ABWP Phase I Decommissioning

Summary of Interaction of Effects

Volume 2, Chapter 9

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Project name ABWP Phase I Decommissioning

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Glossary

Term	Meaning
Arklow Bank Wind Park (ABWP) Phase I	Arklow Bank Wind Park (ABWP) Phase I comprises: • Offshore infrastructure seaward of High Water Mark (HWM), including: – Seven Wind Turbine Generators (WTG) with a combined capacity of 25.2 MW; – One meteorological (met) mast; – Inter-array cables connecting the WTGs and met mast; and – One offshore export cable connecting WTG T4 with landfall at HWM; • Onshore infrastructure landward of HWM including: – One onshore cable connecting landfall at HWM with the onshore substation; and – One onshore substation compound, where the onshore substation and ancillary infrastructure are located.
ABWP Phase II	ABWP Phase II comprises: • Offshore Infrastructure, including: – 53 or 47 WTGs and two Offshore Substation Platforms (OSPs) located within the "Array Area"; – Inter-array cables connecting WTGs with the OSPs; and – Two offshore export cables; • Onshore grid connection infrastructure, including a 220 kV substation at Shelton Abbey with an associated connection to the existing National Electricity Transmission Network;

Term	Meaning
	• Operations and Maintenance Facility (OMF) at South Dock, Arklow Harbour; and • EirGrid Upgrade Works.
Additional mitigation	Actions that will be required to reduce the significance of environmental effects of the Proposed Works, which will be dependent on the significance of effects assessed in the EIAR. Also referred to as secondary mitigation in Institute of Environmental Management and Assessment (IEMA) (2024). IEMA is now the Institute of Sustainability and Environmental Professionals (ISEP).
Arklow Energy	Arklow Energy Limited, the entity seeking planning permission for the Proposed Works, i.e. the applicant.
Baseline	A description of the relevant aspects of the current state of the environment (baseline scenario) (EIA Directive 2014/52/EU).
Bathing waters	All elements of surface water where the competent authority expects a large number of people to bathe and has not imposed a permanent bathing prohibition, or issued permanent advice against bathing (Bathing Water Directive 2006/7/EC).
Beam trawl	A towed fishing gear held open by a rigid beam and used mainly to target demersal species such as flatfish.
Cumulative effect	The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects (EPA, 2022). Cumulative effects within this EIAR comprise those arising from the Proposed Works with other developments, i.e. plans and projects that are 'reasonably foreseeable' (Planning Inspectorate (PINS), 2024).
Cumulative effects assessment	Assessment of potential environmental effects resulting from the Proposed Works cumulatively with other plans, projects or reasonably foreseeable activities.
Decommissioning	The final closing down and putting into a state of safety of a development, project or process when it has come to the end of its useful life (EPA, 2022).
Demersal otter trawl	A towed net held open by water pressure on two otter boards and fished along the seabed to target species such as nephrops and mixed demersal fish.
Demersal species	Demersal fish are species that live and feed on or near the seabed. Includes species such as haddock, cod, whiting and flatfish.
Detailed Marine Mammal Mitigation Protocol (MMMP)	The contractor-developed version of the MMMP, to be prepared before Proposed Works Offshore commence and maintained as a live document until completion.
Diadromous	Fish species which migrate between freshwater and seawater during different life phases.
Draught	Vertical distance between the waterline and the lowest point of a vessel's hull (usually the keel). It essentially measures how deep a vessel sits in the water.
Dredge	Metal-framed basket or scoop that fishing vessels tow along the seabed for the purpose of catching molluscs (e.g. clams, oysters, scallops, mussels). Dredges are made of a robust steel frame, often with a toothed bar across the lower edge, and a heavily reinforced or chain link bag.
Effect	The consequence of an impact on a receptor. For example, in the offshore environment, vessel activity (activity) results in increased levels of underwater noise (impact), with the potential to disturb marine mammals (effect).
EIA Scoping	The scoping stage provides an opportunity for both developers and the Competent Authority to determine those key environmental impacts and issues of concern that are likely to be of the utmost importance to the Project proposal's decision-making and eliminates those that are less of a concern (European Commission (EC,) 2017).

