limiting the potential for effects (refer to **Section 7.10**).

Certain materials produced during the decommissioning project may be exported from Ireland for re-use, recycling, and/or treatment and disposal. Where materials are to be exported, and/or the selected dismantling yard is not located in Ireland, this will be undertaken in a manner consistent with the Waste Management

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

(Shipments of Waste) Regulations 2007, and is not regarded to represent a source of significant effect on the environment, or pose a significant risk to population and human health.

Atmospheric emissions contribute to global GHG loading and therefore represent a very minor addition to those gases which are related to the ongoing and projected impacts associated with anthropogenically induced climate change. As noted in **Section 7.8**, emissions are relevant at a global scale, as are their related effects. These are minor in view of wider emissions from Ireland and Europe, and operations are also temporary; on completion, further emissions from the Kinsale area will be eliminated.

KINSALE ENERGY

Kinsale Area Decommissioning Project

Section 8

Management of Residual Effects and Conclusions

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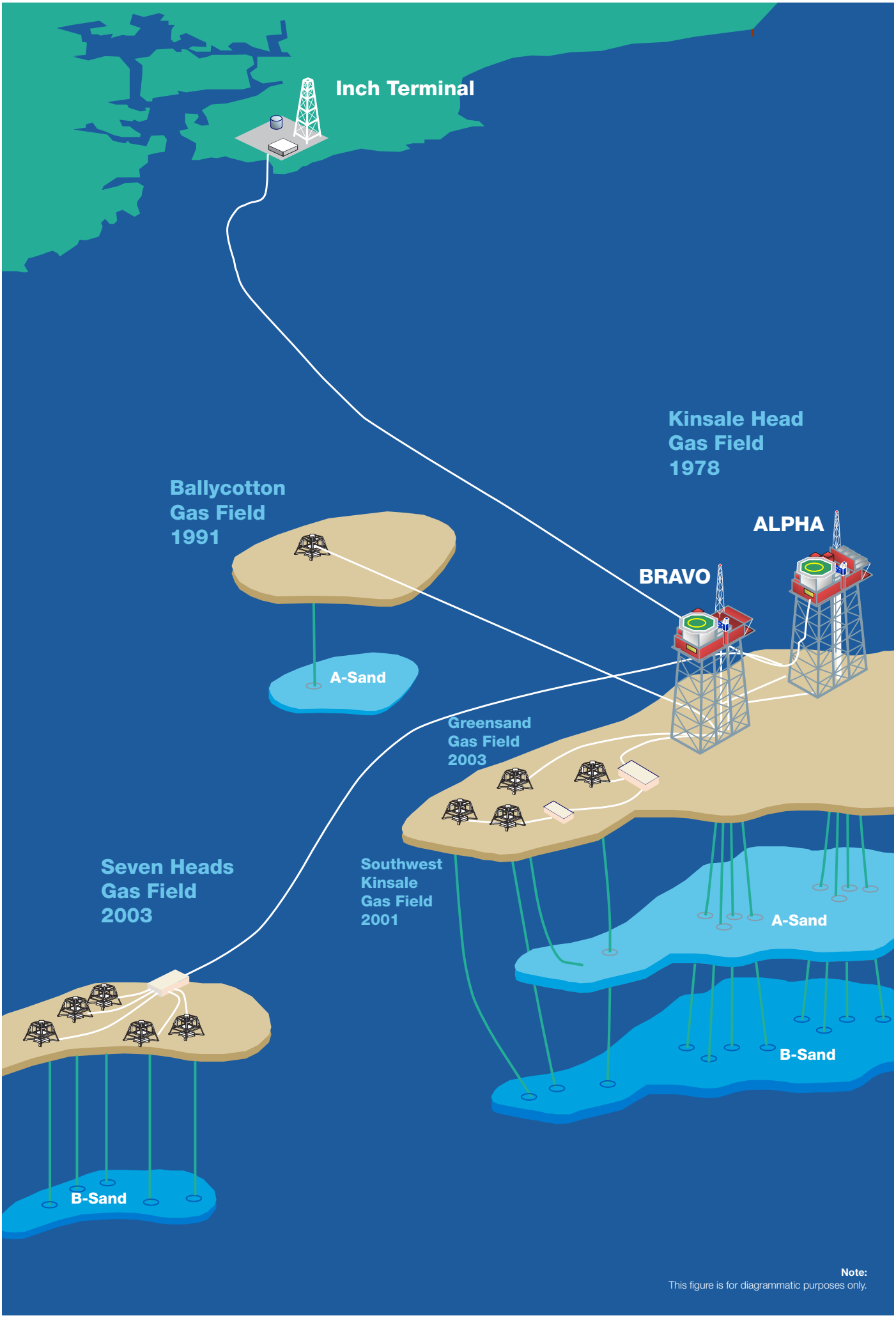
Inch Terminal
Kinsale Head
Gas Field
1978
Ballycotton
Gas Field
1991
ALPHA
BRAVO
A-Sand
Greensand
Gas Field
2003
Seven Heads
Gas Field
2003
Southwest
Kinsale
Gas Field
2001
A-Sand
B-Sand
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Note:
This figure is for diagrammatic purposes only.