Term	Meaning
EIA Scoping Presentation	Presentation scoping the likely environmental impacts of the Proposed Works to be further considered in the Environmental Impact Assessment Report (EIAR). The EIA Scoping Presentation is included in **Volume 3, Appendix 1.1** of the EIAR.
Embedded mitigation	Mitigation measures included as part of the Proposed Works. Include modifications arising through the iterative design process; and standard industry practice that would occur even without input from the EIA process, e.g. actions undertaken to meet other existing legislative requirements, or actions that are standard practices used to manage commonly occurring environmental effects. Correspond to primary and tertiary mitigation defined in Institute of Environmental Management and Assessment (IEMA) (now Institute of Sustainability and Environmental Professionals (ISEP)) (2024).
Environmental factor	Refers to environmental factors used to present the characteristics of the environment (EPA, 2022) that are used to organise the description of the environment in the EIAR.
Environmental Impact Assessment (EIA)	Process of assessment of the effects of a project or development proposal on the environment. In the planning area, it is undertaken by a planning authority or An Coimisiún Pleanála during the consideration of applications for planning permission, taking account of an Environmental Impact Assessment Report (EIAR). The projects which require EIA are listed in Annex I and Annex II of the EIA Directive, as amended (Office of the Planning Regulator, n.d.).
Environmental Impact Assessment Report (EIAR)	A report or statement of the effects, if any, that Proposed Works, if carried out, would have on the environment. It is prepared by the developer to inform the EIA process (Office of the Planning Regulator, n.d.).
Fishery	A group of vessel voyages which target the same species or use the same gear.
Fishing Ground	An area of water or seabed targeted by fishing activity.
Fleet	A physical group of vessels sharing similar characteristics (e.g. nationality).
High Water Mark (HWM)	Level reached by the sea at high tide, measured as the mean of high tides.
Impact	A change brought about by the Proposed Works.
Inter-array cables	Subsea power lines that link individual wind turbine generators (WTGs) together in an offshore wind farm, forming an electrical network. In ABWP Phase I, inter-array cables connect WTGs and the met mast to each other and have an overall length of 7.4 km.
Intertidal	The area between the HWM and the Low Water Mark (LWM).
Landfall	The point where the offshore export cable transitions from the offshore marine environment to the onshore terrestrial environment.
Low Water Mark (LWM)	Level reached by the sea at low tide, measured as the mean of low tides.
Lowest Astronomical Tide (LAT)	Exact, lowest theoretical sea level that can be predicted to occur under average meteorological conditions.
Magnitude	A combination of the spatial extent, duration, frequency and reversibility of an impact.
Meteorological (Met) mast	A mast with a number of meteorological sensors located at different heights to record meteorological and sea condition data
Mitigation measures	Measures to avoid, prevent or reduce impacts (EPA, 2022), which comprise both embedded and additional mitigation, see separate definitions for these.
Monitoring	The periodic or continuous observation of biodiversity indicators and of other parameters that may affect biodiversity for any changes that may occur over time, so as to confirm predictions made with respect to likely

Term	Meaning
	effects and identify adverse changes that may require remedial action (Office of the Planning Regulator, n.d.).
Monopile (MP)	Hollow steel cylinder driven into the seabed typically used to anchor an offshore wind turbine generator (WTG). In ABWP Phase I, MPs support the seven WTGs as well as the meteorological (met) mast.
Nautical mile (nm)	Measurement used for distances at sea. 1 nm equates to 1.852 km.
Noise	The terms noise and sound are often used interchangeably. Noise usually refers to unwanted or disturbing sounds that interfere with normal hearing and can be unpleasant or harmful. It is often characterised by irregularities in the sound waves and is considered a form of sound pollution.
Offshore export cable	Subsea power cable that transports the total generated power from an offshore wind farm to the onshore power grid. In ABWP Phase I, the offshore export cable connects the wind turbine generator (WTG) T4 to landfall with an approximate overall length of 15.6 km. At landfall, the offshore export cable transitions to the onshore cable connecting to the onshore substation.
Offshore Site	Part of the Site where Proposed Works Offshore are proposed to take place. In this application for planning permission, the Offshore Site comprises the Sub Lease Area, where the ABWP Phase I wind turbine generators (WTGs), met mast and inter-array cables are located, and the offshore export cable 10 m corridor connecting WTG T4 to the landfall at high water mark (HWM) near Arklow Harbour.
Onshore cable	Land-based portion of the power cable that transports the total generated power from an offshore wind farm to the onshore power grid. In ABWP Phase I, the onshore cable connects the landfall point at HWM to the onshore substation building.
Onshore Site	Part of the site where Proposed Works Onshore are proposed to take place. In this application for planning permission, the Onshore Site comprises the onshore substation compound that hosts the onshore substation building and ancillary facilities; the onshore cable 10 m corridor connecting the landfall point from high water mark (HWM) to the onshore substation, and the area that will temporarily be used for temporary storage of plant, vehicles, machinery, excavated soil and materials.
Onshore substation compound	Fenced compound that hosts the onshore substation building and ancillary facilities, including the 38 kV transformer.
Pathway	The route by which an effect is conveyed between a source and a receptor (EPA, 2022).
Pelagic species	Pelagic fish are species which live and feed within the water column. Includes species such as herring, sprat and mackerel.
Pelagic trawl	Mid-water trawl gear used to target shoaling pelagic species such as sprat and herring.
Planning permission	Formal, legal approval required from a local planning authority or An Coimisiún Pleanála (ACP) to carry out development. The Proposed Works require planning permission submitted from ACP under Section 291 of the Planning and Development Act 2000, as amended.
Port marshalling area	The port-based area used for temporary storage, segregation, handling and onward transfer of recovered materials and wastes.
Potting	Static gear fishery using baited pots or creels to target shellfish species such as whelk, lobster and brown crab.
Proposed Works	The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).
Receptor	Any element in the environment which is subject to impacts (EPA, 2022).

Term	Meaning
Recycling	Subjection of waste to any process or treatment to make it re-usable in whole or in part (Waste Management Act 1996 (as amended)).
Scallop dredge	A rigid dredging gear towed along the seabed to target king scallop or queen scallop.
Scour protection	Engineered barrier typically placed on the seabed around WTG foundations and subsea cables to prevents sediment erosion caused by accelerated water currents and waves, safeguarding the WTG's stability and protecting subsea cables. In ABWP Phase I, scour protection was originally introduced in the form of rock armour, however, this proved ineffective, and was removed in 2005. Since then, scour protection has been introduced through sandbags.
Sensitivity	The potential of a receptor to be significantly affected (EPA, 2022).
Shellfish	Within the context of commercial fisheries and aquaculture, shellfish is considered a generic term to define molluscs and crustaceans; fish with a hard outer case or shell.
Side scan sonar (SSS)	Underwater remote sensing device that captures an image of the seabed surface across the extent of the area over which the device is deployed
Significance	The importance of the outcome of the impact (or the consequence of change) for the receiving environment (EPA, 2022).
Sound	The terms noise and sound are often used interchangeably. Sound is a broad term that refers to any auditory experience created by vibrations that travel through a medium such as air, water, or solids to the ear.
Sub Lease Area	Area where the ABWP Phase I WTGs, met mast and inter-array cables are located, as defined in the Sub Lease granted by Sure Partners Limited (SPL) to Arklow Energy Limited (Arklow Energy) to construct and operate ABWP Phase I.
Surface water	Surface waters include rivers, lakes, transitional and coastal waters.
Transition Piece	The steel connection structure between the tower and the monopile (MP) foundation.
Waste	Any substance or object belonging to a category of waste specified in the First Schedule or for the time being included in the European Waste Catalogue which the holder discards or intends or is required to discard, and anything which is discarded or otherwise dealt with as if it were waste shall be presumed to be waste until the contrary is proved (Waste Management Act 1996 (as amended)).
Wind Turbine Generator (WTG)	Structure that converts the kinetic energy of ocean winds into electrical energy. ABWP Phase I includes seven GE Energy 3.6s WTGs with a rated capacity of 3.6 megawatts (MW) per WTG.

Acronyms

Acronym	Meaning
ABWP	Arklow Bank Wind Park
ACP	An Coimisiún Pleanála
DCEE	Department of Climate, Energy and the Environment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EU	European Union
FMMS	Fisheries Management and Mitigation Strategy
HWM	High Water Mark
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive and Non-Native Species
ISEP	Institute of Sustainability and Environmental Professionals
LWM	Low Water Mark
LAT	Lowest Astronomical Tide
MAC	Maritime Area Consent
MARA	Maritime Area Regulatory Authority
MDS	Maximum Design Scenario
MMMP	Marine Mammal Mitigation Protocol
MSFD	Marine Strategy Framework Directive
OMF	Operations and Maintenance Facility
OSP	Offshore Substation Platform
SSC	Suspended Sediment Concentrations
SSS	Side scan sonar
WFD	Water Framework Directive
WTG	Wind Turbine Generators

Units

Unit	Meaning
km	Kilometre
kV	Kilovolts
m	Metre
MW	Megawatts
nm	Nautical mile

9 SUMMARY OF INTERACTION OF EFFECTS

9.1 Introduction

9.1.1 Overview

9.1.1.1 Arklow Energy Limited (Arklow Energy) is seeking planning permission to decommission Arklow Bank Wind Park (ABWP) Phase I (referred to hereafter as 'the Proposed Works'). The Proposed Works include decommissioning of ABWP Phase I offshore infrastructure (Proposed Works Offshore) and decommissioning of ABWP Phase I onshore infrastructure (Proposed Works Onshore).

9.1.1.2 The Proposed Works Offshore will be undertaken within the Offshore Site (see **Volume 2, Chapter 3: Proposed Works Description**), which includes:

- The Sub Lease Area, located on the long narrow Arklow Bank sand bank, situated approximately 10 km off the coast of Arklow, south-east Ireland, where seven wind turbine generators (WTGs) and foundations, associated scour protection, 7.4 km of inter-array cables and one met mast are located; and
- A 10 m wide cable corridor along the 15.6 km offshore export cable route connecting WTG T4 to the landfall point at High Water Mark (HWM).