8 Management of Residual Effects and Conclusions

8.1 Introduction

Through a systematic evaluation of the activities relating to the proposed KADP and their interactions with the environment, a variety of environmental effects were identified (**Section 6**), the majority of which were of limited extent and duration and considered minor. Those activities identified as being of potentially greater concern were described and assessed further in **Section 7**.

A number of potential effects are mitigated through mandatory requirements (e.g. as prescribed in legislation), to which non-adherence would constitute an offence. Compliance with these requirements will be ensured as part of Kinsale Energy's legal and environmental management commitments (**Table 8.1**), which will also include the audit and management of contractors. Additionally, environmental issues were considered early in project planning, and mitigation measures were incorporated into the project design.

A number of mitigation measures and environmental management actions were identified in **Section 7 and** are highlighted in **Section 8.2**, along with other environmental management commitments, to be taken forward into final project planning and execution.

8.2 Environmental Management Commitments and Mitigation Measures

Table 8.1: Summary of environmental management commitments and actions

Issue		Environmental management commitments to be taken forward into KADP planning and execution	Assessment topics of relevance	Relevant Application		Responsibility
				1	2	
1	Compliance assurance	Ensure management of the applications for and monitoring of compliance with the requirements of project environmental permits and consents.	All	✓	✓	KEL
2	Procurement	Ensure requirement to meet MARPOL standards included in procurement of vessels and rigs to be used in decommissioning operations.	7.6	✓	✓	KEL
3	Contractor management	All vessels and the rig to be used during decommissioning will be subject to audit. Contractor performance will be monitored throughout the decommissioning operations	All	✓	✓	KEL
4	Activity planning	Wherever possible, seek to minimise vessel days by making using of vessel synergies and careful activity phasing.	7.2, 7.4, 7.5, 7.6, 7.8, 7.10	✓	✓	KEL

Issue		Environmental management commitments to be taken forward into KADP planning and execution	Assessment topics of relevance	Relevant Application		Responsibility
				1	2	
5	Interaction with other users: decommissioning operations	Notices to Mariners will be issued to cover all phases of decommissioning work to communicate the nature and timing of the activities. All vessels used in the decommissioning operations will meet applicable national and international standards (e.g. in terms of signals and lighting) and would follow established routes to ports. Should the jackets be placed in "lighthouse mode" for a period of time following topside removal, navigational aids of a type agreed with the Commissioner of Irish Lights will be deployed. Consultation will take place with fisheries organisations and relevant marine authorities in accordance with legislation.	7.2, 7.10	✓	✓	KEL KEL/Contractor KEL KEL
7	Discharges to Sea	Ensure chemical risk assessment is undertaken as part of final well decommissioning chemical selection and apply for relevant chemical permits (Permit for Use and Discharge of Added Chemicals – PUDAC).	7.6	✓	-	KEL
8	Waste production	Implement a detailed Resource and Waste Management Plan which maximises the potential for reuse and recycling, including source segregating waste where appropriate. Management of all waste will be undertaken in accordance with the relevant waste legislation and only permitted and licensed waste facilities will be used.	7.7	✓	✓	KEL
9	Atmospheric emissions	As part of the decommissioning waste management plan (above), the benefit of materials returned to shore will be maximized through preferential reuse and recycling wherever possible.	7.8, 7.12	✓	✓	KEL/Contractor
10	Accidental events: dropped objects	All lifting operations will be risk assessed.	7.3, 7.10	✓	✓	Contractor
11	Accidental events loss of diesel inventories	Undertake audit of vessel bunkering procedures. Bunkering to be conducted in favourable sea states and during daylight hours so far as practicable. Procedure to be agreed with DTTAS.	7.10	✓	✓	Contractor