9.1.1.3 The Proposed Works Onshore will be undertaken within the Onshore Site (see Volume 2, Chapter 3), located landward of the HWM in Ferrybank, off North Quay Road, within Arklow Harbour, and comprises:

- A fenced compound that hosts the onshore substation building and ancillary facilities; and
- A 10 m wide cable corridor along the onshore cable connecting the landfall point from HWM to the onshore substation.

9.1.1.4 This chapter of the Environmental Impact Assessment Report (EIAR) presents a summary of the interaction of effects assessed in **Volume 2, Chapters 4 - 8** of the EIAR. Those Chapters describe the methodologies, datasets that have informed the Environmental Impact Assessment (EIA), baseline conditions, including future baseline, mitigation measures and the residual significant effects on relevant environmental factors, including direct, indirect and inter-related effects, scoped into the EIAR, that could result from the Proposed Works.

9.1.1.5 Given that the EIA Scoping Presentation (see **Volume 3, Appendix 1.1**) and **Volume 2, Chapter 1: Introduction** did not identify credible pathways to significant effects on onshore environmental factors or in relation to Proposed Works Onshore, these are not considered further in this chapter.

9.1.1.6 This chapter has been informed by:

- **Volume 2, Chapter 1: Introduction;**
- **Volume 2: Chapter 4: Coastal Processes, Water and Sediment Quality;**
- **Volume 2: Chapter 5: Marine Biodiversity;**
- **Volume 2: Chapter 6: Commercial Fisheries and Aquaculture;**
- **Volume 2: Chapter 7: Shipping and Navigation;** and
- **Volume 2: Chapter 8: Marine Archaeology**.

9.1.2 Legal Context

9.1.2.1 As indicated in **Volume 2, Chapter 1**, the need to consider the potential interaction of effects stems from the Environmental Impact Assessment (EIA) Directive (Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (as amended) and its transposition into Irish law through the Planning and Development Act 2000, as amended ('the 2000 Act').

9.1.2.2 Article 3(1) of the EIA Directive requires that the interaction between the environmental factors be identified, described and assessed as part of EIA. Environmental Protection Agency (EPA) guidance (EPA, 2022) requires careful consideration of pathways, direct and indirect, that can magnify effects through the interaction or accumulation of effects, and states that "the interactions between impacts on different environmental factors should be addressed as relevant throughout the EIAR".

9.1.3 Methodology

9.1.3.1 The assessment of the interaction of the potential effects of the Proposed Works Offshore (also referred to as inter-related effects) has been carried out considering:

- Proposed Works lifetime effects: an assessment of the effects that occur both during Proposed Works and after the Proposed Works are complete (effectively the post-decommissioning phase), interacting to potentially create a more significant effect upon a receptor than if the Proposed Works were only considered alone (without consideration of the post-decommissioning phase); and
- Receptor-led effects: effects that interact spatially and temporally resulting in inter-related effects upon a single receptor. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

9.1.3.2 For Proposed Works lifetime effects, **Volume 2, Chapters 4 – 8** of the EIAR have been reviewed in detail to summarise and assess potential effect pathways which may persist beyond the completion of Proposed Works for individual receptors / receptor groups to assess whether they may result in significant impact.

9.1.3.3 For receptor-led effects, the interactions between effects of different environmental factors have been considered throughout individual assessment chapters (**Volume 2, Chapters 4 – 8** of the EIAR) supported by extensive communication and information sharing between all chapter authors and the EIA management team, ensuring these cover potential direct, indirect and inter-related effects. In line with EPA guidance (2022), in this chapter, a matrix of interactions between effects of different environmental factors has been used to provide an overview of these interactions, subsequently summarised.

9.1.3.4 As indicated in **Volume 2, Chapter 1,** impacts (and environmental factors) scoped out of the assessment have not been considered, and the interaction with effects from other plans or projects is separately considered within the assessment of cumulative effects presented within **Volume 2, Chapters 4 – 8** and summarised in **Volume 2, Chapter 10: Summary of Cumulative Effects** of the EIAR.

9.2 Proposed Works Lifetime Effects

9.2.1 Coastal Processes, Water and Sediment Quality

9.2.1.1 **Volume 2, Chapter 4** of the EIAR presents a detailed assessment of the following potential impacts by receptor group:

Water Quality within the Coastal Processes, Water and Sediment Quality Study Area

- Impact to water quality from increased suspended sediment concentrations (SSC); and
- Impact to water quality from disturbance / remobilisation of sediment bound contaminants.

9.2.1.2 All of these potential impacts on water quality are short-term and temporary, and of relatively small spatial scale (with maximum SSC footprint of 7 km and low contaminant concentrations on sediment anticipated), with water quality expected to accommodate changes due to the capacity of the Irish sea waterbody for dilution. All of these potential effects are individually rated as **Negligible - Minor Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. In addition, all of

these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these (scale of days for clay and silt return to background conditions). No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Water Quality within the Water Framework Directive Designated Waterbodies and Water Quality in Designated Bathing Waters

- Impact to water quality from increased SSC; and
- Impact to water quality from disturbance / remobilisation of sediment bound contaminants.

9.2.1.3 Although water quality associated with Water Framework Directive (WFD) designated waterbodies and with designated bathing waters is expected to have limited ability to accommodate changes due to their high sensitivity, potential impacts on water quality are short-term and temporary, and of relatively small spatial scale (noting that designated bathing waters are not anticipated to be affected), overall rated as **Negligible – Minor Adverse** and **Neutral** and not significant in EIA terms, anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these (scale of seconds for SSC near the offshore export cable route to return to background conditions). No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Arklow Bank

- Impacts to the Arklow Bank morphology and stability (including bank erosion); and
- Post-decommissioning monopile (MP) exposure causing scour impacts on Arklow Bank.

9.2.1.4 All of these potential impacts on Arklow Bank are temporary, with the bank anticipated to recover from any potential seabed interaction activities, such as dredging, and potential scour created in the unlikely case that residual MPs become exposed post-decommissioning (as any scour would reach equilibrium within two years). This is due to both the nature and scale of the Proposed Works Offshore, which is anticipated to introduce very localised changes with no measurable far-field impacts on wave climate, currents, or large-scale morphology, and the natural dynamics of Arklow Bank, which dominate the evolution and stability of the Sub Lease Area.

9.2.1.5 Due to the scale of removal works along the offshore export cable route and at landfall, any temporary changes introduced will be highly localised and will not impact the Arklow Bank

9.2.1.6 All of these potential effects are individually rated as **Negligible - Minor Adverse** and not significant in EIA terms, and the potential effects are considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. Both impact pathways are anticipated to extend beyond the duration of the Proposed Works Offshore to some extent, but given that they are rated as Minor Adverse at most, and predicted to be localised, no increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Near-shore Area Adjacent to the Landfall, including Coastline

- Impacts to the near-shore area (including coastline) due to morphological changes of the Arklow Bank; and
- Changes to the near-shore area (including coastline) due to disconnection of the offshore export cable.

9.2.1.7 As described above, the Proposed Works Offshore will be localised and temporary in nature and overall unlikely to affect Arklow Bank's morphology and its function as a natural defence against storms, or affect wave conditions and associated erosion along the coastline, as sediment exchange between the sandbank and the coastline occurs primarily during high-energy events

rather than through continuous transport. The offshore export cable removal process will also cause very localised disturbance, as it will not involve bulk sediment removal but introduce a narrow linear trench, with any sediment resuspension confined to the immediate vicinity of the offshore export cable route, and any temporary depressions anticipated to infill rapidly.

9.2.1.8 These two potential effects are individually rated as **Minor Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. These potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore and are anticipated to be highly localised and unlikely to introduce morphological changes of the Arklow Bank that would indirectly affect the coastline. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

9.2.2 Marine Biodiversity

9.2.2.1 **Volume 2, Chapter 5** of the EIAR presents a detailed assessment of the following potential impacts by receptor group:

Benthic Intertidal Habitats and Species

- Temporary habitat loss / disturbance;
- Increased SSC and associated deposition;
- Disturbance / remobilisation of sediment bound contaminants; and
- Alteration of seabed habitat from changes in physical processes.

9.2.2.2 All of these potential impacts on benthic intertidal habitats and species are short-term and temporary, with habitats and species expected to exhibit rapid recovery due to the small scale of the Proposed Works Offshore, local hydrodynamic regimes, and anticipated rapid SSC deposition rates, having no lasting effects. All of these potential effects are individually rated as **Minor / Negligible Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** when considered together. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Benthic Subtidal Habitats and Species

- Temporary habitat loss / disturbance;
- Increased SSC and associated deposition;
- Disturbance / remobilisation of sediment bound contaminants;
- Alteration of seabed habitat from changes in physical processes;
- Removal of hard offshore infrastructure; and
- Increased risk of invasive and non-native species (INNS) introduction / spread.