Table 8.2 Mitigation measures and residual effects

Issue		Mitigation measures to be taken forward into KADP planning and execution	Assessment topics of relevance	Relevant Application		Responsibility
				1	2	
1	Interaction with other users: decommissioning	Guard vessels will be used to minimise the potential for interaction between decommissioning vessels and other users.	7.2, 7.10	✓	✓	KEL/Contractor

	Issue	Mitigation measures to be taken forward into KADP planning and execution	Assessment topics of relevance	Relevant Application		Responsibility
				1	2	
	operations	**Residual effect:** *The use of guard vessels would reduce the risk of other user interaction with certain activities associated with the decommissioning project (e.g. heavy lifts). However, as these would take place in existing and charted surface exclusion zones, with all vessels subject to mandatory lighting and marking controls, the addition of a guard vessel will result in a minor risk reduction to other users. The residual impact from interactions with other users is temporary and minor.*				
2	Interaction with other users: legacy materials left *in situ*	Rock cover remediation will be used to mitigate the potential snagging risk associated with decommissioning pipelines and umbilicals *in situ*, and the rock will be designed to be overtrawlable.	7.3	✓	✓	KEL/Contractor
		Residual effect: *On application of rock cover following removal of exclusion zones around relevant infrastructure, there remains a low risk to other users (primarily fishing) from interactions with pipelines and umbilicals. The option to rock cover all exposed pipeline sections would further reduce risks to third parties.*				
3		Pipelines and umbilicals will be surveyed post-decommissioning to establish their exact position and this information will be included into navigational charts	7.3	✓	✓	KEL/PAD
		Residual effect: *The post-decommissioning survey will confirm/update the position of the pipelines and umbilicals and inform any update to their charted location to ensure other users are aware of their accurate position, and therefore contribute to risk reduction from interaction.*				
4	Physical disturbance: sensitive seabed features	The minimisation of rig and vessel movements which require anchoring, and the use of dynamic positioning (DP) on most vessels, where practicable (Note that sensitive features (e.g. wrecks, Annex I habitats) have not been recorded in previous surveys within the working area). Pipeline decommissioning options (rock placement) which minimise physical disturbance will be selected subject to wider environmental, safety, technical and economic considerations. For each option involving rock placement, efforts will be made to minimise the volume of rock deployed.	7.4	✓	✓	KEL

Issue		Mitigation measures to be taken forward into KADP planning and execution	Assessment topics of relevance	Relevant Application		Responsibility
				1	2	
		Residual effect: *The measures have the potential to reduce the significance of effect by minimising seabed footprint of activities. The predicted effect of seabed disturbance is negligible and short-term.*				

8.3 Conclusion

The overall conclusion of the Environmental Impact Assessment Report is that, in view of the predicted scale, intensity and duration of the activities, with the implementation of the proposed mitigation, risk reduction measures and commitments in **Table 8.1** and **Table 8.2** (along with adherence to statutory requirements and guidance), the KADP will not result, directly or indirectly, in likely significant adverse effects on the environment, alone or cumulatively with other existing or approved projects.

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Section 9

References

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ARUP

9 References

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