9.2.2.3 As in the case of benthic intertidal habitats and species, all of these potential impacts on benthic subtidal habitats and species are anticipated to be short-term and temporary, with no lasting effects. This is also the case for potential effects from the increased risk of INNS introduction / spread, which are only related to vessel activity during the Proposed Works Offshore; or from removal of hard offshore infrastructure, which are anticipated to be highly localised and only affect species established over the last six years, having no significant impact on food chain interactions in the long-term. All of these potential effects are individually rated as **Minor / Negligible Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** when considered together and not significant in EIA terms. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Fish and Shellfish

- Temporary habitat loss / disturbance;
- Increased SSC and associated deposition;
- Disturbance / remobilisation of sediment bound contaminants; and
- Injury and / or disturbance from underwater noise.

9.2.2.4 As in the case of benthic intertidal and subtidal habitats and species, all of these potential impacts on fish and shellfish are anticipated to be short-term and temporary, with no lasting effects. This is also the case for potential effects from injury and / or disturbance from underwater noise, which are anticipated to be highly localised and only be introduced during the Proposed Works Offshore activities anticipated to generate underwater noise. All of these potential effects are individually rated as **Minor / Negligible Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** when considered together. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Marine Mammals

- Injury and / or disturbance from underwater noise;
- Injury from vessels activity; and
- Changes in the fish and shellfish community affecting prey resources.

9.2.2.5 All of these potential impacts on marine mammals are anticipated to be localised, temporary and transitory, and only be introduced during the Proposed Works Offshore. These activities are anticipated to generate underwater noise / vessel activity or introduce to changes to prey resource. All of these potential effects are overall rated as **Negligible - Minor Adverse** and not significant in EIA terms. In addition, additional mitigation in the form of implementing a Marine Mammal Mitigation Protocol (MMMP) (see **Volume 3, Appendix 5.3**) is proposed to further mitigate any potential impacts associated with underwater noise. All of these potential effects are considered to remain at most **Minor Adverse** when considered together, and anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Marine Ornithology

- Changes in the fish and shellfish community affecting prey resources; and
- Disturbance and/or displacement of birds.

9.2.2.6 These potential impacts on marine ornithology are anticipated to be localised, temporary and transitory and only be introduced during the Proposed Works Offshore activities with potential to cause changes to prey resource and/or cause disturbance / displacement, individually rated as **Negligible - Minor Adverse** and not significant in EIA terms. When considered together, these potential effects are considered to remain at most **Minor Adverse** with very limited potential to temporarily extend beyond the completion of the Proposed Works Offshore. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

9.2.3 Commercial Fisheries and Aquaculture

9.2.3.1 **Volume 2, Chapter 6** of the EIAR presents a detailed assessment of the following potential impacts by receptor group:

Potting fishery

- Loss of fishing grounds or restricted access to fishing grounds in the Sub Lease Area;
- Loss of fishing grounds or restricted access to fishing grounds in the offshore export cable route;
- Displacement of fishing activity into other areas;
- Interference with fishing activity;
- Increased fishing gear snagging risk; and
- Effects on commercially exploited species.

9.2.3.2 All of these potential impacts on Commercial Fisheries and Aquaculture are considered to be short-term and intermittent (associated with the progression of the Proposed Works Offshore), and of relatively small spatial scale. Additional mitigation in the form of implementing a dedicated Fisheries Management and Mitigation Strategy (FMMS) (see **Volume 3, Appendix 3.6**) will ensure that all of these potential effects are individually rated as **Negligible - Minor Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Mussel seed fishery

- Loss of fishing grounds or restricted access to fishing grounds in the Sub Lease Area;
- Loss of fishing grounds or restricted access to fishing grounds in the offshore export cable route;
- Displacement of fishing activity into other areas;
- Interference with fishing activity;
- Increased fishing gear snagging risk; and
- Effects on commercially exploited species.

9.2.3.3 As in the case of potting fishery, all of these potential impacts are anticipated to be short-term and intermittent, and of relatively small spatial scale (noting that no overlap between identified mussel seed beds and the Sub Lease Area has been identified). All of these potential effects are individually rated as **Negligible - Minor Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Other fisheries

9.2.3.4 For the purposes of the EIAR, fisheries receptors with limited or low levels of activity within the Commercial Fisheries and Aquaculture Study Area (including scallop dredge, pelagic trawl, beam trawl and demersal otter trawl fleets) are considered collectively under the single receptor grouping 'other fisheries' to ensure a proportionate and efficient assessment, and the following potential impacts have been assessed in detail in **Volume 2, Chapter 6**:

- Loss of fishing grounds or restricted access to fishing grounds in the Sub Lease Area;
- Loss of fishing grounds or restricted access to fishing grounds in the offshore export cable route;
- Displacement of fishing activity into other areas;
- Interference with fishing activity;
- Increased fishing gear snagging risk; and
- Effects on commercially exploited species.

9.2.3.5 As in the case of the other receptors considered above, all of these potential impacts are anticipated to be short-term and intermittent, and of relatively small spatial scale. All of these potential effects are individually rated as **Negligible - Minor Adverse** and not significant in EIA terms, and considered to remain at most **Minor Adverse** and not significant in EIA terms when considered together. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

9.2.4 Shipping and Navigation

9.2.4.1 **Volume 2, Chapter 7** of the EIAR presents a detailed assessment of the potential impacts on shipping and navigation considering two main impact / risk pathways, with no distinction made on vessel types, considered as a single receptor group:

- Increased collision (vessel-to-vessel) risk; and
- Increased allision (vessel-to-structure) risk.

9.2.4.2 Increased collision (vessel-to-vessel) risks are described as short-term and temporary, predominantly limited to periods of active decommissioning vessel activity during the Proposed Works Offshore, whilst increased allision (vessel-to-structure) risks, whilst low, are noted to be present as long as offshore infrastructure remains in place, with likelihood reduced post-decommissioning, when only residual MPs would introduce such a risk for vessels of larger draughts (6 – 8 m).

9.2.4.1 Due to the temporary nature of the Proposed Works Offshore and the limited extent and location of the Offshore Site (located outside heavily marine trafficked areas, with the Sub Lease Area positioned at the crest of Arklow Bank sandbank, itself a navigational hazard), potential effects associated with increased collision and allision risks are assessed as **Broadly Acceptable** and not significant in EIA terms under the two scenarios considered: most likely scenario, which represents the most often experienced minor glancing scenarios involving relevant vessels; and the worst-case scenario, which represents the applicable worst-case consequence that also reflects the lower probability of such worst-case consequences to occur.

9.2.4.2 When considering increased collision and allision risks together, total frequencies and corresponding return periods are still described as extremely unlikely at most (see **Volume 3, Appendix 7.1: Navigational Risk Assessment**) and accordingly, potential impacts are considered to remain at most **Broadly Acceptable** and not significant. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

9.2.5 Marine Archaeology

9.2.5.1 **Volume 2, Chapter 8** of the EIAR presents a detailed assessment of the following potential impacts by receptor group:

Known Heritage assets

- Sediment disturbance and deposition leading to effects on known and unknown heritage; assets; and
- Direct impact on historic shipwreck sites.

9.2.5.2 Due to the nature and location of the Proposed Works Offshore in relation to known heritage assets, these potential impacts will be highly localised, mainly anticipated to affect known heritage assets located within the footprint of the Offshore Site or its immediate vicinity, with magnitude of impact individually rated as low to medium (only in the case of wrecks W02750 and W02781 in relation to direct impacts), to be managed through embedded mitigation, such as archaeological monitoring, implementation of an Archaeological Management Plan (AMP) and

preservation by record, with impacts individually assessed as **Minor – Moderate Adverse** and not significant in EIA terms.

9.2.5.3 When considered together, the significance of these impacts on known heritage assets is considered to remain unchanged, particularly given the temporary and localised nature of sediment disturbance and deposition effects in the context of seabed dynamics that predominate the Offshore Site. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these, as any scour developed post-decommissioning should have effects on known heritage assets similar to those exerted by existing sediment dynamics within the Offshore Site. Accordingly, no increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

Unknown Heritage Assets

- Sediment disturbance and deposition leading to effects on known and unknown heritage; assets; and
- Direct impact on unknown heritage assets associated with buried palaeo landscapes.

9.2.5.4 Unknown heritage assets also have potential to be exposed during the Proposed Works Offshore, particularly around wind turbine generator (WTG) T5, and be affected by direct physical interaction and / or temporary and localised sediment disturbance and deposition, however, individually, these potential effects are assessed as **Minor Adverse** and not significant in EIA terms when considering embedded mitigation measures that will be implemented to avoid and/or mitigate any potential effects.

9.2.5.5 As above, when considered together, the significance of these impacts on potential unknown heritage assets is considered to remain unchanged, particularly given the temporary and localised nature of sediment disturbance and deposition effects in the context of seabed dynamics that predominate the Offshore Site. In addition, all of these potential effects are anticipated to predominantly occur during the execution of the Proposed Works Offshore, with very limited potential to temporarily extend beyond the completion of these. No increase in significance is anticipated when considering the Proposed Works Offshore together with the post-decommissioning phase.

9.3 Receptor-led Effects

9.3.1.1 The matrix in **Table 9.1** provides an overview of where the potential effects associated with a given environmental factor (in columns) has potential to interact with other environmental factors (in rows) scoped into the EIAR (i.e. with potential to lead to significant effects), further described in **Table 9.2**.

Table 9.1: Interaction of effects matrix. Interactions are indicated with ✓ and no interactions are indicated with a ✗.

Interaction of effects scoped in associated with environmental factor in columns, with environmental factors in rows:		Physical Environment	Biological Environment				Human Environment		
		Coastal processes, Water and Sediment Quality	Marine Biodiversity – Intertidal and Subtidal Benthic Ecology	Marine Biodiversity – Fish and shellfish	Marine Biodiversity – Marine mammals	Marine Biodiversity – Marine ornithology	Commercial fisheries and aquaculture	Shipping and navigation	Marine archaeology
Physical Environment	**Coastal processes, Water and Sediment Quality**		✗	✗	✗	✗	✗	✗	✗
Biological Environment	**Marine Biodiversity – Intertidal and Subtidal Benthic Ecology**	✓		✗	✗	✗	✗	✗	✗
	Marine Biodiversity – Fish and shellfish	✓	✗		✗	✗	✗	✗	✗
	Marine Biodiversity – Marine mammals	✗	✗	✓		✗	✗	✗	✗
	Marine Biodiversity – Marine ornithology	✗	✗	✓	✗		✗	✗	✗
Human Environment	**Commercial fisheries and aquaculture**	✓	✗	✓	✗	✗		✓	✗
	Shipping and navigation	✗	✗	✗	✗	✗	✗		✗
	Marine archaeology	✓	✗	✗	✗	✗	✗	✗	

Table 9.2: Summary of potential inter-related effects.

Interaction	Summary of potential inter-related effects
Potential effects on **coastal processes, water and sediment quality interacting with:** • **Marine biodiversity - intertidal and subtidal benthic ecology;** • **Marine biodiversity - fish and shellfish;** • **Commercial fisheries and aquaculture**; and • **Marine archaeology**.	As detailed in **Volume 2, Chapter 4**, coastal processes are not in themselves receptors but are instead 'pathways', and changes to these can affect other receptors, including water quality on which marine biodiversity receptors, such as intertidal and subtidal benthic ecology, fish and shellfish (and commercially exploited species), as well as marine aquaculture sites rely on. Sediment disturbance and deposition also have the potential to affect marine archaeology assets. These inter-related effects have been assessed in detail in: • **Volume 2, Chapter 5**, which concludes that: – Potential effects of increased SSC and associated deposition from the Proposed Works Offshore on benthic subtidal and intertidal habitats and species and fish (including demersal, elasmobranch, pelagic-spawning fish and migratory / diadromous fish) and shellfish are considered to be **Minor Adverse**, which is not significant in EIA terms; – Potential effects of disturbance and remobilisation of sediment bound contaminants from Proposed Works Offshore on benthic subtidal and intertidal habitats and species and fish and shellfish are considered to be **Negligible**, which is not significant in EIA terms; and – Potential effects associated with the alternation of seabed habitat from changes in physical processes from the Proposed Works Offshore on benthic subtidal and intertidal habitats and species are considered to be **Negligible**, which is not significant in EIA terms. • **Volume 2, Chapter 6**, which concludes that: – Potential effects on commercially exploited species, which include consideration of temporary increases in SSC / changes to water quality, are considered to be **Negligible – Minor Adverse**, which is not significant in EIA terms. • **Volume 2, Chapter 8**, which concludes that: – Potential effects on known and unknown heritage assets, which include consideration of sediment disturbance and deposition, are considered to be **Minor Adverse**, which is not significant in EIA terms.
Potential effects on marine biodiversity fish and shellfish interacting with: • **Marine biodiversity - marine mammals;** • **Marine biodiversity - marine ornithology;** and • **Commercial fisheries and aquaculture**.	As detailed in **Volume 2, Chapter 5**, potential changes in fish and shellfish can affect other marine biodiversity receptors that rely on these for feeding, such as marine mammals and marine ornithology; and / or affect their commercial exploitation. These inter-related effects have been assessed in detail in: • **Volume 2, Chapter 5**, which concludes that: – Potential effects of changes in the fish and shellfish community affecting prey resources from Proposed Works Offshore on marine mammals and marine ornithology are considered to be **Negligible**, which is not significant in EIA terms. • **Volume 2, Chapter 6**, which concludes that: – Effects on commercially exploited species, which include consideration of overall changes in the distribution, behaviour and availability of fish and shellfish species, considered to be **Negligible – Minor Adverse**, which is not significant in EIA terms.
Potential effects on shipping and navigation interacting with: • **Commercial fisheries and aquaculture.**	As detailed in **Volume 2, Chapter 6**, potential changes in navigation safety can affect commercial fisheries activities. **Volume 2, Chapter 7** considers shipping and navigation as a whole, including vessels engaged in commercial fisheries activities, and concludes that increased collision (vessel-to-vessel) risk and increased allision (vessel-to-structure) risk are **Broadly Acceptable** and not significant in EIA terms.

9.4 References

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